

# Ian Breckheimer

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## Education

- Nov. 2017 - **NSF Postdoctoral Fellow**, *Harvard University*.  
2017 **PhD in Biology**, *University of Washington*.  
2011 **Masters of Science in Ecology**, *UNC Chapel Hill*.  
2006 **Bachelors of Science in Biology**, *Guilford College*, Greensboro, NC.

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## PhD Dissertation

- Title *A landscape approach to forecasting climate change impacts on geographic ranges and phenologies of plants in the Washington Cascades*
- Supervisor Janneke Hille Ris Lambers
- Description Combined data from microclimate sensors, repeat survey data, and field experiments to measure ecological and evolutionary constraints on range boundaries and plant phenologies.

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## Forthcoming Publications

**I. Breckheimer**, E. J. Theobald, A. K. Wilson, J. HilleRisLambers. Climate drives fragmentation of subalpine ecosystems via phenological mismatch. *In preparation, draft manuscript available on request.*

**I. Breckheimer**, A. Ettinger, K. Ford, E. Theobald, J. Lundquist, J. Franklin, J. HilleRisLambers. Climatically sheltered plant communities are no less vulnerable to species turnover under climate change. *In preparation, draft manuscript available on request.*

**I. Breckheimer**, E. Theobald, N. Cristea, A. Wilson, J. Lundquist, R. Rochefort, J. HilleRisLambers. Crowd-sourced data reveals climate-driven phenological mismatch between social and ecological systems. *In review, Nature Climate Change.*

Theobald, E., **I. Breckheimer**, J. HilleRisLambers. Climate-induced phenological reassembly of a flowering community. *In press, Ecology.*

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## Publications

Theobald, E. J., **Breckheimer, I.**, & HilleRisLambers, J. 2017. Climate drives phenological reassembly of a mountain wildflower meadow community. *Ecology*, 98(11), 2799-2812.

Cristea, N. C., **Breckheimer, I.**, Raleigh, M. S., HilleRisLambers, J., Lundquist, J. D. 2017. An evaluation of terrain-based downscaling of fractional snow covered area datasets based on Lidar-derived snow data and orthoimagery. *Water Resources Research*. DOI:10.1002/2017WR020799.

Leaché, A. D., Grummer, J. A., Harris, R. B., **Breckheimer, I.** 2017. Evidence for concerted movement of nuclear and mitochondrial clines in a lizard hybrid zone. *Molecular Ecology no. 26(8)*, 2306-2316.

Wilson, A., Bacher, K., **Breckheimer, I.**, Lundquist, J., Rochefort, R., Theobald, E., Whiteaker L., HilleRisLambers, J. 2017. Monitoring wildflower phenology using traditional science, citizen science, and crowdsourcing approaches. *Park Science* no. 33(1):17–26.

Ford, K. R., **I. Breckheimer**, J. F. Franklin, J.A. Freund, S.J. Kroiss, A. J. Larson, J. HilleRisLambers. 2016. Competition alters tree growth responses to climate at individual and stand scales. *Canadian Journal of Forest Research* DOI: 10.1139/cjfr-2016-0188

Krosby, M., **I. Breckheimer**, D. John Pierce, B.L. Cosentino, J. Schuett-Hames, P.H. Singleton, S.A. Hall, K.C. Halupka, W.L. Gaines, R.A. Long B. H.. McRae. 2015. Focal species and landscape "naturalness" corridor models offer complementary approaches for connectivity conservation planning. *Landscape Ecology* 30 no. 10, 2121-2132

HilleRisLambers, J. L.D.L. Anderegg, **I. Breckheimer**, K.M. Burns, A.K. Ettinger, J.F. Franklin, J.A. Freund, K.R. Ford, S.J. Kroiss. 2015. Implications of Climate change for Turnover in Forest Composition. *Northwest Science* 89 no. 3, 201 - 218

**Breckheimer, I.**, N. Haddad, W. Morris, A. Trainor, W. Fields, R.T. Jobe, B. Hudgens, A. Moody, J. Walters. 2014. Defining and evaluating the umbrella species concept for conserving and restoring landscape connectivity. *Conservation Biology* 28 no. 6, 1584-1593

Miller, BW, **I Breckheimer**, A.L. McCleary, L. Guzmán-Ramirez, S.C. Caplow, J.C. Jones-Smith, and S.J. Walsh. 2010. Using stylized agent-based models for population–environment research: a case study from the Galápagos Islands. *Population and Environment* 31, no. 6, pp 401-426

## Grants / Awards

*National Science Foundation* – Postdoctoral Fellowship in Biology, \$130,000

*Northwest Climate Science Center* - Graduate Fellowship, \$72,000

*National Science Foundation* - Doctoral Dissertation Improvement Grant, \$15,000

*UW Biology* - BEACON Award, \$1000, Giles Award, \$2000, Experimental Field Ecology Award, \$2500

*National Science Foundation* - Research Experience for Undergraduates Supplemental Award, \$6000

*UNC Chapel Hill* - Graduate Merit Fellowship, \$23,000

*Tri-Beta* - National Brooks Award, \$500

*Guilford College* - High Honors, Departmental Honors, Clyde A. Milner Award

## Conference Presentations

**I. Breckheimer.** BloomFinder: Leveraging Crowdsourced Data to Understand Climate Change Impacts on Mountain Wildflowers in the Western USA. International Association of Landscape Ecology Annual Meeting, April 2018

**I. Breckheimer**, J. HilleRisLambers. Disturbance and the demographic theory of species ranges: Are we missing the forest by focusing on the trees? 102nd Ecological Society of America Annual Meeting, August 2017

**I. Breckheimer**, E. Theobald, A. Wilson, N. Cristea, J. Lundquist, R. Rochefort and J. HilleRisLambers. Low mountain snowpack drives temporal mismatches between social and ecological systems in Mt. Rainier National Park. Oral Presentation, MtnClim 2016, October 2016

**I. Breckheimer**, E. Theobald, A. Wilson, N. Cristea, J. Lundquist, R. Rochefort and J. HilleRisLambers. Crowd-sourced data reveals phenological mismatches between social and ecological systems driven by climate. Oral Presentation, 101st Ecological Society of America Annual Meeting, August 2016

**I. Breckheimer**, E. Theobald, A. Wilson, J. HilleRisLambers. Climate drives fragmentation of montane meadow ecosystems via phenological mismatch. Oral Presentation, International Association of Landscape Ecology Annual Meeting, April 2016

**I. Breckheimer**, A. Ettinger, K. Ford, E. J. Lundquist, J. HilleRisLambers. Topographic and vegetation structure controls on microclimate in complex landscapes: A case study from Mount Rainier National Park. Poster Presentation, 100th ESA Annual Meeting, August 2015

**Breckheimer, I.**, M. Krosby, P.H. Singleton, J. Pierce, B. McRae, R. Long, B. Cosentino, S. Hall, K. Halupka, B. Gaines, J. Schuett-Hames. Do connectivity models based on “naturalness” capture important habitat linkages for focal species? A case-study from the Pacific Northwest. Oral Presentation, 26th International Conference for Conservation Biology, April 2014

## Teaching and Outreach

*Teaching Assistant and Laboratory Instructor, University of Washington* - Intro Biology (BIOL180), Introductory Physiology (BIOL220), Plant Ecology (Biol471) , 2012 - 2015

*Instructor of Record, University of Washington* - Computational Problem-solving for Biologists (BIOL530C), University of Washington, 2014 - 2015. Graduate-level course in data analysis and visualization using R.

*Botany Greenhouse Docent, University of Washington*, 2014 - 2015. Led tours of greenhouse collections for tour groups of all ages.

*STATMOS DeltaC Program Coordinator, University of Washington* 2013-2014. Developed interactive curriculum materials for high school AP Statistics Classes.

*Data Analyst*, MeadoWatch citizen science program. 2014 - 2016. Coordinated data management and analysis.

*Scientist in Residence*, Mt. Rainier National Park, 2016. Supported park management by developing real-time snow melt forecasts and climate data products.

*Outreach Presentations*, Mt. Rainier National Park Ranger Training, 2014 - 2017. Mt. Si High School, 2016.

## Professional Experience

- August 2011 - **High School Support Teacher - Science and Math**, *The Howard School*,  
 May 2012 Atlanta, GA.  
 Developed and led classroom and field activities in mathematics and science for 9th-12th grade students. Supervised after-school tutoring. Developed hands-on research projects with students on the influence of climate change on the timing of leafing and flowering in plants.
- August 2008 – **Teaching / Research Assistant**, *UNC Chapel Hill*, Chapel Hill, NC.  
 January 2011 Developed new conservation GIS tools in collaboration with the NC Sandhills Conservation Partnership. Teaching Assistant - Ecology and Evolution, Field Skills in Physical Geography, Water Resources Planning. Committee Chair - Ecology and Environment Seminar Series. 2011 Student representative - Curriculum for the Environment and Ecology faculty search committee.
- January – **Land Steward / Land Manager**, *Sandhills Area Land Trust*, Southern  
 August 2008 Pines, NC.  
 Conducted annual monitoring on conservation easements. Prepared biological surveys and baseline documentation for new projects. Collaborated with landowners to design conservation projects.
- January – **Rainforest Ecology Intern**, *School for Field Studies*, Queensland,  
 December 2007 Australia.  
 Conservation biology teaching/research assistant position for American undergraduate students in NE Queensland, Australia. Performed field surveys for birds, bats, and herps. Developed curriculum, led field exercises, and supported student research projects.
- May – **GIS Watershed Planner**, *Piedmont Land Conservancy*, Greensboro, NC.  
 December 2006 Coordinated multiple stakeholders in the development of a Dan River Watershed Protection Plan to direct conservation funding in a 3-county region. Performed GIS land-use analysis using remote-sensing data. Developed skills with GIS, ArcHydro, Technical Writing, analysis of water quality monitoring data.
- May – October **Environmental Education Instructor**, *Haw River Program*, Greensboro,  
 2006 NC.  
 Taught Wetlands Ecology, Forest Ecology, Orienteering, and Team Building Classes for school groups (4th-10th grade).

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## Technical Skills

*Programming* - R (proficient), JAGS / STAN (proficient), Linux / MacOS shell (proficient), Git / Github (proficient), Python (moderate experience), HTML / CSS (moderate experience), Javascript (moderate experience), NetLogo (moderate experience), L<sup>A</sup>T<sub>E</sub>X (moderate experience), Ruby (moderate experience).

*Software* - QGIS (proficient), GRASS GIS (proficient), Microsoft Office (proficient), ArcGIS (moderate experience), Inkscape (moderate experience), Photoshop (moderate experience).

*Data Analysis* - hierarchical models (mixed effects, hierarchical Bayes), machine learning (boosted regression trees, maxent, random forest), computer vision (convolutional neural networks, deep learning), spatial statistics (regression kriging, Bayesian kriging), time-series methods (autoregressive models, EOF, state-space models), multivariate methods (joint models, principal components, ordination), big data analytics (Apache Spark), database management (Microsoft Access, sqlite, PostGIS)

*Data Visualization* - GGplot2 (proficient), Shiny (proficient), leaflet (moderate experience), D3

(moderate experience), MapBox Studio (moderate experience).

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## Extracurricular Activities

**Guilford:** President, Outdoor Club, Forevergreen Environmental Club. **UNC:** Sandhills Conservation Partnership Participant, Habitat for Humanity Volunteer **UW:** DeltaC curriculum development project, Young Naturalists Society, Sound Scholars coordinating committee