



ECOfocus

CARY INSTITUTE OF ECOSYSTEM STUDIES

The science behind environmental solutions

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Shannon LaDeau

URBAN CONDITIONS MAGNIFY WEST NILE VIRUS

by Sian M. Hunter

This year's West Nile virus outbreak is marching toward the record books, with the Centers for Disease Control reporting some 3,100 cases and more than 130 deaths in the United States. The mosquito-borne virus, now found in 48 states, can result in flu-like symptoms, meningitis, and encephalitis. With new funding of \$1.4 million dollars from the National Science Foundation, Cary disease ecologist Shannon LaDeau is headed back to the trenches, literally, to untangle the environmental factors that magnify West Nile virus' spread.

LaDeau and colleagues have spent two years in Baltimore, monitoring mosquito populations and assessing landscape features to better understand conditions that lead to West Nile outbreaks, including what citizens and municipalities can do to combat the virus' spread. "The outbreak in Dallas may have arisen from a perfect storm of conditions that support high mosquito populations and bird-mosquito interactions, including warmer winters and severe rain events," notes LaDeau. Other Texas cities didn't see the same high rate of cases, which highlights how influential the local environment can be in the transmission of this disease.

Over the next four years, LaDeau will work with a team of ecologists, geographers, and public health experts to understand where mosquito populations thrive in urban and suburban settings, how human activity and landscape change affect mosquitoes, and what education efforts might lead to stronger mosquito-control strategies in urban areas.

"You wouldn't think that a pile of tires in an abandoned lot and a ceramic birdbath in a tidy backyard have much in common. But we're finding that human-created landscape features that favor standing water are linked to seasonal patterns of mosquito emergence," says LaDeau. She and her colleagues think that mosquito populations get a boost from overwintering in abandoned buildings and breeding in pools of water that form in exposed garbage during early spring.

In the summer, when these unintended pools dry up, LaDeau finds that adult mosquito populations rise in areas where residents place intentional water-retaining containers, such as planters or fountains, in their yards. In Baltimore, where urban areas are losing residents

"Mosquito populations get a boost from overwintering in abandoned buildings."

and gaining abandoned buildings, there is great need for citizens and the city to tackle mosquito control together.

"Baltimore has seen the arrival of the invasive tiger mosquito, a really nasty human biter," says LaDeau. Her team is exploring the coupled dynamics between humans and mosquitoes, and investigating whether urban decay might be both a cause and result of pest exposure. "The more people get bitten in urban neighborhoods, the less they want to be outdoors, and we hypothesize that these residents are less likely to use and care for outdoor spaces, thus allowing more habitat to develop for mosquitoes," explains LaDeau.

Her new grant will focus on developing public education strategies. The role that individual residents can play in controlling mosquito populations in urban areas is more important than most realize. Partnering with the city and with local nonprofits such as Parks & People Foundation, LaDeau will enlist the help of student and citizen scientists, both to gather and disperse information.

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ECOFOCUS

Ecofocus is published by the Cary Institute of Ecosystem Studies. Our scientists are leading efforts to understand human impacts on air and water quality, climate change, invasive species, and the ecological dimensions of infectious disease. As an independent, not-for-profit organization, the Cary Institute produces unbiased research that leads to more effective management and policy decisions.

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FROM OUR PRESIDENT



Now more than ever, the political process needs to be informed by solid, unbiased science.

Dear Friends of the Cary Institute:

As we enter into the busy fall season, I'd like to reflect for a moment on our successful summer. Eleven aspiring undergraduate scientists partnered with our scientists to hone their ecological skills in the 25th installment of Cary's Research Experience for Undergraduates program, which recently received a National Science Foundation renewal. The campus also saw an influx of summer field assistants, ecology campers, and classroom teachers, who took advantage of our teacher training workshops.

Rick Ostfeld's lab spent the summer assessing the environmental conditions that magnify Lyme disease risk, while Shannon LaDeau's lab made major efforts to quantify mosquito populations—both locally and in Baltimore—to ascertain the epidemiology of West Nile virus. These projects exemplify our efforts to understand the ecology of diseases that affect humans in natural and human-dominated habitats.

Disease ecology joins aquatic ecology and biogeochemistry as three focal areas in which we will strive for preeminence among our nation's environmental research organizations. This focus will be stressed in a new strategic plan being drafted in collaboration with our Board of Trustees. There will also be an increased emphasis on connecting research outcomes with citizens and decision

makers. Now more than ever, the political process needs to be informed by solid, unbiased science.

This fall and winter we have a premier lineup of public programs for "Friday Night at Cary," which we hope you will attend. Upcoming is a talk by our own Gary Lovett on the rising impact of pests and pathogens in northeastern forests. Between invasive species and climate change, our native trees are under siege. Join us on October 19 for Gary's insights.

Your support of the Cary Institute makes possible these programs, our scientific research, and our delivery of science to decision makers. I thank our donors, especially members of the Aldo Leopold Society, and I invite others to join in support of the nation's premier institution focused on environmental research.

Dr. William H. Schlesinger, President

EDUCATION

A SUMMER OF ECOLOGICAL EXPLORATION

by Sian M. Hunter

Traditional academic calendars give teachers and students the summer off to unwind, but you wouldn't know that from the learning that took place on our campus. Each summer, the Cary Institute hosts programs for school-age children, undergraduates, and secondary-school teachers. This year, hundreds of people took advantage of our offerings to learn more about ecology.

The annual summer migration of undergraduates occurred, with college students joining Cary's research community via the long-running Research Experiences for Undergraduates (REU) program. This year's students hailed from as far away as Arizona State University, the University of Minnesota, and the Universidad Metropolitana in Puerto Rico. Projects tackled topics from the behavioral ecology of songbirds to explorations of an introduced pest on hemlock trees. Their research was conducted under the mentorship of a Cary Institute scientist and presented at our 25th REU Symposium.

Sold-out Ecology Day Camps immersed students in grades 2-7 in freshwater exploration. Week-long sessions, coordinated by educator Jen Rubbo, had campers conducting field experiments using insect traps and seine nets. The goal: to reveal how pond food webs influence inhabitants. "Fowler Pond has fish, whereas Skeeter Pond does not, so campers were able to learn about predator effects on ecosystems," noted Rubbo.

Campers also conducted experiments in artificial study ponds, isolating how factors such as fish, tadpoles, and algae, influenced the ecosystems. Rubbo commented, "Campers began to realize that if fish eat all the tadpoles, then algae which the tadpoles eat, grows freely. Seeing and accounting for those differences strengthens their understanding of the aquatic food web." In addition to more than 100 campers, 12 junior counselors participated in our



Pamela Freeman



Claire Nemes



Cornelia Harris

camp program. This year, Rubbo and her colleagues also introduced a new two-week session geared toward 8th-9th graders, with plans to offer this longer camp regularly in summers hereafter.

For teachers, four major workshops were offered. Thirty elementary and high-school teachers attended multi-day workshops at the Cary Institute, and 25 participants met in Baltimore for the Environmental Science Literacy Progression, a year-long fellowship program.

Educator Cornelia Harris and colleagues also hosted a summer workshop on hydrofracking. Fourteen teachers from across the state participated as part of a year-long fellowship funded by the National Science Foundation. Teachers explored current science on hydrofracking, gaps in our

understanding, and viewpoints they encounter in their classrooms, such as families who seek the financial benefits of leasing land to gas companies.

"The entire Cary Institute community is involved in supporting education activities, allowing learning to take place alongside our experts—whether you are 7 or 57," comments Harris. "The passion and excitement that Cary Institute scientists and staff exude for ecology is clear to all the participants who join us in the summers, and we are proud of the way we are able to make cutting-edge science available to a wide range of visitors."

SPOTLIGHTS

CONFERENCES

On September 19, the Cary Institute hosted a one-day conference on the impacts of tropical storms Irene and Lee on the Hudson River. Organized by the Hudson River Environmental Society, with leadership from Cary's Stuart Findlay, the forum examined how the river and estuary responded to the storms, which dropped an estimated 12-18 inches of rainfall throughout the Hudson Valley and Catskill regions. Topics included dredging, sediment transport, water quality, impacts to fish, and future management practices.

In late October, Gary Lovett will present his assessment of the health of the Catskill Forest at the second Catskill Environmental Research & Monitoring Conference (CERM). The forum brings together research on the region, to better understand the effects of extreme weather, air pollution, invasive species, biodiversity loss, and habitat fragmentation. The Catskills provide the majority of New York City's drinking water supply; CERM forums help coordinate research and identify research agendas to protect these resources.

In November, Cary Institute will hold a two-day conference examining the effects of climate change on plant, animal, and microbial species. The invitation-only event is being organized by Richard Ostfeld, Shannon LaDeau, and Amy Angert (University of British Columbia). With more than 50 invited experts, the conference's goal is to identify tools that will help lessen the negative effects of climate change on biodiversity, disease risk, extinction, and ecosystem function.

THE NEWSLETTER IS AVAILABLE ONLINE

The Cary Institute's newsletter is available on our website at www.caryinstitute.org/newsletter.html. If you would prefer to read the newsletter online instead of receiving a printed copy by mail please notify us at freemanp@caryinstitute.org.

CARY DEBUTS NEW MONITORING STATION



Courtesy of Marist College / On Location Studios

This summer Stuart Findlay held a press conference with partners to launch a high-tech environmental monitoring station based at Marist College. The new station, located in the river's channel, will continuously monitor water quality and automatically collect samples for the assessment of toxics and pharmaceuticals.

This facility extends the network of 15 monitoring stations, collectively called the Hudson River Environmental Conditions Observing System (HRECOS), which provides round-the-clock data on conditions in the Hudson River from Albany to the New York Harbor. By collecting data on a range of variables every 15 minutes, HRECOS informs flood risk, pollution cleanup, restoration efforts, and fisheries management.

The Poughkeepsie station was funded through the Environmental Protection Agency and built in partnership with the U.S. Geological Survey, the New York State Department of Environmental Conservation, the Cary Institute, and Marist College.

FUNDING SUPPORTS PHARMACEUTICAL RESEARCH

Emma Rosi-Marshall has received funding from the Wallace Genetic Foundation, Inc. and the Cornell-Douglas Foundation to help build an artificial stream facility on the Cary Institute's campus, to facilitate research on the effects of pharmaceuticals on stream ecosystems.



Paul Hoppe

Globally, lakes and rivers are polluted by an array of pharmaceutical and personal care products. Freshwater fish and the invertebrates they eat are increasingly bathed in a weak solution of caffeine, estrogen, antibiotics, and antihistamine drugs—but little is known about the levels at which these compounds become toxic or lethal, or what the effect on our drinking water may be. Few places exist without some level of these contaminants, so scientists need artificial streams to serve as control waters for research.

Rosi-Marshall constructed a similar system during her tenure at Loyola University Chicago. Support from the Wallace Genetic Foundation and the Cornell-Douglas Foundation will allow her to continue to pursue research on an emerging environmental problem of global concern.

WHERE WE WORK

NOTES FROM THE FIELD: WESTERN RIVERS



A.J. Reisinger

The Cary Institute's ecological expertise extends beyond the Northeast, with our scientists tackling environmental problems far afield. As part of her ongoing work to assess how human activity affects freshwater resources, aquatic ecologist Emma Rosi-Marshall spent this past summer studying nutrient cycling in large western rivers.

Tributaries deliver nitrogen and other nutrients into large rivers, which were long assumed to transport nutrients down to saltwater gulfs, like large pipes. But Rosi-Marshall and colleagues are finding that large rivers retain nutrients, and their field work focuses on measuring how large rivers use these nutrients.

With a team of 16 scientists, technicians, and students, Rosi-Marshall performed experiments by day and camped by night at one site in Wyoming (the North Platte River) and four sites in Utah (the Bear River, the Colorado River at Moab, the Green River at the Ouray Northern Wildlife Refuge, and the Green River at Desolation & Gray Canyons).

Last summer, the team focused on Midwestern rivers, which generally carry higher nutrient levels due to agricultural and wastewater runoff. Gathering data from rivers in different regions that are affected by different human impacts will allow the team to provide a better understanding of how the continent's major waterways process nutrients.

ON THE GROUNDS AUTUMN'S PALETTE

New England's heralded autumn leaf show is now on display, and a walk on the Cary Institute campus is a great opening act.

Change in day length is the most important factor prompting the onset of fall foliage. As days grow shorter and darkness increases, leaves stop producing chlorophyll, the green pigment that lets plants convert energy from sunlight. This breakdown allows other colors take center stage; the yellow, orange, red, and brown tones that we associate with fall are always present in leaves, but they are masked by an abundance of chlorophyll during summer's long days.

Different tree species are associated with different colors. Hickory and sycamore leaves are golden-orange. Ash leaves tend to be yellow and purple.

Oaks hold onto their leaves the longest and produce russet brown foliage. Sugar maples take on an orange or red tone.

The ecology of red fall foliage is not well known. There is evidence that red leaves are more prevalent when days are warm, dry, and sunny, and nights are cool (but not freezing). Red foliage has also been linked to fungus and drought.

During their lifetime, trees respond to a range of environmental influences, from airborne pollutants to insect pests, many of which can influence leaf color. One year might yield more red, and another more gold. Come see what this year's show will bring.

Armchair leaf-viewers can log on to the Tree Cam to see real-time aerial views of changing foliage near the main research building (<http://phenocam.sr.unh.edu/>

[data/latest/caryinstitute.jpg](http://phenocam.sr.unh.edu/data/latest/caryinstitute.jpg)). The campus grounds are open to visitors from 8:30 am-7pm until November 1, when they close for the winter season.



SUPPORTERS' CORNER

FALL LUNCHEON ON THE GROUNDS OF CARY INSTITUTE



Our second annual Fall Luncheon, held on September 16, was a resounding success. More than eighty supporters enjoyed beautiful weather and a sumptuous lunch under a tent in a research field in the middle of our 2,000-acre campus. It was a perfect setting for Aldo Leopold Society members, Benefit Committee members, Trustees, and their guests to learn more about the Cary Institute's wide range of environmental research programs.

Cary Institute's Peter Groffman gave a lively talk about how the increasingly variable timing of seasonal changes affects plants and animal life. In spring, trees are flowering and leafing out earlier, making them vulnerable to late frosts. Insects are emerging earlier, creating chaos for animals, such as migratory birds, that eat them. Fall is getting warmer and longer, but our native vegetation is often unable to exploit these new conditions, while invasive exotic species are.

Just how early does a bird need to be to catch a worm these days? One thing is certain: climate change makes the timing of seasonal changes harder to predict, which can be lethal for plants and animals whose lives depend on getting it right. What is also certain is that "the ecosystem approach" as applied by the Cary Institute, with its focus on long-term, multidisciplinary studies of complex problems, is the best way to address these challenges.

Our third Fall Luncheon is slated for next September 15th. You won't want to miss it.



Jennifer Donnelly Dundas and Doug Dundas

Tony Henneberg



Mary Moeller, Marta Nottebohm, Deane and Judy Leonard

Tony Henneberg



David Cuming and Barbara Hogan

Tony Henneberg



Edie Ellis

Tony Henneberg



Board of Trustees Chair
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Event Co-chair Felicitas Thorne and speaker Dr. Peter Groffman

Tony Henneberg

CALENDAR

Upcoming Public Programs

Our public programs are a great way to expand your ecological understanding while learning about issues facing the environment. Lectures are held in our auditorium, located at 2801 Sharon Tpk., (Rte. 44) in Millbrook, NY. Registration is required for outdoor events. For more information call (845) 677-7600 x 121 or e-mail freemanp@caryinstitute.org.

Friday, October 19 at 7 p.m.

What's Bugging Our Forests?

Forest Ecologist Gary Lovett will talk about the insect pests and diseases that are changing the nature of our forests, as a result of moving plants and animals around the world. Doors open at 6:30 p.m. Seating is first come first served.

Saturday, October 27 at 6:30 p.m.

Full Moon Ecology Walk

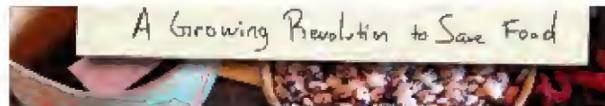
During a leisurely walk on our internal roads, guests will be treated to the sights and sounds of nature at dusk. Listen for owls and other forest-dwelling animals while enjoying the crisp fall air, the scent of pines, and the full moon.

Strollers welcome. Register online at <http://caryfullmoonwalk.eventbrite.com>.

Sunday, November 11 at 1 p.m.

Changing Seasons: A Family Friendly Stroll

Join our educators for a late fall walk along paved trails that weave through lowland habitats. Participants will observe signs of the changing season, identify stream critters, and make a leaf rubbing craft to take home. Strollers welcome. Register online at <http://caryfallwalk.eventbrite.com>.



Friday, November 16 at 7 p.m.

The Seed Underground

Janisse Ray will talk about her new book, *The Seed Underground*, reminding us that while our health and food security are at stake as seeds disappear, so, too, are the stories and history exchanged between people when seeds are passed from hand to hand. Doors open at 6:30 p.m. Seating is first come first served.

Scientific Seminar Series

Free and open to the public, our scientific seminars are held on Thursdays at 11 a.m. in the Cary Institute's auditorium. A sampling of offerings is below; a complete list is available online at www.caryinstitute.org.

Oct. 11: Nutrient Cycling by Animals in Aquatic Ecosystems: From Individuals to Ecosystems. Dr. Michael Vanni, Miami University

Oct. 18: Citizen Scientists on the Phenological Frontier: Measuring Spatial and Temporal Connectivity of Urban Plants. Dr. Kerissa Fuccillo, The Ashokan Center

Nov. 1: Looking at the Evidence: How Certain Are We? Dr. Amy Pallant, The Concord Consortium

Nov. 8: Global Water Crisis? Yes...Closer Than You Think. Dr. Charles Vorosmarty, City College of New York

For a complete listing of upcoming events, programs, and videos of past programs visit our website at www.caryinstitute.org/events.html.

Ways to Support the Cary Institute

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Visit us online at www.caryinstitute.org

MARIA CORYELL-MARTIN INSPIRATION FROM ICE

From October 4 -18, painter Maria Coryell-Martin will join the Cary Institute's research community as our fall artist-in-residence.

Hailing from Seattle, Coryell-Martin's work takes her to polar and glaciated regions. Her career path launched with participation in the Juneau Icefield Research Program, an interdisciplinary study of the fifth largest icefield in the Western Hemisphere. She received a Thomas J. Watson Fellowship for her project, *Ties to the Land: Exploring Remote Regions through Art*. In addition to her travels, Coryell-Martin leads workshops and has held over 20 exhibitions. Through watercolors, inks, and field drawings, she records species, terrain, and climate to promote environmental awareness.



Maria Coryell-Martin

Millbrook Community Day



Pamela Freeman

On September 8, 2012, the Cary Institute participated in Millbrook Community Day. Learners of all ages discovered stream life through our hands-on exhibit while members of our staff shared information about ongoing research.

