Matthew M. Kling, PhD

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RESEARCH

I'm a spatial ecologist and data scientist focused on understanding biodiversity patterns and informing conservation management under global environmental change. Working at scales ranging from genes to species to ecosystems, I conduct empirical research, develop modeling tools, and create data visualizations.

EDUCATION

PhD, Integrative Biology — *2020*
University of California, Berkeley—David Ackerly, advisor
Thesis: *Plants on the move: the biogeography of dispersal and persistence under climate change*

BA, Conservation Biology & Environmental Studies — *2005*
Middlebury College—Stephen Trombulak & Andrea Lloyd, advisors
Thesis: *The ecophysiology of alpine treeline: a case study of balsam fir*

AWARDS & FELLOWSHIPS

Postdoctoral Fellow, Gund Institute for the Environment	*2022–present*
NSF Graduate Research Fellow ($102,000 + tuition)	*2015–2020*
Berkeley Fellow ($60,000 + tuition)	*2015–2020*
NSF NRT Data Science Fellow	*2015–2017*
USGS-NatureServe EcoInforma student app award ($2000 travel)	*2015*
EPA Apps for the Environment (National runner-up)	*2011*
High Honors & *Magna Cum Laude*, Middlebury College	*2005*

RESEARCH & CONSULTING POSITIONS

Postdoctoral Associate, Dept. of Biology—UVM	*2021–present*
Consultant—Institute for Parks, People & Biodiversity	*2023–2024*
Postdoctoral Scholar, Ackerly Lab—UC Berkeley	*2020–2021*
Consultant in Global Change Biology—NatureServe	*2015–2019*
Bioclimate Analyst—NatureServe	*2013–2015*
Science Analyst—Brighter Planet	*2008–2013*
Supervisory Biologist—Institute for Wildlife Studies	*2007–2008*
Canid Ecology Crew Leader—Yellowstone Ecol. Rsrch. Ctr.	*2005–2006*
Plant Ecology Technician—US Geological Survey	*2005*
Ungulate Ecology Technician—National Park Service	*2005*
Environmental Intern—Admin. Ambiental Cooperativa Chilena	*2004*
Research Assistant—USDA National Wildlife Research Center	*2002*

JOURNAL ARTICLES

McLaughlin, B., **M. Kling**, S. Jackson, E. Zavaleta, and D. Ackerly. (2025) Sustaining species of the future: "climatic nuclei" for climate change adaptation. *Global Change Biology*, 31:e70253.

Kling, M., I. González-Ramírez, B. Carter, I Borokini, and B. Mishler. (2025) Spatial phylogenetics with continuous data: an application to California bryophytes. *Systematic Botany*, in press.

Pellitier, P., **M. Kling**, C. Qin, M. Van Nuland, K. Zhu, and K. Peay. (2025) Wind Patterns Influence the Dispersal and Assembly of North American Soil Fungal Communities. *Ecology Letters*, 28:e70130.

Kling, M. (2025) `phylospatial`: an R package for spatial phylogenetic analysis with quantitative community data. *Methods in Ecology and Evolution*, 2025;00:19.

Deng, J-Y., R-H. Fu, S. Compton, C. Yuan, **M. Kling**, X-Y. Chen, Y-B. Song, K. Jiang, M. Liu, J. Greeff, Jaco, and Y. Chen. (2025) Wind direction and strength determine the genetic structure of an insect-pollinated plant across heterogeneous landscape. *Journal of Biogeography*, e15119.

Hébert-Dufresne, L., **M. Kling**, S. Rosenblatt, S. Miller, P. Burnham, N. Landry, B. Gotelli, and B. McGill. (2024) Stochastic diffusion using mean-field limits to approximate master equations. *arXiv preprint*, arXiv:2408.07755.

Kling, M., K. Baer, and D. Ackerly. (2024) A tree's view of the terrain: downscaling bioclimate variables to high resolution using a novel multi-level species distribution model. *Ecography*, e07131.

Kling, M., C. Brittain, G. Galford, T. Waring, L. Hébert-Dufresne, M. Dube, H. Sabzian, N. Gotelli, B. McGill, and M. Niles. (2024) Innovations through crop switching happen on the diverse margins of US agriculture. *Proceedings of the National Academy of Sciences*, 121(42).

Jon, A., J. Olden, M. Oldfather, **M. Kling**, and D. Ackerly. (2024) Topography influences diurnal and seasonal microclimate fluctuations in hilly terrain environments of coastal California. *PLoS ONE*, 19(3): e0300378.

Waring, T., M. Niles, **M. Kling**, S. Miller, L. Hébert-Dufresne, HS. Papi, N. Gotelli, and B. McGill. (2023) Operationalizing cultural adaptation to climate change: contemporary examples from United States agriculture. *Philosophical Transactions of the Royal Society B*, 378(20220397).

Kling, M., and D. Ackerly. (2021) Global wind patterns shape genetic differentiation, asymmetric gene flow, and genetic diversity in trees. *Proceedings of the National Academy of Sciences*, 118(17).

Skelton, R., L. Anderegg, J. Diaz, **M. Kling**, P. Papper, L. Lamarque, S. Delzon, T. Dawson, and D. Ackerly. (2021) Evolutionary relationships between drought-related traits and climate shaped large hydraulic safety margins in North American oaks. *Proceedings of the National Academy of Sciences*, 118(10).

Kling, M., and D. Ackerly. (2020) Global wind patterns and the vulnerability of wind-dispersed species to climate change. *Nature Climate Change*, 10: 868-875.

Ackerly, D., **M. Kling**, M. Clark, P. Papper, M. Oldfather, A. Flint, and L. Flint. (2020) Topoclimates and Biotic Responses to Climate Change: Which locations on the landscape will be most sensitive? *Frontiers in Ecology and the Environment*, 18(5): 288297.

Stevens, J., **M. Kling**, D. Schwilk, M. Varner, and J. Kane (*2020*). Biogeography of fire regimes in western US conifer forests: a trait-based approach. *Global Ecology and Biogeography*, 29: 944-955.

Kling, M., S. Auer, P. Comer, D. Ackerly, and H. Hamilton (*2020*). Multiple axes of ecological vulnerability to climate change. *Global Change Biology*, 26: 2798-2813.

Oldfather, M., **M. Kling**, S. Sheth, N. Emery, and D. Ackerly (*2019*). Range Edges in Heterogeneous Landscapes: Incorporating Realistic Landscapes into Range Dynamics. *Global Change Biology*, 26: 1055-1067.

Comer, P., J. Hak, M. Reid, S. Auer, K. Schulz, H. Hamilton, R. Smyth, and **M. Kling** (*2019*). Habitat Climate Change Vulnerability Index Applied to Major Vegetation Types of the Western Interior United States. *Land* 8(7): 108.

Skelton, R., Anderegg, L., Papper, P., Dawson, T., **Kling, M.**, Thompson, S., Diaz, J., Reich, E., and D. Ackerly (*2019*). No local adaptation in leaf or stem xylem vulnerability to embolism, but consistent vulnerability segmentation in a North American oak. *New Phytologist* 223(3):1296-1306.

Daru, B., **M. Kling**, E. Meineke, and A. van Wyk (*2019*). Temperature controls phenology in continuously flowering *Protea* species of subtropical Africa. *Applications in Plant Sciences* 7(3): e1232.

Kling, M., B. Mishler, B. Baldwin, A. Thornhill, and D. Ackerly (*2018*). Facets of phylodiversity: evolutionary diversification, divergence, and survival as conservation targets. *Philosophical Transactions of the Royal Society B* 374: 20170397.

Morueta-Holme, N., M. Oldfather, R. Olliff-Yang, A. Weitz, C. Lefine, **M. Kling**, E. Riordan, C. Merow, S. Sheth, A. Thornhill, and D. Ackerly (*2018*). Best practices for reporting climate data in ecology. *Nature Climate Change* 8:92-94

Thornhill, A., B. Baldwin, W. Freyman, S. Nostratinia, **M. Kling**, N. Morueta-Holme, T. Madsen, D. Ackerly, and B. Mishler (*2017*). Spatial phylogenetics of the native California flora. *BCM Biology* 15(1): 96.

Hammerson, G., **M. Kling**, M. Harkness, M. Ormes, and B. Young (*2017*). Strong geographic and temporal patterns in the conservation status of North American bats. *Biological Conservation* 212: 144-152.

Baldwin, B., A. Thornhill, W. Freyman, D. Ackerly, **M. Kling**, N. Morueta-Holme, and B. Mishler (*2017*). Species richness and endemism in the native flora of California. *American Journal of Botany*, 104(3): 487-501.

Sterner, R., **M. Kling**, S. Schwiff, and D. Slate (*2003*). Oral rabies vaccination: reducing economic uncertainty via response surface analysis. *Proceedings of the 10th Wildlife Damage Management Conference* (K. Fagerstone, G. Witmer, Eds).

SOFTWARE

Seeds of Change (*Shiny app*). Decision support tool for ecological restoration efforts, incorporating species distributions, climate change, soils, and adaptive neighborhoods. M. Kling and P. Gonzalez (2024). `https://bnhm-shiny.berkeley.edu/seeds-of-change/`

ggcube (*R package*). Data visualization library for creating 3D plots using ggplot2. M. Kling (2024). `https://github.com/matthewkling/ggcube`

phylospatial (*R package*). Toolkit for spatial phylogenetic analyses including alpha and beta phylodiversity metrics, phylo-regionalization, and conservation prioritization. M. Kling (2024). `https://matthewkling.github.io/phylospatial/`

deranged (*R package*). Demographic range modeling with dispersal: tools for mechanistic, spatially-explicit, environmentally-dependent species range simulation. M. Kling (2023). `https://github.com/matthewkling/deranged`

windscape (*R package*). Software for modeling landscape connectivity by wind, and testing statistical relationships between wind and ecological patterns. M. Kling (2022). `https://github.com/matthewkling/windscape`

colors3d (*R package*). Data visualization functions to generate two-dimensional and three-dimensional color gradient legends. M. Kling (2022). `https://cran.r-project.org/web/packages/colors3d/`

Windsheds (*Shiny app*). Interactive visualization of wind connectivity landscapes. M. Kling (2020). `http://matthewkling.net/shiny/windscape/`

hydro (*R package*). Functions for computing climatic water balance variables such as actual evapotranspiration and climatic water deficit. M. Kling (2019). `https://github.com/matthewkling/hydro`

Ombrothermy (*Shiny app*). Interactive global visualization of seasonal climate patterns. M. Kling (2019). `http://matthewkling.net/shiny/seasons/`

CAPPA (*Shiny app*). The California Plant Phylodiversity Atlas: an interface for exploring the biogeography, evolutionary relationships, and conservation status of California's 5000+ native plant species. M. Kling (2018). `https://bnhm-shiny.berkeley.edu/cappa/`

INVITED TALKS

Kling, M. (*2025, Mar*) Decision support for climate-smart ecological restoration practices. NSF-ORCC workshop on climate change adaptation and assisted gene flow, Sausalito, California.

Kling, M. (*2023, Nov*). Panelist: Using species occurrence data in modeling, forecasting, and tool-building. Past-Present-Future Biodiversity Convening, California Academy of Sciences, San Francisco, California.

Kling, M. (*2022, Feb*). Whither, whence, and whether: modeling the ability of plant biodiversity to track climate change. UVM Plant Biology department seminar, Burlington, Vermont.

Kling, M. (*2021, Nov*). Emigrate, Evolve, Endure, or go Extinct: climate change vulnerability modeling in biogeography. UVM Biology department seminar, Burlington, Vermont.

Kling, M. (*2021, Jun*). Windscape connectivity modeling for biogeography. BEYOND seminar series, INRAE, Avignon, France.

Kling, M. (*2019, Dec*). California plant conservation gaps: an evolutionary perspective. Mary Bowerman Science & Research Colloquium, Berkeley, California.

Kling, M. (*2019, Dec*). Winds of change: climate-driven migration and the geography of wind. Carnegie Institution at Stanford, Palo Alto, California.

Kling, M. (*2019, Oct*). California plant conservation gaps: an evolutionary perspective. Half-Earth Day symposium, Berkeley, California.

Kling, M. (*2019, Sep*). Seeds of change: climate-smart seed collection for ecological restoration. Bay Area National Park Science Symposium, San Francisco, California.

Kling, M. (*2019, May*). Save the trees: informing conservation planning with multiple facets of phylodiversity. Hennig XXXVIII symposium, Berkeley, California.

Kling, M., S. Brown, A. Harvey, and P. Gonzalez (*2019, May*). Seeds of change: climate-smart seed provenancing for ecological restoration. US National Park Service workshop, San Francisco, California.

Kling, M. (*2018, Sep*). Conserving the evolutionary diversity of the California flora. Botany Lunch seminar series, Berkeley, California.

CONTRIB. TALKS & POSTERS

Kling, M., K. Baer, and D. Ackerly (*2022, Aug*). Plant communities as microclimate sensors: a new approach to climate downscaling using North American trees as bioindicators. Talk presented at Ecological Society of America, Montreal, Quebec.

Kling, M. and D. Ackerly (*2020, Aug*). Isolation by wind: wind connectivity shapes the landscape genetics of the world's forests. Talk presented at Ecological Society of America, virtual conference.

Kling, M., H. Hamilton, D. Ackerly, P. Comer, and S. Auer (*2020, Jul*). Dimensions of climate change vulnerability and their management implications. Talk presented at North American Congress for Conservation Biology, virtual conference.

Kling, M. and D. Ackerly (*2019, Jul*). Winds of change: wind connectivity, gene flow, and climate adaptation in trees. Talk presented at Species on the Move, Kruger, South Africa.

Kling, M., B. Mishler, B. Baldwin, A. Thornhill, and D. Ackerly (*2018, Jul*). Conserving the evolutionary diversity of the California flora. Talk presented at North American Congress for Conservation Biology, Toronto, Canada.

Kling, M., B. Mishler, B. Baldwin, A. Thornhill, and D. Ackerly (*2018, Jun*). Future priorities for conserving the evolutionary diversity of the California flora. Talk presented at Digital Data in Biodiversity Research Conference, Berkeley, CA.

Kling, M. (*2016, Dec*). Multidecadal historic trends in California's coastal fog. Poster presented at the American Geophysical Union, San Francisco, CA.

Kling, M., E. Burns, P. Cowan, and H. Hamilton (*2016, Sept*). The coast redwood climate envelope: 20th-century trends across space and time. Talk presented at Coast Redwood Science Symposium, Eureka, CA.

Kling, M., M. Fernandez, and H. Hamilton (*2014, Jun*). The biogeography of recent climate change in coast redwood ecosystems. Poster presented at the Smithsonian Botanical Symposium, Washington, DC.

Kling, M., M. Fernandez, and H. Hamilton (*2014, Jul*). Spatiotemporal patterns in greater sage-grouse exposure to recent climate change. Talk presented at the Society for Conservation GIS Conference, Monterey, CA.

GRAY LITERATURE

EcoAdapt [multiple authors] (*2014*). A Climate Change Vulnerability Assessment for Resources of Nez Perce-Clearwater National Forests. Version 3.0. EcoAdapt, Bainbridge Island, WA.

Bureau of Land Management [multiple authors] (*2014*). Madrean Archipeligo Rapid Ecoloregional Assessment. US BLM, Washington, DC.

Kling, M. and I. Hough (*2011*). Air travel carbon and energy efficiency: case studies, best practices, industry trends, airline rankings. Brighter Planet, San Francisco, CA. Presented at the 2012 Conference of the Institute for Computational Sustainability, Copenhagen, Denmark.

Kling, M. and I. Hough (*2012*). Hotel carbon and energy efficiency: chain rankings, industry trends, efficiency drivers, market patterns. Brighter Planet, San Francisco, CA

Kling, M. and I. Hough (*2011*). Employee Engagement in Sustainability. Brighter Planet, San Francisco, CA

Kling, M. and I. Hough (*2010*). The American carbon foodprint: understanding your foods impact on climate change. Brighter Planet, San Francisco, CA

Kling, M. (*2005*). The ecophysiology of alpine treeline: spatial patterns in balsam fir (*Abies balsamea*) growth and water relations on Mount Abraham, Vermont. Undergraduate senior honors thesis, Middlebury College.

TEACHING & MENTORING

Advanced data visualization in R (University of Vermont) *Jun 2023*
Workshop instructor

Spatial Phylogenetics (International Biogeography Society) *Oct 2022*
Workshop instructor

Master's thesis research (University of Vermont) *2021–2022*
Mentor for two Master's student thesis projects

Data Science in Global Change Ecology (UC Berkeley) *Fall 2019*
Graduate Student Instructor

Undergrad Research Apprentice Program (UC Berkeley) *2018–2020*
Mentor and research supervisor for two undergraduate students

Reproducible & Collaborative Data Science (UC Berkeley) *Spring 2019*
Graduate Student Instructor

R Shiny web app development (UC Berkeley) *Jan 2019; Jan 2018*
Workshop instructor

Introductory R (UC Berkeley) *Jan 2017*
Workshop co-instructor

PEER REVIEW

Biological Conservation; Conservation Science and Practice; Diversity and Distributions; Ecology; Global Change Biology; Global Ecology and Biogeography; Heredity; Journal of Biogeography; Landscape Ecology; National Science Foundataion DEB; PeerJ; Philosophical Transactions of the Royal Society: B; PLOS One; Proceedings of the National Academy of Sciences

SOCIETIES

Ecological Society of America
International Biogeography Society
American Geophysical Union
Society for Conservation Biology