CORY MEROW

Research Scientist

Yale University

Ecology and Evolutionary Biology

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Website: https://cmerow.github.io

Teaching Website: https://cmerow.github.io/RDataScience/

EDUCATION

2012 Ph.D. **Ecology and Evolutionary Biology**, University of Connecticut

2004 M.S. **Physics**, University of Connecticut

2002 B.S. **Applied Mathematics, Physics**, University of Connecticut, *Magna Cum Laude*

PUBLICATIONS

* *denotes graduate student author at the time of writing*

Kass, J.M.*, B. Vilela, R. Muscarella, M. Aiello-Lammens, C. Merow, and R.P. Anderson. 2018. *Wallace*: a flexible platform for reproducible modeling of species niches and distributions built for community expansion. In Press, **Methods in Ecology and Evolution.**

Needham, J., C. Merow, C.-H. Chang-Yang, H. Caswell, S. McMahon. 2018. Inferring forest fate from demographic data: from vital rates to population dynamic models. In Press, **Proceedings of the Royal Society B.**

Maitner, B.S.*, B. Boyle, N. Casler, R. Condit, J. Donoghue II, S. M. Durán, D. Guaderrama, C. E. Hinchliff, P. M. Jørgensen, N. J.B. Kraft, B. McGill, C. Merow, N. Morueta-Holme, R. K. Peet, B. Sandel, M. Schildhauer, S.A. Smith, J. –C. Svenning, B. Thiers, C. Violle, S. Wiser and B. J. Enquist. 2018. The BIEN R package: A tool to access the Botanical Information and Ecology Network (BIEN) database. **Methods in Ecology and Evolution.** 9: 373-379.

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

Serra-Diaz, J.M., B. J. Enquist, B. Maitner, B. McGill, C. Merow, and J-C. Svenning. 2018. Big data of tree species distributions: How big and how good? **Forest Ecosystems.** 4:30.

Merow, C., S.T. Bois, J. Allen, Y. Xie*, J. A. Silander Jr. 2017. Climate change will both facilitate and restrict invasive plant ranges in New England. **Proceedings of the National Academy of Sciences.** 114: E3276-E3284.
Highlighted for commentary: http://www.pnas.org/content/114/16/4040.extract

Merow, C., A. Wilson, W. Jetz. 2017. Integrating occurrence data and expert maps for improved species range predictions. **Global Ecology and Biogeography**. 26: 243-258.

Slingsby. J., C. Merow, M. Aiello-Lammens, S. Hall*, H. Kilroy*, R. Turner*, A. Wilson, and J. A. Silander, Jr. 2017. Intensifying post-fire weather and invasion history drive diversity loss in a Mediterranean-type ecosystem. **Proceedings of the National Academy of Sciences.** 114: 4697-4702.

Aiello-Lammens, M., J. Slingsby, D. Euston-Brown, H. Kilroy*, C. Merow, J.A. Silander Jr. 2017. Processes of community composition in an environmentally heterogeneous, high biodiversity region. **Ecography**. 40: 561-576

Evans, M.E.K., C. Merow, S.M. McMahon, S. Record, B.J. Enquist. 2016. Towards process-based range modeling of many species. **Trends in Ecology and Evolution**. 31: 860-871.

Griffith, A., R. Salguero-Gomez, C. Merow, S.M. McMahon. 2016. Demography beyond the population. **Journal of Ecology** 102: 272-280.

Merow, C. 2016. Methods in Population Ecology. **Oxford Bibliographies in Ecology**. http://www.oxfordbibliographies.com/view/document/obo-9780199830060/obo-9780199830060-0158.xml

Merow, C., J. Allen, M. Aiello-Lammens, J.A. Silander Jr. 2016. Building better range models with Maxent and Point Process Models by integrating spatially explicit information. **Global Ecology and Biogeography.** 25: 1022-1036.

Needham, J.*, C. Merow, N. Butt, Y. Malhi, T. Marthews, M. Morecroft, and S. M. McMahon. 2016. Forest community response to pathogens: the case of ash dieback in a British woodland. **Journal of Ecology** 102:315-330.
Editor's Choice in Science: http://science.sciencemag.org/content/352/6281/twil

Rominger. A*, C. Merow. 2016. meteR: An R package for testing the Maximum Entropy Theory of Ecology. **Methods in Ecology and Evolution.** 8: 241-247.

Metcalf, C.J.E., S.P. Ellner, D.Z. Childs, R. Salguero-Gomez, C. Merow, S.M. McMahon, E. Jongejans, M. Rees. 2015. Modeling annual variation for stochastic population dynamics using Integral Projection Models. **Methods in Ecology and Evolution** 6:1007-1017.

Visser, M.D.*, S.M. McMahon, C. Merow, P.M. Dixon, S. Record, E. Jongejans. 2015. Speeding up ecological and evolutionary computations in R. **PLoS Computational Biology** 11: e1004140.

Recommended on F1000

Merow, C., A. M. Latimer, A. Wilson, S. McMahon, A. Rebelo, J. A. Silander Jr. 2014. On using integral projection models to generate demographically driven predictions of species' distributions: development and validation using sparse data. **Ecography**, 37: 1167-1183.

Merow, C., M. Smith, T. Edwards, A. Guisan, S. McMahon, S. Normand, W. Thuiller, R. Wüest*, N. Zimmermann, J. Elith. 2014. What do we gain from simplicity versus complexity in species distribution models? **Ecography,** 37: 1267-1281.

Thuiller, W., T. Münkemüller, K.H. Schiffers, D. Georges, S. Dullinger, V.M. Eckhart, T. C. Edwards, D. Gravel, G. Kunstler, C. Merow, K. Moore O'Leary, C. Piedallu, S. Vissault, N.E. Zimmermann, D. Zurell, F. M. Schurr. 2014. Does probability of occurrence relate to demographic performance? **Ecography,** 37: 1155-1166.

Merow, C., J. Dahlgren, C.J.E. Metcalf, D. Childs, M.E.K. Evans, E. Jongejans, S. Record, M. Rees, R. Salguero-Gómez, S. M. McMahon. 2014. Advancing population ecology with integral projection models: a practical guide. **Methods in Ecology and Evolution** 5: 99-110.

Merow, C., J. A. Silander Jr. 2014. A comparison of Maxlike and Maxent for modeling species distributions. **Methods in Ecology and Evolution** 5: 215-225.

Merow, C., M. Smith, J. A. Silander Jr. 2013. A practical guide to Maxent: what it does, and why inputs and settings matter. **Ecography** 36: 1-12.

Denoted Editor's Choice

One of Ecography's most accessed/cited papers in 2013 (#6), 2014 (#2), 2015 (#11)

Merow, C., A. M. Latimer, J. A. Silander Jr. 2011. Can entropy maximization use functional traits to explain species abundances? A comprehensive evaluation. **Ecology** 92: 1523-1537.

Merow, C., N. LaFleur, J. A. Silander Jr., A. M. Wilson, M. Rubega. 2011. Developing dynamic, mechanistic species distribution models: predicting bird-mediated spread of invasive plants across northeastern North America. **American Naturalist** 178: 30-43.

Midgley, G.F., R. Altwegg, D. Guo, C. Merow. 2009. Are quiver trees a sentinel for climate change in arid southern Africa? **South African National Biodiversity Institute.** ISBN: 978-0-620-43639-7.

Rawitscher, G., C. Merow, M. Nguyen, I. Simbotin. 2002. Resonances and quantum scattering for the Morse potential as a barrier. **American Journal of Physics.** 70: 935-944.

Manuscripts in review or draft

de Gouvenain, R.C., J. J. Midgley, and C. Merow. Geographical variability in serotiny in the South African shrub *Protea repens* is associated with gradients of fire intensity, precipitation, and temperature, and mediated by the energetic support of live leaves. In review at **Plant Ecology.**

Enquist. B.J. B. Sandel, B. Boyle, J.C. Donoghue II, J. Regetz, J.-C. Svenning, B.J. McGill, C. Merow, R.K. Peet, P.M. Jørgensen, R. Condit, B. Thiers, M. Schildhauer, S.S. Smith, C.E. Hinchliff, S. K. Wiser, C. Violle, I. Šímova, N. Spencer, N. Dolins, N. Morueta-Holme, A. Marcuse-Kubitza, N. J. B. Kraft, J. E. Ott, S. Andelman, H. ter Steege, O. Phillips, Lindsey L. Sloat, M. L. Narro, and N. Casler. Taxonomic and phylogenetic diversity of Land Plants in the New World. In revision for **Science**, rejected at Nature.

Merow, C. Confusing geographic aggregation with complex environmental response and overfitting in species' range models: Two solutions for inferring species' niches from spatially aggregated data. Submission planned for **Methods in Ecology and Evolution.**

Merow, C. Quantifying uncertainty in species' range limits when thresholding species distribution models. Submission planned for **Ecography.**

Merow, C., B. Maitner, H. Owens, J. Kass, R. Guralnik. RMMS: Species' Range Model Metadata Standards. Submission planned for **Ecography.**

Merow, C., N.P. Casler, N. Morueta-Holme, B. Boyle, J. Donoghue II*, P. Jorgensen, R. Peet, B. Maitner*, B. McGill, B. Enquist, and the BIEN Working Group. Range models for all New World land plants. Submission planned for **Global Ecology and Biogeography.**

Merow, C., A. Ranipeta, W. Jetz. Projected regional distribution losses of terrestrial vertebrates under different climate change and land use scenarios. Submission planned for **Nature.**

Ortiz-Rodríguez*, I. A., J. Raventós, E. Mújica, E. González, P. Ortega-Larrocea, A. Bonet, and C. Merow. Demographic fate of an endemic epiphytic orchid in a post-hurricane context: planning a population management scheme. In review, **Journal of Ecology.**

SOFTWARE PACKAGES

Merow, C. *trinaryMaps*: Tools to discretize continuous species range model predictions in a tolerable way. **R package** version 1.0.

Merow, C., B. Maitner, H. Owens, J. Kass, R. Guralnik. *rangeModelMetadata*: Tools for generating metadata objects for species distribution and ecological niche models. **R package** version 1.0.

Serra-Diaz, J., B. Maitner, C. Merow. *occProfileR*: Tools for cleaning occurrence data and determining their quality. **R package** version 1.0.

Kass, J.M.*, B. Vilela, R. Muscarella, M. Aiello-Lammens, R.P. Anderson. 2017. *wallace*: a modular platform for reproducible modeling of species' niches and distributions. **R package** version 0.7 onwards. https://cran.r-project.org/web/packages/wallace/index.html

Maitner, B.S.*, B. Boyle, C. Merow, D. Guaderrama, N. Casler, B. J. Enquist. 2017. *RBIEN*: Tools to access the Botanical Information and Ecology Network (BIEN) Database. **R package** version 1.0. https://cran.r-project.org/web/packages/BIEN/index.html

Rominger, A.*, C. Merow. 2015. *meteR*: Analysis with the Maximum Entropy Theory of Ecology. **R package** version 1.0. https://cran.r-project.org/web/packages/meteR/index.html

Wilson, A.M., C. Merow. 2015. *bossMaps*: Combining expert range maps and occurrence data. **R package** version 1.0. https://cran.r-project.org/web/packages/bossMaps/index.html

Metcalf, C.J.E., S.M. McMahon, R. Salguero-Gomez, E. Jongejans, C. Merow. 2012. *IPMpack*: Builds and analyzes Integral Projection Models. CRAN. **R package** version 2.0. onwards. https://cran.r-project.org/web/packages/IPMpack/index.html

Vieilledent, G., A. M. Latimer, A. E. Gelfand, C. Merow, A.M. Wilson, F. Mortier & J. A. Silander Jr. 2012. *hSDM*: hierarchical Bayesian species distribution models. CRAN. **R package** version 1.0. https://cran.r-project.org/web/packages/hSDM/index.html

GRANTS AND AWARDS

2018-21 **Expanding *Wallace* biodiversity modeling software to support national biodiversity change indicator calculations for GEO BON assessment and reporting**. NASA. PI: Mary Blair. Co-PIs: Robert P. Anderson, Ned Horning, Cory Merow, Matt Aiello-Lammens, Jorge Velásquez-Tibatá. **$5.95e5**

2018-21 **Activities to advance, build, and deliver remote-sensing supported species distribution and species abundance EBVs.** NASA AIST. PI: Walter Jetz. Co-PIs: Rob Guralnik, Melodie McGeoch, Cory Merow, Adam Wilson.

2017-20 **Collaborative Proposal: ABI Development: Wallace: A modular, extensible and reproducible pipeline for modeling species niches and distributions.** National Science Foundation, DBI Advances in Biological Informatics PI: Robert P. Anderson. Co-PIs: Cory Merow, Matthew Aiello-Lammens. **$5.93e5**

2016-18 **Monitoring dimensions of biodiversity in a mega-diverse region of Southern Africa: from traits to communities to ecosystems.** NASA. PIs: Adam Wilson, John Silander. Senior Personnel: Cory Merow. **$2.37e5**

2016-19 **Collaborative Research: ABI Development: Creating a generic workflow for scaling up the production of species ranges**. National Science Foundation, DBI Advances in Biological Informatics. PIs: Brian Enquist, Brian McGill, Cory Merow **$8e5**

2018 **Range models for all New World land plants.** XSEDE (via NSF). PI: Cory Merow. **$3.3e4**

2017 **Range models for all New World land plants.** XSEDE (via NSF). PI: Cory Merow. **$8.3e3**

2017 **Best reviewer award** from **Global Ecology and Biogeography**. (1/5 recipients).

2014 New advancements on Integral Projection Models for comparative demography – Max Plank Institute for Demographic Research. PIs: Roberto Salguero-Gómez, Sean McMahon, Cory Merow, Jessica Metcalf, Eelke Jongejans. **€1.7e4**.

2013 New advancements on Integral Projection Models in a continuous and variable world II. Max Plank Institute for Demographic Research. PIs: Roberto Salguero-Gómez, Sean McMahon, Cory Merow, Jessica Metcalf, Eelke Jongejans. **€3e4**.

2012 New advancements on Integral Projection Models in a continuous and variable world. Max Plank Institute for Demographic Research. PIs: Roberto Salguero-Gómez, Sean McMahon, Cory Merow, Jessica Metcalf, Eelke Jongejans. **€3.6e4**.

2011 Bamford Research Fund for Botany. U. Connecticut. **$2e3**.

2010 'Parallel Evolutionary Radiations in Protea and Pelargonium in the Greater Cape Floristic Region'. National Science Foundation. PIs: Carl Schlicting, Justin Borevitz, Kent Holsinger, Cynthia Jones, Andrew Latimer, John Silander. Graduate student co-author: Cory Merow. **$3e6**.

2008; 10 U. Connecticut Center for Environmental Science and Engineering Graduate Student Research Fellowship (2008: **$1e4**; 2010: **$1e4**).

2007-10 U. Connecticut Center for Environmental Science and Engineering Multidisciplinary Environmental Research Award (2007: **$5e3**; 2008: **$5e3**; 2009: **$5e3**; 2010: **$8e3**).

RESEARCH EXPERIENCE

Research Scientist

2016-pres Ecology and Evolutionary Biology, Yale University, New Haven, CT

Research Assistant Professor (Gratis 2013-2014)

2013-16 Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT

Statistician

2015 Division of Migratory Bird Management, Branch of Population and Habitat Assessment
United States Fish and Wildlife Service, Laurel, MD
Developed statistical methods for species' range modeling

Postdoctoral Researcher

2013-14 Forest Demography, Smithsonian Environmental Research Center, Edgewater, MD
Grant: Climate Change Impacts on Forest Biodiversity: Individual Risk to Subcontinental Impacts (NSF Funded)

Visiting Scientist

2012-13 Computational Ecology and Environmental Science, Microsoft Research, Cambridge, UK
Developed machine learning tools for range modeling applications

Postdoctoral Researcher

2012 Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT
Grant: *Parallel Evolutionary Radiations in Protea and Pelargonium in the Greater Cape Floristic Region (NSF Funded)*

Graduate Research Assistant

2008–11 Ecology and Evolutionary Biology, University of Connecticut, Storrs, CT
Worked on a wide range of modeling projects funded by NSF, USDA and Center for Environmental Science and Education at UConn

Visiting Scientist

2008 South African National Biodiversity Institute, Cape Town, ZA
Linked demographic responses of quiver trees in southern Africa to climate change

TEACHING EXPERIENCE

Course Instructor

2018 Global Biodiversity Change Research in the Era of Big data. Yale U.
Course Materials: https://cmerow.github.io/YaleBGCCourses/

2016-17 Workshop series in statistics, programming, and data science. Biodiversity and Global Change Center. Yale U.
Course Materials: https://cmerow.github.io/RDataScience/

2016 Biological Statistics. Seminar (Co-taught). U. Connecticut

2015, 12 Introduction to Integral Projection Modeling. One-week intensive course. Max Planck Institute for Demographic Research, Rostock, Germany.
Course Materials: https://github.com/cmerow/teachIPMs

2013 R Programming for Ecologists. Seminar. U. Connecticut

2011 Modeling Biodiversity Patterns and Ecological Processes. Seminar. U. Connecticut.
Course Materials: https://cmerow.github.io/teaching.html

High School Physics Teacher

2005-06 Woodstock Academy. Woodstock, CT.

2004-05 Gardner High School. Gardner, MA.

Workshop Organizer

2017 Integrating and cleaning biodiversity data: Workflows to model ranges and merge associated ecological, phylogenetic, and trait information. International Biogeography Society Meeting

2012-16 Demography in a Continuous World: An Introduction to Integral Projection Models. See open source, editable course materials at: https://github.com/cmerow/teachIPMs

2015 British Ecological Society Symposium: Demography beyond the population

2015, 16 Evolutionary Demography Meeting

2015 Mexican Congress of Ecology

2012, 13, 14, 15 Ecological Society of America National Meeting

2012 Swiss Federal Research Institute, Zurich.

2008 Bayesian modeling in R with applications in ecology. South African National Biodiversity Institute, Cape Town.

Laboratory Instructor

2006-07 Introductory Biology (Non-majors). U. Connecticut

2000-04 Astronomy, Physics of the Environment, Physics for Engineers. U. Connecticut.

ADDITIONAL EXPERIENCE

Editor

2017-Pres **'Emerging Technologies' Associate editor, Ecosphere**

2016-Pres **Associate editor, Ecography**

2016-Pres **Associate editor, Diversity and Distributions**

2015-Pres **Associate editor, Biological Invasions**

2015 Guest editor, Ecological Applications

2015 Guest editor, Functional Ecology**.** *Coordinated special feature issue, 'Demography beyond the population', across British Ecological Society journals*

Invited Talks

2018 Ecological Society of America. Inspire session: *Natural History in the Digital Age*

2017 Cary Institute of Ecosystem Studies

National Socio-Environmental Synthesis Center (SESYNC)

2016 Harvard Forest.

U. Tennessee. Ecology and Evolutionary Biology.

Roger Williams U. Biology.

2015 Yale U. Spatial Biodiversity Science and Conservation Program.

American Museum of Natural History. Species distribution modeling group.

British Ecological Society Symposium. *Demography beyond the population*.

Mexican Congress of Ecology.

Ecological Society of America. Organized session: *Predicting range shifts in response to ongoing environmental change using dynamic modeling approaches*.

2014 U. California, Berkeley. Workshop: *Big ecological questions, diverse data, new methods*

Woods Hole Research Center.

Ecological Society of America. Ignite session: *New approaches in spatial plant population dynamics: Population ecology is everywhere!*

2013 U. Cambridge. Plant Sciences.

U. Sheffield. Animal and Plant Sciences.

U. College London. Genetics, Evolution and Environment.

Ecological Society of America. Organized session: *Evaluating the dynamics of tree species range limits under climate change for sustaining biodiversity*

American Museum of Natural History. Species distribution modeling group.

2012 Central Connecticut State U. Biology.

Field Work

2008-12 **South African Fynbos**: Trait-based community assembly

Working Groups

2014-pres **Botanical Information and Ecology Network (BIEN):** *We study plant diversity patterns and support a database to document global patterns of plant diversity, distribution and function.*
Support: NSF, NCEAS, Cyverse
biendata.org

2015-pres **Map of Life.** *We study global biodiversity patterns and changes while maintaining a database, web service and mobile app for documenting, and studying global species distribution.*
Support: NSF, Max Plank Institute, NASA
mol.org

2016-pres **SPARC (Spatial Planning for Protected Areas in Response to Climate Change).** *We make conservation recommendations to governments based on how species distributions may respond to climate change and the adequacy of protected areas to anticipate these change.*
Support: Conservation International
sparc-website.org

2016-pres **GEOBON (Group on Earth Observation – Biodiversity Observation Network) -Species Populations Working Group**. *We are developing a pipeline to link occurrence and abundance data to Essential Biodiversity Variables for global and regional assessments.*
Support: iDiv, NASA, UNEP, GBIF, UNESCO
geobon.org

2017 Cross-Disciplinary Statistical Applications in the Anthropocene.
Support: SESYNC

2015 **Co-organizer: British Ecological Society Symposium**: Demography beyond the population.
Support: British Ecological Society
http://onlinelibrary.wiley.com/subject/code/000046/homepage/cross_journal_special_feature.htm

2013-15 Diversity and Forest Change: Characterizing functional, phylogenetic, and genetic contributions to diversity gradients and dynamics in tree communities.
Support: National Science Foundation and Chinese Academy of Sciences

2012-16 Co-organizer: New advances in Integral Projection Models in a continuous and variable world.
Support: Max Plank Institute for Demographic Research

2012-13 Advancing concepts and models of species range dynamics: understanding and disentangling processes across scales.

Support: Swiss Federal Research Institute