

Vincent M. Eckhart
Curriculum Vitae

Department of Biology, Grinnell College, Grinnell, IA, USA.
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Citizenship USA. Born 3 April 1962, Pasadena, California

Education

1984-91 University of Utah, Ph.D. 1991 (Biology), Adviser: Jon Seger.
“Floral investment and the mating system of *Phacelia linearis*”
1980-84 Pomona College, B.A. 1984 (Biology, cum laude; *Phi Beta Kappa*, *Sigma Xi*)

Teaching experience. Ecology; evolutionary and organismal biology; plant evolution and systematics, paleoecology, and conservation; plant reproductive biology; environmental sustainability; spatial ecology; environmental challenges and responses; first-year tutorials on "Guns, Germs, and Steel," "Environmental Messages and Messengers," "Got Limits?" "The Evolution of Domestication."

Research interests. Evolutionary ecology of plant reproduction, life history, and geographic distribution; pollination biology; spatial ecology; ecological genetics.

Post-Ph.D. Professional Experience

2015-present Waldo S. Walker Professor of Biology, Grinnell College
2012-present Professor of Biology, Grinnell College
2002-2012 Associate Professor of Biology, Grinnell College
1996-2002 Assistant Professor of Biology, Grinnell College
1995-96 Visiting Scientist, Cornell University
1992-96 Visiting Postdoctoral Scholar, University of California, Berkeley
1991-92 Associate Instructor of Biology, University of Utah

External funding

2018-2023 NSF DEB 1754157: LTREB RUI Renewal: Evolutionary demography - the contribution of adaptation and environment to population dynamics, range size, and niche width; (PI), \$47,482; total award \$450,000.
2017-2020 NSF MRI 1726941: Acquisition of an integrated gas exchange and fluorescence instrument for multidisciplinary physiological research; (Co-PI) \$77,371.
2013-2018 NSF DEB 1256316: Collaborative research - LTREB: evolutionary demography - the contribution of adaptation and environment to population Dynamics, range size, and niche width. (PI) \$37,437; total award \$450,000.
2009-2011 NSF DBI 0820756: MRI: Acquisition of a quantitative real-time PCR system for biological science research. (Co-PI) \$51,700.
2005-2010 NSF DEB 0515409: Ecological and evolutionary-genetic limits to range expansion. (PI) \$161,817; total award ca. \$500,000.

- 2004 Mellon 8 Summer Award. The evolutionary ecology of flower color: The molecular basis of adaptation. \$4,500.
- 2003-2006 NSF MRI/RUI-0319571: Acquisition of instrumentation for nutrient analyses in ecological research. (Co-PI) \$135,900
- 2001 NSF DBI-0070310: Acquisition of a capillary electrophoresis system for DNA analysis in investigations of adaptation, speciation, species interactions, and DNA repair. (Co-PI) \$67,300
- 1999-2002 NSF DUE-99-50289: Reform of undergraduate biology education: biological inquiry and integrative biology (Co-PI). ca. \$100,000
- 1996-2001 NSF DEB 96-29086: Development and selection in the correlated evolution of morphology, life-history, and physiology in annual plants. (senior personnel) \$350,000; REU suppl. \$5,000
- 1993-95 USDA NRICGP CSRS 93-37100-9010: Consequences of male resource allocation for plant growth and yield. (PI) \$68,000
- 1988-91 NIH Graduate Traineeship in Genetics
- 1985-88 NSF Graduate Research Fellowship

Memberships. American Society of Naturalists, Botanical Society of America, Ecological Society of America, Phi Beta Kappa

Peer-reviewed journal articles (undergrad authors underlined)

- Burnette TE, **Eckhart VM** (2021) Evolutionary divergence of potential drought adaptations between two subspecies of an annual plant: Are trait combinations facilitated, independent, or constrained? *American Journal of Botany* 108:1-11. doi:10.1002/ajb2.1607
- James ARM, Burnette TE, Mack J, James DE, **Eckhart VM**, Geber MA (2020) Germination predicts spatial distribution and coexistence more than adult hydrological traits do in four closely-related annual flowering plants. *Journal of Ecology*. doi: 10.1111.1365-2745.13408.
- Kulbaba MW, Sheth SN, Pain RE, **Eckhart VM**, Shaw RG (2019) Additive genetic variance for lifetime fitness and the capacity for adaptation in annual plant. *Evolution* 73: 1746-1758. doi:10.1111/evo.13830
- Benning J, Geber MA, **Eckhart VM**, Moeller, DA. (2019) Biotic interactions limit the geographic range of an annual plant: herbivory and phenology mediate fitness beyond a range margin. *American Naturalist* 193: 786-797. doi: 10.1086/703187
- Eckhart VM**, Howland M, Jennison K, Kircher B, Montgomery DM, Yuan Y, Geber MA. (2017) Contrasting soil-texture niches facilitate coexistence of two congeneric plants that differ in competitive ability. *AOB PLANTS* 9(6). doi: 10.1093/aobpla/plx066.
- Pironon S, Vilellas J, Thuiller W, **Eckhart VM**, Geber MA, Moeller DA, García, MB (2017) The “Hutchinsonian niche” as an assemblage of demographic niches: implications for species geographic ranges. *Ecography* 40:1-10. doi:10.1111/ecog.03414
- Anderson JT, **Eckhart VM**, Geber MA (2015) Experimental studies of selection and adaptation in *Clarkia xantiana* (Onagraceae). III. Phenotypic selection across a subspecies border. *Evolution* 69: 2249-2261.
- Thuiller W, Münkemüller T, Schiffers KH, Georges D, Dullinger S, **Eckhart VM**, Edwards TC, Gravel D, Kunstler G, Merow C, Moore K, Piedallu C, Vissault S, Zimmerman NE,

- Zurell D, Schurr FM (2014) Does probability of occurrence relate to population dynamics? *Ecography* 37: 1155-1166.
- Schiffers K, Schurr FM, Travis MJJ, Duputié M, **Eckhart VM**, Lavergne S, McInerney G, Moore KA, Pearman PB, Thuiller W, Wüest RO, Holt RD (2014) Landscape structure and genetic architecture jointly impact rates of niche evolution. *Ecography* 37: 1218-1229.
- Gould BA, Moeller DA, **Eckhart VM**, Tiffin P, Fabio E, Geber MA (2014) Local adaptation and range boundary formation in response to complex environmental gradients across the geographic range of *Clarkia xantiana* ssp. *xantiana*. *Journal of Ecology* 102:95-107.
- Moeller DA, Geber MA, **Eckhart VM**, Tiffin P (2012) Reduced pollinator service and elevated pollen limitation at the geographic range limit of an annual plant. *Ecology* 93:136-1048.
- Kramer AHC, Montgomery DA, **Eckhart VM**, Geber, MA (2011) Environmental and dispersal controls of an annual plant's distribution: How similar are patterns and apparent processes at two spatial scales? *Plant Ecology* 212: 1887-1899.
- Eckhart VM**, Geber MA, Morris WF, Tiffin P, Fabio ES, Moeller DA (2011) The geography of demography: Long-term demographic studies and species distribution models reveal a species border limited by adaptation. *American Naturalist* 178: S26-S43. [10.1086/661782](https://doi.org/10.1086/661782)
- Hart GM, **Eckhart VM** (2010) Ecological separation in foraging schedule and food type between pollinators of the California wildflower *Clarkia xantiana* ssp. *xantiana*. *Journal of Pollination Ecology* 2:13-20.
- Eckhart VM**, Singh I, Louthan AM, Keledjian AJ, Chu A, Moeller DM, Geber MA (2010) Plant-soil water relations and the species border of *Clarkia xantiana* ssp. *xantiana* (Onagraceae). *International Journal of Plant Sciences* 171:749-760.
- King EG, **Eckhart VM**, Mohl EC (2008) Magnitudes and mechanisms of shoot-damage compensation in annual species of *Linum* (Linaceae) in Iowa. *American Midland Naturalist* 159:200-213.
- Eckhart VM**, Rushing NC, Hart GM, Hansen JD (2006) Frequency dependent pollinator foraging in polymorphic *Clarkia xantiana* ssp. *xantiana* populations: Implications for flower colour evolution and pollinator interactions. *Oikos* 112:412-421.
- Geber MA, **Eckhart VM** (2005) Experimental studies of selection and adaptation in *Clarkia xantiana* (Onagraceae). II. Fitness variation across a subspecies border. *Evolution* 59:521-531.
- Eckhart VM**, Geber MA, McGuire C (2004). Experimental studies of selection and adaptation in *Clarkia xantiana* (Onagraceae). I. Sources of character variation across a subspecies border. *Evolution* 58:59-70.
- Fausto JA Jr, **Eckhart VM**, Geber MA (2001) Reproductive assurance and the evolutionary ecology of self-pollination in *Clarkia xantiana* (Onagraceae). *American Journal of Botany* 88: 1794-1800.
- Eckhart VM**, Geber MA (1999) Character variation and geographic distribution of *Clarkia xantiana* (Onagraceae): Flowers and phenology distinguish two subspecies. *Madrono* 46:117-125.
- Eckhart VM**, Chapin FS III. (1997) Nutrient sensitivity of the cost of male function in *Phacelia linearis* (Hydrophyllaceae). *American Journal of Botany* 84:1092-1098
- Seger J, **Eckhart VM** (1996) Evolution of sexual systems and sex allocation in plants when growth and reproduction overlap. *Proceedings of the Royal Society of London B*. 263:833-841.
- Eckhart VM** (1993) Do hermaphrodites of gynodioecious *Phacelia linearis* (Hydrophyllaceae)

- trade off seed production to attract pollinators? *Biological Journal of the Linnean Society*, 50:47-63.
- Eckhart VM** (1992) Resource compensation and the evolution of gynodioecy in *Phacelia linearis* (Hydrophyllaceae). *Evolution* 46:1313-1328.
- Eckhart VM** (1992) Spatio-temporal variation in abundance and variation in foraging behavior of the pollinators of gynodioecious *Phacelia linearis* (Hydrophyllaceae). *Oikos* 64:573-586.
- Eckhart VM** (1992) The genetics of gender and the effects of gender on floral characters in gynodioecious *Phacelia linearis* (Hydrophyllaceae). *American Journal of Botany* 79:792-800.
- Eckhart VM** (1991) The effects of floral display on pollinator visitation vary among populations of *Phacelia linearis* (Hydrophyllaceae). *Evolutionary Ecology* 5:370-384.
- Bierzychudek P, **Eckhart V** (1988) Spatial segregation of the sexes of dioecious plants. *American Naturalist* 132:34-43.
- Carlquist S, **Eckhart VM** (1984) Wood anatomy of Polemoniaceae. *Aliso* 10:547-572.
- Carlquist S, **Eckhart VM** (1984) Wood anatomy of Hydrophyllaceae. II. Genera other than *Eriodictyon*, with comments on parenchyma bands containing vessels with large pits. *Aliso* 10:527-546.
- Carlquist S, **Eckhart VM**, Michener DC (1983) Wood anatomy of Hydrophyllaceae. I. *Eriodictyon*. *Aliso* 10:397-412.
- Carlquist S, **Eckhart VM** (1982) Wood anatomy of *Darwiniothamnus*, *Lecocarpus*, and *Macraea* (Asteraceae). *Aliso* 10(2):291-300.

Book chapters, book reviews, and other publications

- Eckhart VM** (2006) Evolutionary ecology of plant reproductive strategies. (Review of: de Jong T, Klinkhamer P. 2005. *Evolutionary Ecology of Plant Reproductive Strategies*, Cambridge Univ. Press). *Quarterly Review of Biology* 81:205
- Eckhart, VM** (2006) The flora of the Iowa River Corridor: Taking the long view. In: The Iowa River Corridor Book, R. Wolf (ed.), Iowa River Corridor Project.
- Eckhart VM**, Seger J (1999) Phenological and developmental costs of male sex function in hermaphroditic plants. pp. 195-213 in: Vuorisalo T, Mutakainen P (eds.) *Plant Life Histories*. Kluwer Academic, Dordrecht.
- Eckhart VM** (1999) Sexual dimorphism in flowers and inflorescences. pp. 123-148 in: Geber, MA, Delph LF, Dawson TE (eds.). *Gender and Sexual Dimorphism in Flowering Plants*. Springer, Berlin.
- Chapin FS III, Reynolds H, D'Antonio C, **Eckhart VM** (1996) The functional role of species in terrestrial ecosystems. pp. 403-430 In: *Global Change and Terrestrial Ecosystems*. B.H. Walker and W. L. Steffens (eds.). Cambridge University Press, Cambridge, UK.

Manuscripts

- Siegmund G-F, Moeller DA, **Eckhart VM**, Geber MA. bioRxiv 2022.09.15.508102; doi: <https://doi.org/10.1101/2022.09.15.508102>. In review.
- Carley L, Geber MA, Morris WF, **Eckhart VM**, Moeller DA. Does demographic variation drive local adaptation across a species range? In preparation.
- Benning JW, Geber MA, **Eckhart VM**, Moeller DA. Replicated transplant experiments reveal a species range constrained by low genetic variation and maladaptive gene flow.

Google Scholar citations: 2,760 (881 since 2017); h-index 25 i10-index 31, as of 21 September, 2022.

Selected professional meeting presentations (21st Century)

Bebee W, Eckhart VM (2021). Soil water potential improves performance of species distribution models of an annual plant. Poster. Midwest Ecology and Evolution Conference. Lawrence, KS.

Bebee W, Eckhart VM (2021). Soil water potential improves performance of species distribution models of an annual plant. Poster. Midstates Consortium in Math & Science Undergraduate Research Symposium, St. Louis.

Vergara I, Eckhart VM. Building the ecological niche from the ground up. Poster. Midstates Consortium in Math & Science Undergraduate Research Symposium, St. Louis.

Larson B, Tomczik K, **Eckhart VM** (2020) Seed germination cues and dormancy have evolved rapidly between and within subspecies of the annual plant, *Clarkia xantiana*. Poster. Midstates Consortium in Math & Science Undergraduate Research Symposium, Chicago.

Snodgrass RJ, **Eckhart VM** (2019) Causes and consequences of hydrologic microrefuges in an arid-land annual plant. Poster. Midstates Consortium in Math & Science Undergraduate Research Symposium, St. Louis.

Tantiviramonond A, **Eckhart VM** (2019) Tannins, herbivory, and petal-spot polymorphism. Poster. Midstates Consortium in Math & Science Undergraduate Research Symposium, St. Louis.

Wright S, **Eckhart VM** (2019) Comparing root traits of drought adapted winter annual plants. Louise Stokes Alliances for Minority Participation in the Sciences Conference, Iowa-Illinois-Nebraska, Ames, IA, February.

Nalamalapu V, **Eckhart VM** (2018). Candidate hydrologic refuges predict the distribution of a water-limited plant at two spatial scales. Midstates Consortium in Math & Science Undergraduate Research Symposium, Chicago.

Kulbaba M, Sheth S, Pain R, **Eckhart VM**, Shaw RG (2018) Adaptive potential and realized changes in fitness in natural populations. Joint Meetings of the European Society for Evolutionary Biology and the Society for the Study of Evolution. Montpellier, France.

Moeller DA, Benning J, Morris WF, **Eckhart VM**, Geber MA (2018). Evolution on the edge: eco-evolutionary dynamics, range expansion, and local adaptation. Joint Meetings of the European Society for Evolutionary Biology and the Society for the Study of Evolution. Montpellier, France

Pulak AM, Burnette TE, James ARM, **Eckhart VM** (2018) Variation in water relations in a genus of Mediterranean-climate winter-annual plants. Ecological Society of America Meetings, New Orleans, LA.

Pulak AM, **Eckhart VM** (2018) Evolutionary divergence of water relations and seed germination in winter annuals suggests trade-offs between drought adaptations. Midwest Ecology & Evolution Conference, Hickory Corners, MI.

Kulbaba M, Sheth S, Pain R, **Eckhart VM**, Shaw R (2017) The immediate capacity for adaptation and its realization in natural plant populations. XIX International Botanical Congress. Shenzhen, PRC.

- Healey A, **Eckhart VM** (2017) Drought occurrence, topography, and soils predict the geographic distribution of an arid-land annual plant, *Clarkia xantiana* ssp. *xantiana*. Midwest Ecology & Evolution Conference, Urbana, IL.
- Solomon C, Margida G, Sokolsky S, **Eckhart VM** (2016) Competition and facilitation in *Chamaecrista* neighborhoods. Midstates Consortium in Math & Science Undergrad Research Symposium, Chicago, IL.
- Howland M, **Eckhart VM** (2015) Contrasting responses to soil properties may enable coexistence of closely related annual plants. Midwest Ecology & Evolution Conference (MEEC), Bloomington, IN.
- Phillips DA, **Eckhart VM** (2015) How to signal bees and deter grasshoppers with flavonoids: exploring genetic and biochemical links between spotted flowers and unpalatable fruits. Midwest Ecology & Evolution Conference Bloomington, IN.
- Eckhart VM** (2014) Can species distribution models predict demography? Invited “Ignite” presentation. Ecological Society of America (ESA) meetings, Sacramento, CA.
- Eckhart VM**, Jennison K, Kircher B, Montgomery DM (2013) Where must niches differ, if differ they must? Spatial scaling of climatic, topographic, and soil control of distribution and performance in closely related annual plants. Poster. Ecological Society of America (ESA) meetings, Minneapolis, MN.
- Eckhart VM**, Geber MA, Morris WF, Moeller DA, Tiffin P, Fabio ES (2010) The geography of demography: Distribution limits in the annual plant *Clarkia xantiana* ssp. *xantiana*. American Society of Naturalists Vice Presidential Symposium, SSE/ASN/SMBE Meetings, Portland, OR.
- Kramer HA, **Eckhart VM** (2009) Ecological niche modeling at the within-population scale: Microtopography controls distribution and performance in the arid-land annual plant *Clarkia xantiana* ssp. *xantiana*. Midwest Ecology & Evolution Conference, Lincoln, NE
- Eckhart VM**, Singh I, Chu A, Keledjian AJ, Louthan A. (2008) Multiple sources of water stress help define the species border of an arid-land annual plant. Ecological Society of America (ESA) meetings, Milwaukee, WI.
- Geber MA, **Eckhart VM**, Moeller P, Looney EC, Singh I, Louthan A (2007) Population dynamics and environmental variation across the geographic range of a California annual plant. Ecological Society of America (ESA) meetings, San Jose, CA.
- Eckhart VM**, Carter DC, McCord AI, Twieg E (2006) Geostatistical analysis of flower color polymorphism reveals signatures of selection and breeding system. Ecological Society of America (ESA) meetings, Memphis, TN.
- Eckhart VM**, Marsh N (2003) I’ll have whatever she’s not having: Opposing forms of frequency-dependent pollination in color-polymorphic plant populations. Society for the Study of Evolution (SSE) meetings, Chico, CA.
- Geber MA, **Eckhart VM** (2003) Regional versus range adaptation across a border between plant subspecies. SSE meetings, Chico, CA.
- Eckhart VM**, Jacobson P, Robertson DC (2002) Scaling carbon dynamics from molecules to ecosystems: A model investigation in an integrative biology curriculum. Contributed poster presentation at the Ecological Society of America (ESA) meetings, Tucson, AZ.
- Brown J, Caruso C, Mottl L, **Eckhart V** (2002) Promoting an understanding of biological inquiry: curricular reform and Grinnell College's Center for Prairie Studies. ESA meetings, Tucson, AZ.

Eckhart VM, Geber MA, McGuire C (2001) Experimental studies of selection and adaptation in *Clarkia xantiana* (Onagraceae): Sources of character variation across a subspecies border. Ecological Society of America (ESA), Madison, WI.

Professional service (BLUE = review period)

Associate Editor of *The American Naturalist* (2018-present), handling 12-15 manuscripts / year.

Ad Hoc reviewer and/or panelist for: *American Journal of Botany, American Midland Naturalist, American Naturalist, Australian Journal of Botany, Biological Conservation, Biological Journal of the Linnaean Society, EcoEd Digital Library, Ecography, Ecology, Ecology Letters, Evolution, Evolutionary Ecology, Functional Ecology, Genetics, Global Change Biology, Heredity, International Journal of Plant Sciences, Iowa Academy of Science, Journal of Ecology, Israel Science Foundation, Journal of Evolutionary Biology, National Science Foundation, New Phytologist, New Zealand Journal of Botany, Oecologia, Oikos, Plant Biology, Plant Ecology, PLOS One, Proceedings of the Royal Society of London B, Psyche, Trends in Ecology and Evolution, USDA*

Continuing college service

- Director of the Conard Environmental Research Area (2018-)
- Grinnell College representative to the Midstates Consortium in Math & Science (2017-)
- Scholarship Selection Committee (2019-)
- Faculty Organization Committee (2021-)
- Curator, Grinnell College Herbarium (2001-)

Selected past college service, last decade

- Faculty Accountability Mentor (2012-2018)
- Committee for the Support of Faculty Scholarship (2015-2017)
- Biology Department Chair (2014-2015)
- Phi Beta Kappa, Beta Chapter of Iowa, Scholar's Award coordinator (2015-16), Past President (2014-15), President (2013-2014), VP (2012-2013)
- Emergency Preparedness Committee (2013-2014)
- Campus Sustainability Planning Committee / Ecocampus Committee (2012-2014)
- Faculty Personnel Committee (2011-2013)
- Director of the Conard Environmental Research Area (2011-2013)

Selected distant-past college service

- Biology Department Chair (2006-2008)
- Committee on Academic Standing (and Academic Honesty Subcommittee)
- Office of Interdisciplinary Studies Advisory Board
- Personnel Appeals Board
- Instructional Support Committee (& Chair)
- Science Phase II Building Committee
- Ad Hoc Ombuds Committee
- Center for Prairie Studies Executive Committee
- Phi Beta Kappa, Beta Chapter of Iowa, multiple officer roles, multiple terms

- Director of the Conard Environmental Research Area (several terms)