

Megan Bontrager

Postdoctoral Researcher
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Department of Evolution and Ecology
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Research interests I study how ecology and evolution interact to shape species' geographic ranges. I conduct large-scale, rigorous field and greenhouse experiments, quantitative syntheses of the literature, and analyses using natural history collections.

Academic positions **University of California, Davis** 2018–
Postdoctoral researcher
Advisors: Jennifer Gremer, Johanna Schmitt, Sharon Strauss, Julin Maloof
Project themes:
1) *How have germination cues diverged across a clade of native mustards?*
2) *How does flowering phenology respond to interannual weather variation?*
3) *How have vernalization requirements diverged along elevation gradients?*

Education **University of British Columbia** 2012–2018
Ph.D. in Botany
Advisor: Amy Angert
Committee: Sally Aitken, Michael Whitlock, and 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 advisor: Ingrid Parker

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

Preprints and in press

13. **M. Bontrager**, J. A. Lee-Yaw, T. Usui, A. L. Hargreaves, D. Anstett, H. A. Branch, and A. L. Angert. Expansion dynamics and marginal climates drive adaptation across geographic ranges. bioRxiv 2020.08.22.262915. In review.
12. A. L. Angert, **M. Bontrager**, and Jon Ågren. What do we really know about adaptation at range edges? In press at the Annual Review of Ecology, Evolution, and Systematics.

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

Publications

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 (2018). 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

Non-refereed contributions

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.

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.

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

M. Bontrager (19 February 2020). Local adaptation at range edges and under anomalous climates. Frontiers in Plant Biology Symposium, University of Utah.

M. Bontrager (28 June 2019). Local adaptation at range edges and under anomalous climates. Hamilton Symposium at Evolution, Providence, Rhode Island. Video link.

M. Bontrager (26 February 2019). Local adaptation at range edges and under anomalous climates. Population Biology Seminar Series, University of California, Davis.

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, C.R. Mahony, D.E. Gamble, R.M. Germain, A.L. Hargreaves, E.J. Kleyhans, C.S. Leven, K.A. Thompson, and A.L. Angert (6 January 2018). Climate anomalies drive local maladaptation. Presentation at the American Society of Naturalists meeting. Asilomar, California.

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.

Mentoring and teaching

Leader, Data management workshop (for colleagues at UC Davis)	2020
Advisor to undergraduate students (UC Davis)	2018–
5 students presented work at the Undergraduate Research Conference	
3 ongoing student projects	
6 additional undergrads trained and supervised	
Leader, R workshop for undergraduate research assistants	2018
Head teaching assistant, Biostatistics	2017–2018
Coordinated other TAs and provided feedback on course materials in development	
Teaching assistant, Plant Ecology	2017
Developed lab activities in data collection and analysis	
Teaching assistant and guest lecturer, Phytogeography	2016
Co-advisor of undergraduate honours thesis students (UBC, 2 students)	2016–2017
Supervisor of undergraduate research assistants (UBC, 4 students)	2014–2017

Service, outreach, and professional development

Course participant, Education Research and Evidence-based Teaching, UC Davis	2020
Grad representative, Biodiversity Research Centre postdoc search committee	2018
Co-organizer of Biodiversity Centre Women in STEM Workshop	2017
Coordinator of Florum, a weekly meeting of UBC plant ecologists	2013–2016
Modules in Ecology and Evolution Development, curriculum developer	2013–2015
UBC Let's Talk Science, visiting scientist in primary school	2012–2014
UBC Let's Talk Science, science fair mentor	2012–2013
Beaty Biodiversity Museum Nature Club, volunteer	2012–2013

Fellowships and awards

Society for the Study of Evolution Hamilton Finalist (500 USD)	2019
UBC Biology teaching award (500 CAD)	2018
Best research presentation, Brackendale Ecology and Evolution Retreat	2016
Li Tze Fong Memorial Fellowship (25000 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 (1200 USD)	2016
Vladimir J. Krajina Prize in Plant Ecology (2000 CAD)	2013
UBC Four Year Doctoral Fellowship (102400 CAD)	2012

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

Professional experience

Staff research associate, UC Santa Cruz 2011–2012

Supervisors: Ingrid Parker and Greg Gilbert

Undergraduate research assistant, UC Santa Cruz 2010–2011

Supervisors: Ingrid Parker, Kathleen Kay, and Jenn Yost