

## LONG TERM ECOLOGY— MIKE WILLIG'S 30+ YEARS OF RESEARCH



Photo by Bri Diaz/UConn

When newly minted assistant professor Mike Willig arrived in the Luquillo mountains of Puerto Rico in summer 1982, he did what he'd always done: He went into the forest at dusk, spread a mist net between two poles, pulled out his field notebook and waited for bats. He was confident, based on years of grad school experience from Brazil, that he'd catch dozens, or even a hundred. Over the course of ten hours, Willig captured three bats.

Determined, he went out the next night, and the next. For five weeks he spent nights in that forest, catching three or four bats nightly.

When he finally had enough for his experiment, to observe the bats feeding on their favorite tropical fruit, the fruits had gone sour.

A few nights into his foray, Willig noticed the forest was crawling with walking sticks. Each night, while waiting for the rare bat, Willig caught the stick insects, took their measurements, marked them, and let them go. The resulting publication documented how much the insects moved, what they ate, and how many there were. The next summer Willig returned, this time with eyes only for the walking sticks.

"I was a poster child of what it meant to be an ecologist at the time," he says. Ecologists, he says, generally focused on one abundant animal or plant, in one small area, for a short time period. But modern ecologists have learned to understand how Earth's life works, you have to think bigger, and longer-term.

"Ecologists finally realized that if you want to understand the plot of a movie, including the protagonist and the antagonist, and how it all unravels, you don't restrict your attention to two frames of the movie," he says. "The LTER program revolutionized that."

The Long-Term Ecological Research Network (LTER) is a network of thousands of scientists and hundreds of research projects continuously funded by the National Science Foundation for 36 years. Willig, a participant at Luquillo for more than 30 years, is co-PI on a recent \$3.9 million LTER grant to that project.

His experience inspired his new book, [Long-Term Ecological Research: Changing the Nature of Scientists](#). The volume features scientists' accounts of how participating in "big data" science has changed them as researchers, and as people.



*Continued on page 2*

Image courtesy Oxford University Press.

## LONG TERM ECOLOGY—30 YEARS OF RESEARCH CON'T

The National Science Foundation created LTER in 1980 by funding nine research projects for groups of scientists across the U.S. At research sites spanning the mountains of Oregon, the dry plains of Kansas and the Great Lakes of Wisconsin, their charge was to understand a diverse array of ecosystems, over large areas, and over time; and to create a legacy for future generations to continue that work.

Today LTER has 25 sites across the continental U.S., Alaska, Puerto Rico, French Polynesia and Antarctica, and boasts about 2,000 scientists. Geoscientists, chemists, molecular biologists, and even anthropologists teamed up with traditional field ecologists, which Willig says was crucial. Environmental issues of the day, like acid rain and the first whisperings of climate change, couldn't be addressed by ecologists alone.

In 1989, a year after the Luquillo Mountains became an LTER site, Hurricane Hugo hit the forest hard. It looked like a field of popsicle sticks, describes Willig, with trees' leaves and entire branches stripped clean away. In the brown, desolate aftermath, Willig's beloved walking sticks were nowhere to be found.

"It starts to challenge your view of how a system works if one of the most abundant organisms, a week after a disturbance, can't even be found," says Willig. "Is it extinct? Will it come back? Which view of nature is the most 'accurate'?"

At many sites, remotely-sensed data is uploaded automatically to LTER databases. Willig notes happily that ultrasonic detectors have revolutionized bat ecology, because they record continuously, and don't require operation by humans. "You put them up on a tree, and they have microphones that record all night long," he explains. "You can use them for birds, frogs, bats, all kinds of things."

Over time, Willig noticed that he, too, had changed. No longer the laser-focused organismal ecologist of his youth, Willig now studies large-scale issues like deforestation and forest dynamics. Willig's book, co-edited with Lawrence Walker of the University of Nevada Las Vegas, contains personal essays and evaluations of the LTER program by scientists from most of its 25 sites. They conclude, perhaps unsurprisingly, that their careers and outlook on ecology were broadened by LTER.

Mark Boyer and Scott Brown, Board of Trustees Distinguished Professors of Geography and Educational Psychology, respectively, contribute an analysis that concludes that LTER has indeed changed the field. They call the LTER movement an "invisible college" whose only challenge will be to continue to recruit like-minded scientists for future innovation.

Willig thinks that's likely. With research themes like coastal vulnerability, sea ice disappearance, and landscape modification under climate change, Willig predicts that LTER will continue to attract young environmental scientists. The ideas of change, and of leaving something behind for future generations, says Willig, are inherently human.

"Ecosystems are so fascinating because they're constantly changing. They're always in a state of flux. Just like our lives. <https://global.oup.com/academic/product/long-term-ecological-research-9780199380213?cc=us&lang=en&>

*Adapted from an article by Christine Buckley, CLAS, UConn Today*

## AWARDS AND GRANTS

### FACULTY

**Mark Urban**, Carol Auer (PLSA) **Chris Elphick**, **Gene Likens**, **Carl Schlichting** were awarded one of UConn's Academic Plan Proposal Awards, This grant entitled "*Biological Risk and Big Data: Sustainability and Resilience in the Era of Global Change*" is a 3-year grant.

**Jill Wegrzyn** received a USDA/National Institute of Food and Agriculture/North Carolina State University grant for her project entitled: *Towards Genomic Breeding in Forest Trees*"

Working with colleagues at the US Fish and Wildlife Service, **Chris Elphick** received funding to continue ongoing research to track saltmarsh sparrows during migration. The grant, *Conserving a Surrogate Species at the Landscape Level; Connecting the Dots Between Breeding, Migration and Wintering in Regions 4 & 5*, will allow the team to put small transmitters on sparrows immediately prior to migration and to use an existing network of receiver towers distributed along the Atlantic coast to track birds as they move between New England breeding sites and wintering areas in the southeastern US.

In this new NSF grant entitled *Ecological and Evolutionary Resilience of Aquatic Communities to the Climate-Mediated Expansion of an Apex Predator*, collaborators **Mark Urban** and **Jill Wegrzyn** explore the ecological and evolutionary resilience of pond communities to the invasion of a top predator. Warmer winters are increasing the prevalence of a top predator, the marbled salamander, in small temporary ponds in New England. Over shorter time scales, they have observed dramatic changes to pond communities and ecosystems when this predator invades. However, the colonization of species better adapted to deal with this predator and the local adaptation of populations of its prey could alleviate these impacts. By manipulating entire natural ponds and applying next-generation genomic approaches, Urban and Wegrzyn will evaluate if nature can buffer against predator invasion as winter temperatures warm throughout New England.

### GRADS

**Dustin Ray** and **Holly Brown** each received 2016 Doctoral Dissertation Fellowships from the University of Connecticut Graduate School. **Dustin** also won the 2016 Katherine Esau Award for the best student paper at the Botanical Society of America meeting for his talk entitled "Vessel packing and scaling relationships in petioles."

**Kevin Keegan**, **Kate Nazario** and **Katie Taylor** received 2016 Society of Systematic Biologists awards. Kevin's funding will be used to carry additional sequencing on stiriine and related amphipyrrine noctuids. Kate's funding will allow her to produce detailed phylogeny for her Patagonian Tettigades cicadas using hybrid capture data. Katie's funding will allow her to produce a detailed phylogenetic tree for the *Chrysoperia carnea* species group using reduced representation genome sequencing.

### UNDERGRADS

Several EEB and Biological Science majors earned SURF (Summer Undergraduate Research Fund) awards in 2016-2017. Students are mentored by EEB faculty. They are **Adam Chiu** (Elizabeth Jockusch), **Genevieve Nuttall** (Morgan Tingley), **Limmond Ayisi** (Elizabeth Jockusch), **Satpal Jutla** and **Dinah Parker** (Bernard Goffinet). **Nicholas Russo** was awarded a 2016 Udall Scholarship; he is a STEM Scholar, a 2015 Holster Scholar and received an IDEA Grant for his research on avian dispersal of the woolly adelgid (Morgan Tingley).

## EEB IN THE NEWS

**The Saltmarsh Sparrow Is Creeping Dangerously Close to Extinction** - Hannah Furfaro *Audubon* - Elphick <http://www.audubon.org/news/the-saltmarsh-sparrow-creeping-dangerously-close-extinction>

**Seaweed Farming Takes Root in Southern New England** - Leigh Vincola *EcoRI News* **Yarish** <http://www.ecori.org/green-economy/2016/7/29/seaweed-farming-takes-root-in-southern-new-england>

**Red Tape Slows Bloom of Seaweed Farming's Green Revolution** **Yarish** - Petra Cahill *NBC News* <http://www.nbcnews.com/news/us-news/red-tape-slows-bloom-seaweed-farming-s-green-revolution-n613526>

**UConn to establish Institute of Biological Risk** <http://wtnh.com/2016/07/18/uconn-to-establish-institute-of-biological-risk/>

**The diversity of life across much of Earth has plunged below 'safe' levels** - Chris Mooney *Wash Post* - Institute of Biological Risk - **Urban** [https://www.washingtonpost.com/news/energy-environment/wp/2016/07/14/the-diversity-of-life-across-much-of-earth-has-plunged-below-safe-levels-scientists-say/?tid=pm\\_business\\_pop\\_b](https://www.washingtonpost.com/news/energy-environment/wp/2016/07/14/the-diversity-of-life-across-much-of-earth-has-plunged-below-safe-levels-scientists-say/?tid=pm_business_pop_b)

**New Faculty Projects Will Advance Academic Plan** - Kristen Cole - Institute of Biological Risk - **Urban** [http://today.uconn.edu/2016/07/new-faculty-projects-advance-academic-plan/?utm\\_source=FacStaffDailyDigest&utm\\_medium=email&utm\\_campaign=UConnTodayDailyDigest](http://today.uconn.edu/2016/07/new-faculty-projects-advance-academic-plan/?utm_source=FacStaffDailyDigest&utm_medium=email&utm_campaign=UConnTodayDailyDigest)

**Greenwich Shellfish Commission, UConn, share space and data on Sound** - Peregrine Frissell <http://www.greenwichtime.com/local/article/Greenwich-Shellfish-Commission-UConn-share-8353016.php>

## PUBLICATIONS

**Turchin, P.** "Mine from the Past" *Nature* Volume 535, Issue 7613 <http://www.nature.com/news/lessons-from-brexit-1.20306>

**Wegrzyn, J. L., Whalen, J., Kinlaw, C. S., Harry, D. E., Puryear, J., Loopstra, C. A., . . . Neale, D. B.** (2016). Transcriptomic profile of leaf tissue from the leguminous tree, *Milletia pinnata*. *Tree Genetics & Genomes*, 12(3), 1-12.

Vangestel, C., Vázquez-Lobo, A., Martínez-García, P. J., Calic, I., **Wegrzyn, J. L., & Neale, D. B.** (2016). Patterns of neutral and adaptive genetic diversity across the natural range of sugar pine (*Pinus lambertiana* Dougl.). *Tree Genetics & Genomes*, 12(3), 1-10.

Syring, J. V., Tennessen, J. A., Jennings, T. N., **Wegrzyn, J., Scelfo-Dalbey, C., & Cronn, R.** (2016). Targeted Capture Sequencing in Whitebark Pine Reveals Range-Wide Demographic and Adaptive Patterns Despite Challenges of a Large, Repetitive Genome. *Front Plant Sci*, 7, 484. doi:10.3389/fpls.2016.00484

Martínez, García, P. J., Crepeau, M. W., Puiu, D., Gonzalez, Ibeas, D., **Wegrzyn, J., Stevens, K. A., . . . Reagan, R. L.** (2016). The walnut (*Juglans regia*) genome sequence reveals diversity in genes coding for the biosynthesis of nonstructural polyphenols. *The Plant Journal*. doi: 10.1111/tj.13207

## PUBLICATIONS

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

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

Aiello-Lammens, M., Slingsby, J., Merow, C., Mollmann, H., Douglas Euston-Brown, Jones, C., and Silander, Jr, J.A., 2016. *Processes of community assembly in an environmentally heterogeneous, high biodiversity region*. *Ecography* 39: 001-016.

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.

Kaufman, A. B., and J.C. Kaufman, eds. (2015). *Animal creativity and innovation*. San Diego, CA: Academic Press.

Kaufman, A.B. and J.C. Kaufman, eds. (in press). *Pseudoscience: The conspiracy against science*. Boston, MA: MIT Press.

Kaufman, A.B., Bashaw, M.J, and T. Maple, eds. (in press). *The scientific foundation of zoos and aquariums: Their role in conservation and research*. Cambridge, UK: Cambridge University Press.

O'Hearn\*, W.J., Kaufman, A.B., and J.C. Kaufman. (2015). Animal Creativity and Innovation: An Integrated Look at the Field. In: A.B. Kaufman and J.C. Kaufman (eds.), *Animal Creativity and Innovation* (pp. 501-506). Waltham, MA: Academic Press.

Walker, L. R., and M. R. Willig. 2016. Tradeoffs of participation in the Long-Term Ecological Research (LTER) Program: Immediate and long-term consequences. Pages 433-437 in M. R. Willig and L. R. Walker, editors. *Long-Term Ecological Research: Changing the Nature of Scientists*. Oxford University Press, New York, New York.

Klingbeil, B. T., and M. R. Willig. 2016. Community assembly in temperate forest birds: habitat filtering, interspecific interactions, and priority effects. *Evolutionary Ecology* 30:703-722. doi: 10.1007/s10682-016-9834-7

Klingbeil, B. T., and M. R. Willig. 2016. Matrix composition and landscape heterogeneity structure multiple dimensions of biodiversity in temperate forest birds. *Biodiversity and Conservation*. In Press.

Harris, J. B. C., Tingley, M. W., Hua, F., Yong, D. L., Adeney, J. M., Lee, T. M., Marthy, W., Prawiradilaga, D. M., Sekercioglu, C. H., Suyadi, Winarni, N. and Wilcove, D. S. (2016), Measuring the impact of the pet trade on Indonesian birds. *Conservation Biology*. doi:10.1111/cobi.12729

Russo, N. J., A.S.-J. Cheah, and M. W. Tingley. (2016), Experimental evidence for branch-to-bird transfer as a mechanism for avian dispersal of the hemlock woolly adelgid (Hemiptera: Adelgidae). *Environmental Entomology*. doi:10.1093/ee/nvw083

Lind, B. M., Friedline, C. J., Wegrzyn, J. L., Maloney, P. E., Vogler, D. R., Neale, D. B., & Eckert, A. J. (2016). When local means local: Polygenic signatures of local adaptation within whitebark pine (*Pinus albicaulis* Engelm.) across the Lake Tahoe Basin, USA. *bioRxiv*, 056317.

## PUBLICATIONS

Duelli, P., **Henry, C. S.**, Hayashi, M., Nomura, M., and Mochizuki, A. *In press*. Molecular phylogeny and morphology of *Pseudomallada* (Neuroptera: Chrysopidae), one of the largest genera within Chrysopidae. *Zoological Journal of the Linnean Society*.

Richmond, M. P., Park, J., and **Henry, C. S.** 2016. The function and evolution of male and female genitalia in *Phyllophaga* Harris scarab beetles (Coleoptera: Scarabaeidae). *Journal of Evolutionary Biology*.

**Nadeau C. P., M. C. Urban,** and J. R. Bridle. Coarse climate change projections for species living in a fine-scaled world. *Global Change Biology*. DOI: 10.1111/gcb.13475.

**Nadeau, C. P.** and A. K. Fuller. Combining landscape variables and species traits can improve the utility of climate change vulnerability assessments. *Biological Conservation*. In press.

**Spence, A.R.**, Hopkins, G.R., Neuman-Lee, L.A., Smith, G.D.S., Brodie, E.D. and French, S.S. 2016. Detrimental Effects of Zinc Oxide Nanoparticles on Amphibian Life Stages. *Journal of Experimental Zoology Part A: Ecological Genetics and Physiology*.

Bjerregaard, R., Valderrama, D., Radulovich, R., Diana, J., Capron, M., McKinnie, C.A., Cedric, M., Hopkins, K., **Yarish, C.**, Goudey, C., Forster, J. 2016. Seaweed aquaculture for food security, income generation and environmental health in Tropical Developing Countries. Washington, D.C.: World Bank Group. (Report #107147). <http://documents.worldbank.org/curated/en/947831469090666344/Seaweed-aquaculture-for-food-security-income-generation-and-environmental-health-in-Tropical-Developing-Countries;jsessionid=4sLY8b149Hwa-8ramT5do35G>

Kjer, K., **C. Simon,** M. Yavorskaya and R.G. Beutel. 2016. Progress, pitfalls and parallel universes: a history of insect phylogenetics. *Journal of the Royal Society Interface* 13: 20160363. Doi: 10.1098/rsif.2016.0363

Price B., E. Allan, K. Marathe, V. Sarkar, **C. Simon,** and K. Kunte. 2016. The cicadas (Hemiptera: Cicadidae) of India, Bangladesh, Bhutan, Myanmar, Nepal and Sri Lanka: an annotated provisional catalogue, regional checklist and bibliography. *Biodiversity Data Journal* 4: e8051. (156 pages, including data downloadable in Darwin Core Archives) doi: [10.3897/BDJ.4.e8051](https://doi.org/10.3897/BDJ.4.e8051)

**Cooley, J.R.,** G. Kritsky, **D.C. Marshall, K.B.R. Hill,** G. Bunker, M.L. Neckerman, J. Yoshimura, J.E. Cooley, and **C. Simon.** 2016. A GIS-based map of periodical cicada Brood XIII in 2007, with notes on adjacent populations of Broods III and X (Hemiptera: *Magicicada* spp.). *American Entomologist*. In press.

**Marshall, D. C., K. B. Hill, M. Moulds, D. Vanderpool, J. R. Cooley,** A. B. Mohagan, and **C. Simon.** 2016. Inflation of Molecular Clock Rates and Dates: Molecular Phylogenetics, Biogeography, and Diversification of a Global Cicada Radiation from Australasia (Hemiptera: Cicadidae: Cicadettini). *Systematic Biology* 65:16-34.

**Trumbo, S.T., Sikes, D.S. & Philbrick, P.K.B.** 2016. Parental care and competition with microbes in carrion beetles: a study of ecological adaptation. *Animal Behaviour* 118:47-54. doi 10.1016/j.anbehav.2016.06.001

**Trumbo, S.T.** 2016. The fate of mouse carcasses in a northern woodland. *Ecological Entomology*.  
**DOI:** 10.1111/een.12341

**Trumbo, S.T.** 2016. Carcass Age and Reproductive Costs for *Nicrophorus orbicollis* (Coleoptera: Silphidae). *Environmental Entomology*. doi: 10.1093/ee/nvw114