Samantha A. Alger, PhD

Education

PhD, Biology (Ecology and Evolution), University of Vermont, 2018

BS, General Business, University of Rhode Island, Kingston, RI, 2009

BA, Biology, University of Rhode Island, Kingston, RI 2009

Affiliations/ Memberships

Scientific Advisor, Vermont Beekeepers Association, 2017-present

Bumble Bee Conservation Task Force; North American Pollinator Protection Campaign, 2018- present

Selected publications

Alger, S.A., Burnham, P.A., Brody, A.K., 2019. Flowers as viral hot spots: Honey bees (*Apis mellifera*) unevenly deposit viruses across plant species, PLOS ONE.

Alger, S.A., Burnham, P.A., Boncristiani, H.F., Brody, A.K., 2019. RNA virus spillover from managed honey bees (*Apis mellifera*) to wild bumble bees (*Bombus* spp.). PLOS ONE.

Alger, S.A., Burnham, P.A., Lamas, Z.S, Brody, A.K., Richardson, L.R.; 2018. Homesick: Impacts of migratory beekeeping on

Dr. Alger has extensive experience designing field and laboratory experiments and conducting original research. She has in-depth experience in survey/experiment design, molecular laboratory techniques, statistical analyses and management of complex data sets. Dr. Alger has provided expert testimony on several bills in Vermont related to pollinator health and currently serves as Assistant Research Professor at the University of Vermont where she directs the Vermont Bee Lab and instructs courses on beekeeping and pollinator conservation.

10 years of professional experience

Selected Project Experience

Rusty patched bumble bee surveys- Department of Maine Inland Fisheries and Wildlife, Waldo and Knox Counties, Maine, Project Manager

Alger is working with scientists from the US Fish and Wildlife and the Maine Department of Inland Fisheries and Wildlife, to address conservation of the Federally Endangered Rusty Patched Bumble Bee (*Bombus affinis*). In 2019, she conducted comprehensive bumble bee surveys in the vicinity of the last documented observations in Knox and Waldo counties to determine the status of this species in Maine and to investigate the status of other bumble bee species. This task included designing field surveys, processing specimens, data analysis, preparation of figures to display data, and report preparation.

Pollinator monitoring for developing milkweed as a commercial crop to enhance farm viability and biological diversity, University of Vermont Extension, Burlington, Vermont, Project Manager

In this two-year study, Alger is working with Agronomists at the University of Vermont, Extension to document the presence of monarchs and other pollinators as well as insect pests in commercially grown milkweed plots. Results of this work will inform best practices to ensure conservation of fragile monarch and pollinator populations within this crop. Alger is also investigating the bioaccumulation of pesticides from residues of treated corn seed to inform milkweed planting recommendations and the Natural Resources Conservation Service Environmental Quality Incentives Program that provide aid to landowners and farmers. Alger is responsible for experimental design, data collection, data analysis, and report preparation.

Monarch Candidate Conservation Agreement with Assurances Application Preparation, Vermont Agency of Transportation, Vermont, Project Manager

Alger is working with the Vermont Agency of Transportation (VTrans) to develop an application for the nationwide Candidate Conservation Agreement with Assurances (CCAA) for Monarch butterfly on transportation lands. This task includes a comprehensive review of current land management practices along roadsides,

investigating new conservation measures to improve roadside habitat for monarch butterflies, preparation of an application for the CCAA agreement.

National Honey Bee Survey, USDA-APHIS, Vermont Program Coordinator
Alger serves as the Vermont Program Coordinator for the National Honey Bee Survey. She spearheaded and currently manages Vermont involvement in the survey to collect baseline data on bee disease and pesticide residues inside honey bee pollen and wax. Since 2015, Alger has prepared and submitted technical reports that summarize the data collected. Alger prepares technical reports for legislative committees and granting agencies. Alger coordinates with staff, government employees, and beekeepers to perform colony inspections.

Neonicotinoid imidacloprid affects virus titers and sucrose consumption in bumble bees (*Bombus impatiens*) University of Vermont, Burlington, Vermont, Principal Investigator
Prior to VHB, Alger conducted original research on the effects of neonicotinoid pesticides on bumble bees. Alger conducted a literature review, designed and conducted experiments, conducted statistical analyses, and prepared a technical report of findings.

Open-source tools for apiary inspectors, University of Vermont, Burlington, Vermont, Principal Investigator.
Prior to VHB, Alger spearheaded this project to aid state apiary inspection programs to control the spread of bee disease and to collect better standardized data on hive health and beekeeper management practices. Using Vermont as a case-study, she conducted GIS analyses, designed multi-software suite workflows for data manipulation, and wrote R scripts to analyze data and display results using R Shiny (https://apiarydata.shinyapps.io/BeekApp/)

Bee viruses: the evaluation of hedgerow plants in horizontal transmission, University of Vermont, Burlington, VT, Principal Investigator
Prior to VHB, Alger investigated the role of flowers in virus transmission between bee species. She designed and conducted experiments, and used molecular techniques to examine virus loads on flowers and bees, and published results in a peer-reviewed journal.

Homesick: impacts of migratory beekeeping on honey bee pests, pathogens, and colony size, University of Vermont, Burlington, VT, Principal Investigator
Prior to VHB, Alger worked with commercial beekeepers and UVM scientists to investigate how migratory beekeeping impacts the health of honey bees. She led experimental design and assisted in data collection and sample processing, and published results in a peer-reviewed journal.

RNA viruses: prevalence, transmission, and effect in native bumble bee species in Vermont, University of Vermont, Burlington, VT, Principal Investigator
Prior to VHB, Alger led all field and laboratory research in this project to examine RNA viruses in bumble bee species in Vermont. She designed lab and field studies, conducted virus assays using molecular protocols and published results in a peer-reviewed journal.

honey bee pests, pathogens, and colony size. PeerJ.

Alger, S.A., Burnham, P.A., 2019. Commercially grown milkweed as habitat and forage for monarch butterflies and other pollinators, 2018 Milkweed Production Trials-Combined Report, University of Vermont Extension Northwest Crops and Soils Program.

Alger, S.A., Burnham, P.A., Report of Vermont's National Honey Bee Survey (APHIS USDA), (2017). Pollinator Protection Committee Report to the VT Legislature as required by Act 83 of 2016 Session.

P. Alexander Burnham, Alger, S.A., Boncristiani, H., Herbert-Dufresne, L.; 2019. Flowers as dirty doorknobs: Virus transmission through flowers depends on floral diversity. National Regional Conference on Complex Systems Proceedings.

Burnham P.A., Alger, S.A.; Lamas, Z.S., 2018. RNA viruses and Varroa mites: Temporal variation in honeybee pathogens influences patterns of coinfection. American Beekeeping Federation Conference & Tradeshow 2018 Proceedings.

Perrotti, L. & Alger, S. 2010. American burying beetle (Silphidae: Nicrophorus americanus) survey on Naushon Island, Massachusetts. Invertebrates in Education and Conservation: Sonoran Arthropod Studies Institute Conference Proceedings.

Alger, S. 2009. Eciton burchellii: polymorphism of submajor caste and foraging

efficiency. Invertebrates in Captivity: Sonoran Arthropod Studies Institute Conference Proceedings.

Job Experience

Environmental Scientist/Pollinator Specialist, VHB, South Burlington, VT, 3/2019-Present

- Leading all research and outreach activities related to pollinator biology and conservation including: bee diversity surveys, education curriculum development, and pollinator habitat restoration projects.
- Assisting with client development, proposal preparation, technical presentations, and other proposal preparation activities.

Assistant Research Professor, Plant and Soil Science Department, University of Vermont, Burlington, VT, 9/2019-Present

- Managing the Vermont Bee Lab: a research group that investigates the stressors to wild and native bee populations, works to improve resources for pest and disease monitoring, diagnosis, and education for Vermont beekeepers and the Vermont Apiary Inspection Program.
- Mentoring five undergraduate students on research projects, publishes original research in peer-reviewed journals, and teaches UVM's Introduction to Beekeeping.

Research Affiliate, UVM, Burlington, VT, 12/2019-9/2019

- Grant writing for research and outreach projects related to pollinator research and outreach.

NSF Graduate Research Fellow, University of Vermont, Burlington, VT, 9/2013-9/2018

- Designed, developed, and conducted novel scientific studies and research programs to fill knowledge gaps about pollinator conservation, the spillover of emerging infectious disease among bees, and effects of pesticide exposure on bee physiology and virus replication.
- Led community outreach initiatives to improve pollinator health in Vermont, including workshops and presentations to beekeeping communities (over 200 beekeepers).
- Obtained and managed over $200,000 in competitive grants and awards.
- Wrote reports for grants and scientific publications.
- Conducted GIS analyses and designed multi-software suite workflows for data manipulation, analyzed data with R statistical packages.
- Developed open source tools and technology to aid state apiary inspection programs to control spread of bee diseases.
- Mentored over 25 technicians in field and laboratory studies.

Backcountry Field Biologist, Institute for Bird Populations, Mt. Rainier, WA, 5/2012- 8/2012

- Conducted field survey for longitudinal monitoring of bird communities in national parks.

Mountain Birdwatch Technician, Vermont Center for Ecostudies, Norwich, VT, 5/201 8/2011

- Managed field survey for NH and ME for longitudinal study examining high elevation bird populations and their response to climate change.

Entomology Intern, Maria Mitchell Association, Nantucket, MA, 5/2010-8/2010

- Assisted with field survey and reintroduction efforts for federally endangered American Burying Beetle.
- Instructed natural history programs both in the field and in the museum, managed invertebrate collections.

Conservation Intern, Roger Williams Park Zoo, Providence, RI, 10/2009-4/2011

- Assisted in developing sustainable invertebrate rearing facilities for the El Valle Amphibian Conservation Center, Panama.
- Facilitated FrogWatch USA training, a citizen science program to assess amphibian communities.
- Conducted habitat and assessment of endangered Nicrophorus beetles on Naushon Island, MA to assist with land management recommendations.
- Assisted with captive rearing for the federally endangered American Burying Beetle.

Legislative Service and Expert Testimony

Provided expert testimony on Bill H.205: An act relating to the regulation of neonicotinoid pesticides; April, Vermont Senate Committee on Agriculture.

Provided expert testimony on Bill H.205: An act relating to the regulation of neonicotinoid pesticides; February, Vermont House Committee on Agriculture.

Provided expert testimony on Bill H.236: Bill proposes to ban the use, sale, or application of neonicotinoid pesticides; January 2016, Vermont House Committee on Agriculture.

Provided expert testimony on Bill H.539: Bill proposes to establish a Pollinator Protection Committee January 2016, Vermont Senate Committee on Agriculture,

Vermont Pollinator Protection Committee meeting, Invited speaker, "Results from National Honey Bee Survey and Bumble bee virus survey," October 2016, Vermont Statehouse.

Teaching Experience

Prior to joining VHB, Alger's teaching experience included:

- Adjunct Lecturer, University of Vermont, Burlington, VT, Summer 2019

Lead instructor for UVM beekeeping course.

- Graduate Teaching Assistant, University of Vermont, Burlington, VT, 9/2013-8/2015

Prepared and instructed labs for three undergraduate biology courses: Ecology and Evolution, Biology I and II.

- Invited Guest Lecturer, University of Vermont, Burlington VT

Ecology and Evolution (BCOR 102): "Virus Ecology in Bumble Bees and Evidence for Disease Spillover", October 2018

- Invited Guest Lecturer, University of Vermont, Burlington VT

Environmental Science (ENSC095), "Bee-Plant-Pathogen Interactions", March 2017

- EcoWorker, Ocean View Foundation, Block Island, RI, 5/2013-8/2013

Instructed environmental public education programs. Independently developed and delivered a weekly 'Native Pollinator' program, including citizen science bee survey program.

- Environmental Educator, Audubon Society of Rhode Island, Bristol, RI, 1/2013-5/2013

Instructed 'Urban Naturalist' after school program in Providence middle schools to increase environmental literacy for inner city youth

Peer Review Service

Invited reviewer of manuscripts for academic journals: Ecological Applications, Ecology, Nature Scientific Reports

Invited reviewer of grant proposals for the National Fellowship Committee for Graduate Women in Science

Invited Speaking Engagements

May 2019: "Are viruses spilling over from honey bees to wild bumble bees through flowers?", Southern Adirondack Beekeepers Association, Saratoga Springs, New York

March 2019: "Threats to Pollinators and Efforts to Improve Pollinator Health," UVM Extension Northwest Crops & Soils Program and Northern Grain Growers Association Grain Growers Conference, Essex, VT

January 2019: "On the Status and Challenges of State Apiary Inspection Programs," American Honey Producers Association, Tempe, AZ

January 2019: "Tools to Improve Apiary Inspection Programs," Apiary Inspectors of America, Tempe, AZ

November 2018: "Virus Ecology in Bumble Bees and Evidence for Disease Spillover," Vermont Society of Engineers, Waterbury, VT

October 2018: "Shared Honey Bee and Bumble Bee Viruses: Demonstrating the Floral Transmission Route," North American Pollinator Protection Campaign Conference, Washington DC

July 2018: "An Analysis of Vermont Beekeepers' Practices, Colony Health and Loss," Addison County Beekeepers Association Club Meeting, Middlebury, VT

June 2018: "An Analysis of Vermont Beekeepers' Practices, Colony Health and Loss," Vermont Beekeepers Association Summer Meeting, Swanton, VT

April 2018: "RNA Viruses in Bumble Bees and the Role of Flowers in Virus Transmission," Plant Soil Science Seminar, University of Vermont, Burlington VT

January 2018: "National Honey Bee Survey Update," Vermont Beekeepers Association Winter Meeting, Essex, VT

January 2018: "Bee Virus Ecology," keynote speaker, Addison County Beekeepers Association Club Meeting, Middlebury, VT

July 2017: "Homesick- The Role of Migratory Beekeeping on Disease Spread," Vermont Beekeepers Association Summer Meeting, Middlebury, VT

January 2017: "Bee Virus Ecology," Vermont Beekeepers Association Winter Meeting, Essex, VT

January 2017: "Ecology of Bee Viruses," keynote speaker, Southern Adirondack Beekeepers Association, Saratoga, VT

September 2016: "RNA Viruses in Vermont Bumble Bees," Garden Club of America Bee Involved Business Meeting, Lenox, Massachusetts

June 2016: "Bee Pathogen Workshop," Hands-on workshop for beekeepers to identify and quantify honey bee pests using laboratory methods, Bennington Beekeeping Club meeting, Bennington, Vermont.

January 2016: "Vermont's National Honey Bee Survey Results", Bennington Beekeeping Club meeting, Bennington, Vermont

Participating Speaking Engagements

September 2019 "RNA virus spillover from honey bees to wild bumble bees," Apimondia, Montreal, Canada

January 2019: "Spillover of RNA Viruses from Managed Honey Bees to Wild Bumble Bees," American Bee Research Conference, Tempe, AZ

April 2018: "Evidence for RNA Virus Spillover from Managed Honeybees to Wild Bumble Bees," The Northeast Natural History Conference, Burlington VT

March 2018: "Homesick- The Role of Migratory Beekeeping on Disease Spread," BioLunch Presentation, University of Vermont, Department of Biology, Burlington, VT

July 2016: "RNA Viruses in Vermont Bumble Bees," Poster Presentation at the International Pollinator Conference, Penn State University.

April 2016: "RNA Viruses in Vermont Bumble Bees", Bumble Bee Working Group Meeting, University of Sussex, UK

February 2016: "'Honey Bee Viruses' in Vermont's Bumble Bees'" BioLunch Presentation, University of Vermont, Department of Biology

January 2016: "Bee Health in Vermont", Annual Vermont Grazing and Livestock Conference, Fairlee Vermont

January 2016: "Vermont's National Honey Bee Survey Results", Vermont Beekeeping Association, VT Farm Show, Essex, Vermont

January 2015: "RNA viruses in Bumble bees" EEEB Presentation, University of Vermont Departments of Ecology, Evolution, and Environmental Biology.

April 2015: "Prevalence, transmission, and effect of RNA viruses on Bumble bees" BioLunch Presentation, University of Vermont Department of Biology

April 2014: "RNA viruses in Vermont's Bumble bees" EcoLunch Presentation, University of Vermont Department of Biology.

October 2014: "RNA viruses: prevalence, transmission, and effect on native bumble bees in Vermont" EEEB Presentation, University of Vermont Departments of Ecology, Evolution, and Environmental Biology.

July 2010: "Eciton burchellii: polymorphism of submajor caste and foraging efficiency". Sonoran Arthropod Studies Institute, 2010 Invertebrates in Education and Conservation Conference, Rico Rico, Arizona

Appointments

Scientific Advisor, Vermont Beekeepers Association, 2017-present

Bumble Bee Conservation Task Force; North American Pollinator Protection Campaign, 2018- present

Funded Projects and Awards ($453,505)

2019

- National Honey Bee Survey in Vermont, USDA-APHIS, $13,800, (Principal Investigator)
- UVM Bee Diagnostic Lab: Protecting Vermont's honey and pollination services through pest and disease monitoring, $88,500, (Principal Investigator)

2018

- Developing milkweed as a commercial crop to enhance farm viability and biological diversity, Gund Catalyst Award, $40,000, (key personnel)
- National Honey Bee Survey in Vermont, USDA-APHIS, $13,800, (Principal Investigator)
- Shared honey bee and bumble bee viruses: Demonstrating the floral transmission route, North American Pollinator Protection Campaign, $9,980, (Co-PI)

2017

- National Honey Bee Survey in Vermont, USDA-APHIS, $13,800, (PI)
- American Beekeeping Federation Conference Travel Grant, VT beekeepers, $1,300, (PI)
- Switzer Environmental Fellowship, Robert and Patricia Switzer Foundation, $15,000, (PI)

2016

- National Honey Bee Survey in Vermont, USDA-APHIS, $12,000 (PI)
- Homesick: effects of migratory beekeeping on honey bee disease, Experiment.com, $5,970, (PI)
- Travel grant for USDA lab, UVM College of Arts and Sciences, $300, (PI)
- Managing locally sourced native bees as alternative pollinators for Vermont specialty crops, USDA Specialty Crop Block Grant, $61,455, (key personnel)

2015

- National Honey Bee Survey in Vermont, USDA-APHIS, $12,000, (PI)
- Graduate Research Fellowship, National Science Foundation, $138,000, (PI)
- Bee viruses: the evaluation of hedgerow plants in horizontal transmission and pesticide effects on virus replication, Sustainable Agriculture Research and Education, $14,600, (PI)

2014

- Travel grant to USDA Lab, Ronald Suiter Prize, UVM College of Arts and Sciences, $1,000, (PI)
- RNA viruses: prevalence, transmission, and effect on native bumble bees in Vermont, Sophie Danforth Conservation Biology Fund, Roger Williams Park Zoo, $1,000, (PI)
- RNA viruses: prevalence, transmission, and effect on native bumble bees in Vermont, Theodore Roosevelt Memorial Fund, American Museum of Natural History, $2,500, (PI)
- Assessing floral transmission routes for RNA viruses, Garden Club of America, $4,000, (PI)
- RNA viruses: prevalence, transmission, and effect on native bumble bees in Vermont, Roberto Fabri Fiahlo, Michael D. Upton, $1,500, (PI)

2013

- Travel grant for USDA Lab, Ronald Suiter Prize, UVM College of Arts and Sciences, $1,000, (PI)

2009

- Costa Rica Documentary, Undergraduate Research Grant, University of Rhode Island, $1000
- Costa Rica Documentary, Award for Environmental Research, Joan Smith & Athalie Clark, $500

Costa Rica Documentary, Memorial Humanities Honors Student Endowment, Eric F. Kumpf, $500

Media Appearances

The plight of the humble bee. BBC Science Focus, 10/1/2019.

Notes from the lab. American Bee Journal, 9/2/2019, https://americanbeejournal.com/category/columns/notes-from-the-lab/

Domestic honeybees are driving wild populations of bumblebees to extinction by infecting shared plants with killer diseases. Daily Mail, 6/27/2019, https://www.dailymail.co.uk/sciencetech/article-7184277/War-bees-Honeybees-infecting-bumblees-driving-extinction.html

Those honeybees you're so worried about? They're killing off wild bee species. Grist, 6/27/2019, https://grist.org/article/those-honeybees-youre-so-worried-about-theyre-killing-off-wild-bee-species/

Honeybees infect wild bumblebees through shared flowers. Domestic beehives linked to spike in viral infections in nearby bumblebee populations. ScienceDaily, 6/26/2019, https://www.sciencedaily.com/releases/2019/06/190626160339.htm

Are commercial honeybees making wild bees sick? PBS News Hour, 6/26/2019, https://www.pbs.org/newshour/science/are-commercial-honeybees-making-wild-bees-sick

Diseased honeybees are spreading infections to wild bumblebees, Earth.com, 6/26/2019, https://www.earth.com/news/diseased-honeybees-wild-bumblebees/

Commercial honeybee apiaries may transmit viral infections to wild bumblebees through flowers. IFLScience!, 6/26/2019, https://www.iflscience.com/plants-and-animals/commercial-honeybee-apiaries-may-transmit-viral-infections-to-wild-bumblebees-through-flowers/

Why flowers may be partially to blame for the deaths of wild bumblebees. Inverse. 6/26/2019, https://www.inverse.com/article/57080-are-honeybees-getting-bumblebees-sick-by-drinking-from-their-flowers

How honeybees may infect bumblebees, UVM Today. 6/26/2019, https://www.uvm.edu/uvmnews/news/how-honeybees-may-infect-bumblebees?utm_source=Twitter.com&utm_medium=post&utm_term=&utm_content=&utm_campaign=UVM_Twitter_general

Honeybees infect wild bumblebees-through shared flowers. Phys.org. 6/26/2019, https://phys.org/news/2019-06-honeybees-infect-wild-bumblebeesthrough.html

Bees kept for honey are killing wild species by spreading disease, study suggests. Independent. 6/26/2019, https://www.independent.co.uk/environment/beekeepers-honeybees-wild-bumblebees-pollinator-decline-a8976101.html

Bee declines a concern for U.S. food supply. The Saratogian. 5/23/2019. https://www.saratogian.com/news/bee-declines-a-concern-for-u-s-food-supply/article_e89a9f0e-7be0-11e9-b086-5341ea6335e9.html

Senate Oks bee-harming pesticide restriction. Vermont Digger. 5/7/2019. https://vtdigger.org/2019/05/07/senate-oks-bee-harming-pesticide-restriction/

Nicholson et al.: Pass Bill H.205 to save Vermont's bees. Vermont Digger. 4/28/2019. https://vtdigger.org/2019/04/28/nicholson-et-al-pass-bill-h-205-save-vermonts-bees/

Save Vermont bees: Senators should pass Bill H.205. Times Argus. 4/27/2019. https://www.timesargus.com/opinion/perspective/save-vermont-bees-senators-should-pass-bill-h/article_e904dbbd-5609-50f8-9f5e-3bfa1fcfb127.html

House approves bill that restricts use of bee-harming pesticide. Vermont Digger. 3/26/2019. https://vtdigger.org/2019/03/26/house-approves-bill-restricts-use-bee-harming-pesticide/

Northeast SARE Graduate Student Snapshot. Northeast SARE. 7/13/2018. https://www.youtube.com/watch?v=6dowG7ZEkEA&feature=youtu.be

The National Honey Bee Survey in Vermont. Bee Culture. 3/21/2017. http://www.beeculture.com/national-honey-bee-survey-vermont/

Bees under siege. WCAX TV News. 7/29/15. http://www.wcax.com/story/29660551/bees-under-siege

UVM researchers buzzing about the declining bee populations. My Champlain Valley.com. http://www.mychamplainvalley.com/news/symposium-on-vt-bee-population-held

Highgate field becomes bee research site. The St. Albans Messenger. 7/30/2015.