Megan Bontrager

Postdoctoral Researcher
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Research interests

I study the determinants of species' geographic ranges and the drivers of local adaptation. I conduct large-scale, rigorous field and greenhouse experiments, quantitative syntheses of the the literature, and analyses using herbarium collections.

Academic positions

Postdoctoral researcher 2018–
University of California, Davis
Advisors: Jennifer Gremer, Julin Maloof, Johanna Schmitt, Sharon Strauss

Staff research associate 2011–2012
University of California, Santa Cruz
Supervisors: Ingrid Parker, Greg Gilbert

Education

University of British Columbia 2012–2018
Ph.D. in Botany
Advisor: Amy Angert
Committee: Sally Aitken, Michael Whitlock, Jeannette Whitton
Title: *Pollination, genetic structure, and adaptation to climate across the geographic range of* Clarkia pulchella.

University of California, Santa Cruz 2008–2011
B.Sc. in Plant Sciences
B.Sc. in Molecular, Cell, and Developmental Biology
Undergraduate research advisors: Kathleen Kay, Ingrid Parker

Cabrillo Community College 2007–2008
Prerequisites for transfer to B.Sc.

Preprints

14. **M. Bontrager**, C. D. Muir, C. R. Mahony, D. E. Gamble*, R. M. Germain, A. L. Hargreaves, E. J. Kleynhans, K. A. Thompson, and A. L. Angert. Climate warming weakens local adaptation. *bioRχiv* 2020.11.01.364349. In review.

13. **M. Bontrager**, J. A. Lee-Yaw, T. Usui, A. L. Hargreaves, D. Anstett, H. A. Branch, C. D. Muir, and A. L. Angert. Expansion dynamics and marginal climates drive adaptation across geographic ranges. *bioRχiv* 2020.08.22.262915. In revision.

12. **M. Bontrager** and A. L. Angert. Genetic differentiation is determined by geographic distance in *Clarkia pulchella*. *bioRχiv* 374454. In revision for resubmission.

Publications

11. A. L. Angert, **M. Bontrager**, and J. Ågren (2020). What do we really know about adaptation at range edges? *Annual Review of Ecology, Evolution, and Systematics* 51: 341-361.
10. J. R. Gremer, A. Chiono, E. Suglia, **M. Bontrager**, L. Okafor, and J. Schmitt (2020). Variation in the seasonal germination niche across an elevational gradient: the role of germination cueing in current and future climates. *American Journal of Botany*, 107(2): 350-363.
9. A. L. Hargreaves, R. M. Germain, **M. Bontrager**, J. Persi, and A. L. Angert (2020). Local adaptation to biotic interactions: a meta-analysis across latitudes. *The American Naturalist*, 195(3): 395-411.
8. **M. Bontrager**, C. D. Muir, and A. L. Angert (2019). Geographic variation in reproductive assurance of *Clarkia pulchella*. *Oecologia*, 190(1): 59-67.
7. **M. Bontrager** and A. L. Angert (2019). Gene flow improves fitness at a range edge under climate change. *Evolution Letters*, 3(1): 55-68.
6. D. E. Gamble*, **M. Bontrager**, and A. L. Angert (2016). Floral trait variation and links to climate in the mixed-mating annual *Clarkia pulchella*. *Botany*, 96(7): 425-435.
5. **M. Bontrager** and A. L. Angert (2016). Effects of range-wide variation in climate and isolation on floral traits and reproductive output of *Clarkia pulchella*. *American Journal of Botany*, 103(1): 10-21.
4. J. A. Lee-Yaw, H. M. Kharouba, **M. Bontrager**, C. Mahony, A. M. Csergő, A. M. Noreen, Q. Li, R. Schuster, and A. L. Angert (2016). A synthesis of transplant experiments and ecological niche models suggests that range limits are often niche limits. *Ecology Letters*, 19(6): 710-722.
3. I. M. Parker, M. Saunders, **M. Bontrager**, A. P. Weitz, R. Hendricks, R. Magarey, K. Suiter, and G. S. Gilbert (2015). Phylogenetic structure and host abundance drive disease pressure in communities. *Nature*, 520(7548): 542-544.
2. **M. Bontrager**, K. Webster, M. Elvin, and I. M. Parker (2014). The effects of habitat and competitive/facilitative interactions on reintroduction success of the endangered wetland herb, *Arenaria paludicola*. *Plant Ecology*, 215(4): 467-478.
1. J. M. Yost, **M. Bontrager**, S. W. McCabe, D. Burton, M. G. Simpson, K. M. Kay, and M. Ritter (2013). Phylogenetic relationships and evolution in *Dudleya* (Crassulaceae). *Systematic Botany*, 38(4): 1096-1104.

* Undergraduate trainee for whom I was the primary mentor

Non-refereed contributions

3. K. R. Acierto, R. S. Hendricks, **M. Bontrager**, and I. M. Parker (12 December 2012). Transplant success for the endangered herb *Arenaria paludicola* at Golden Gate National Recreation Area: effects of site, propagation type, and competition. Technical report to the U.S. Fish and Wildlife Service and the California Department of Fish and Game.

2. I. M. Parker and **M. Bontrager** (29 February 2012). Propagation and establishment of new populations of marsh sandwort (*Arenaria paludicola*) in Santa Cruz County. Technical report to the U.S. Fish and Wildlife Service and the California Department of Fish and Game.
1. **M. Bontrager** and I. M. Parker (26 September 2011). Effects of serpentine soil on plant community composition in natural populations and seedling growth in a bioassay. Technical report to Midpeninsula Regional Open Space District.

Invited seminars

Duke University, PopBio Seminar Series, 15 October 2020.

University of Utah, Frontiers in Plant Biology Symposium, 19 February 2020.

Hamilton Symposium at Evolution, Providence, Rhode Island, 28 June 2019. Video link.

University of California, Davis, Population Biology Seminar Series, 26 February 2019.

Maladaptation Symposium at the American Society of Naturalists Asilomar Meeting, 6 January 2018.

Selected presentations

M. Bontrager, J. Maloof, J. R. Gremer, and S. Y. Strauss (4 January 2020). Climatic drivers of the flowering niche in the *Streptanthus* clade. Poster presentation at the American Society of Naturalists meeting. Asilomar, California.

M. Bontrager and A. L. Angert (4 April 2018). Effects of gene flow on performance at the northern range margin of Clarkia pulchella. Presentation at Evo-Wibo. Port Townsend, Washington.

M. Bontrager and A. L. Angert (24 June 2017). Effects of gene flow on the performance of Clarkia pulchella at the species' northern range margin. Presentation at Evolution. Portland, Oregon. Video link.

M. Bontrager and A. L. Angert (9 May 2017). Effects of gene flow on the performance of Clarkia pulchella at the species' northern range margin. Presentation at the Annual Meeting of the Canadian Society for Ecology and Evolution. Victoria, British Columbia.

M. Bontrager and A. L. Angert (5 November 2016). Effects of gene flow on the performance of Clarkia pulchella at the species' northern range margin. Presentation at Ecology and Evolution Retreat. Brackendale, British Columbia.

M. Bontrager and A. L. Angert (16 April 2016). Effects of gene flow on the performance of Clarkia pulchella at the species' northern range margin. Poster presentation at Evo-Wibo. Port Townsend, Washington.

M. Bontrager and A. L. Angert (22 May 2015). Effects of range-wide variation in climate and isolation on floral traits and reproductive output of Clarkia pulchella. Presentation at the Annual Meeting of the Canadian Society for Ecology and Evolution. Saskatoon, Saskatchewan.

M. Bontrager, K. Webster, M. Elvin, and I. M. Parker (12 January 2012). Factors influencing growth and survival of a critically endangered plant, Arenaria paludicola. Presentation at the California Native Plant Society 2012 Conservation Conference. San Diego, California.

J. Yost, **M. Bontrager** (co-presented), S. McCabe, K. M. Kay, and M. Ritter (11 July 2011). A classification of California's diploid Dudleya species based on molecular phylogenetic data. Poster presentation at Botany 2011 Conference. St. Louis, Missouri.

Fellowships and awards

Society for the Study of Evolution Hamilton Finalist (500 USD)	2019
Grand Challenges Postdoctoral Fellowship, University of Minnesota (declined; 107,000 USD)	2018
UBC Biology teaching award (500 CAD)	2018
Student talk award, Evo-Wibo, Port Townsend, Washington	2018
Best research presentation, Brackendale Ecology and Evolution Retreat	2016
Li Tze Fong Memorial Fellowship (25,000 CAD)	2016
Botanical Society of America Genetics Section Grad Research Award (500 USD)	2016
Botanical Society of America Graduate Student Research Award (500 USD)	2016
Washington Native Plant Society Research Grant (1,200 USD)	2016
Vladimir J. Krajina Prize in Plant Ecology (2,000 CAD)	2013
UBC Four Year Doctoral Fellowship (102,400 CAD)	2012

Mentoring and teaching

Teaching experience

Lead teaching assistant, Biostatistics (UBC, 2 terms) 2017–2018

- *Coordinated all TAs and prepared written guides for running labs*
- *Assisted with writing exams and provided feedback on course materials in development*
- *Received UBC Biology Teaching Award for outstanding work in this role*

Teaching assistant, Plant Ecology (UBC) 2017

- *Developed lab activities in data collection and analysis*
- *Led labs in the field, greenhouse, and on the computer*
- *Facilitated discussions of primary literature*

Teaching assistant and guest lecturer, Phytogeography (UBC) 2016

- *Provided suggestions for revisions on written work*
- *Facilitated discussions of primary literature*

Mentoring experience

Supervisor and mentor to post-baccalaureate lab technicians (UC Davis) 2018–2020

Advisor to undergraduate students (UC Davis) 2018–

- *5 students presented work at the Undergraduate Research Conference*
- *1 ongoing student project*
- *8 additional students trained and mentored*

Co-advisor of undergraduate honours thesis students (UBC, 2 students) 2016–2017

Supervisor of undergraduate research assistants (UBC, 4 students) 2014–2017

Supervisor of undergraduate research assistants (UC Santa Cruz, 3 students) 2011–2012

Workshops given

Leader and developer, Data management workshop (for colleagues at UC Davis) 2020

Leader and developer, Intro to R workshop (for undergraduate researchers at UC Davis) 2018

Pedagogical training

Participant, Center for Educational Effectiveness Accelerate Program, UC Davis 2020

Participant, Education Research and Evidence-based Teaching, UC Davis 2020

Service, outreach, and professional development

Mentor, Evolution and Ecology Graduate School Preview, UC Davis 2020
Participant, Anti-Racism reading group 2020
Administrative member, Women in Life Sciences at UC Davis 2019–2020
Mentor, Evolution and Ecology Graduate Admissions Pathways, UC Davis 2019
Grad representative, Biodiversity Research Centre postdoc search committee, UBC 2018
Co-organizer, Biodiversity Centre Women in STEM Workshop, UBC 2017
Coordinator of Florum, a weekly meeting of plant ecologists, UBC 2013–2016
Curriculum developer, Modules in Ecology and Evolution Development, UBC 2013–2015
Developed educational activity about pollination, presented it in a primary school classroom, and added it to a library of activities for future use.
Visiting scientist in primary school classrooms, Let's Talk Science, UBC 2012–2014
Led educational activities for students over the course of several visits in two classrooms.
Science fair mentor, Let's Talk Science, UBC 2012–2013
Mentored two high school students from project design through to their presentation.
Volunteer, Beaty Biodiversity Museum Nature Club, UBC 2012–2013
Facilitated educational activities for kids and their families several weekends per term.

Selected field experience

Demographic surveys of *Streptanthus tortuosus* 2019-2020
Transplant installation and monitoring (*Clarkia pulchella*) 2015-2016
Obtained permits, coordinated logistics for planting and relocating 16,800 seeds
Water addition and pollinator exclusions to experimental plots (*Clarkia pulchella*) 2016
Obtained permits, coordinated logistics for 8 sites in 3 states/provinces
Demographic surveys of *Mimulus cardinalis* 2013-2016
Multi-week trips relocating and surveying populations in rugged riparian terrain
Surveys of plant community composition and abundance 2010-2011
Identified every plant found in chaparral, redwood forest, and grassland habitats
Developed quantitative methods, trained and led field crews
Transplant installation and monitoring reintroduction of *Arenaria paludicola* 2010-2011
Characterized biotic and abiotic site conditions in wetland habitat
Prepared reports on this locally extirpated species for government agencies
Evaluate invasive species removal methods for reforestation 2009-2010
Characterize density and size classes of Cytisus scoparius

Professional engagement

Reviews since 2019: American Journal of Botany (1), Ecology Letters (1), Evolution (3), Evolution Letters (1), Global Change Biology (2), Global Ecology and Biogeography (1), Journal of Ecology (2), Journal of Systematics and Evolution (1), New Phytologist (2), PeerJ (2), Trends in Ecology and Evolution (1).

Member: American Society of Naturalists, Botanical Society of America, Canadian Society for Ecology and Evolution, Society for the Study of Evolution, Washington Native Plant Society