

# Matthew M. Kling, PhD

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## RESEARCH

I'm an ecologist and data scientist focused on understanding biodiversity patterns and informing conservation under global environmental change. My work uses big data to investigate spatial and temporal ecological dynamics 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. Center 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

**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).

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: down-scaling bioclimate variables to high resolution using a novel multi-level species distribution model. *Ecography*, e07131.

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. Schwillk, 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.

Moruet-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. Moruet-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. Moruet-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, and soils. M. Kling and P. Gonzalez (2024). <https://bnhm-shiny.berkeley.edu/seeds-of-change/>

**deranged** (*R package*). Demographic range modeling with dispersal: tools for mechanistic, spatially-explicit, environmentally-dependent species range simulation. M. Kling (2024). <https://github.com/matthewkling/deranged>

**colors3d** (*R package*). Data visualization functions to generate two-dimensional and three-dimensional color gradient legends. M. Kling (2023). <https://cran.r-project.org/web/packages/colors3d/>

**spatialphy** (*R package*). Toolkit for spatial phylogenetic analyses including alpha and beta phylodiversity metrics, phylo-regionalization, and conservation prioritization. M. Kling (2022). <https://github.com/matthewkling/spatialphy>

**windscape** (*R package*). Software for modeling landscape connectivity by wind, and testing statistical relationships between wind and ecological patterns. M. Kling (2021). <https://github.com/matthewkling/windscape>

**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.** (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 phylogenetic diversity. 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 micro-climate 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 footprint: 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)  
Workshop instructor

*Jan 2019; Jan 2018*

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

*Jan 2017*

**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 Foundation 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  
Society for Conservation GIS