ECOfOCUS
CARY INSTITUTE OF ECOSYSTEM STUDIES
The science behind environmental solutions *Vol 3, Issue 1*

Jim Gilbert

SMALL WETLANDS SUPPORT BIODIVERSITY AND FRESHWATER RESOURCES

by Lori M. Quillen

In early spring, shortly after the snow melts, vernal pools dot the landscape. Isolated from larger water bodies, these small wetlands are usually only wet for a few months out of the year. If you are not paying attention, you just might miss them. And that would be a shame, because these oft-overlooked wetlands are valuable and interesting ecosystems.

Certain frogs and salamanders rely on vernal pools for breeding. Amphibians begin life as aquatic animals; their egg masses must be placed in freshwater. Because vernal pools dry up, they don't support fish—making them ideal nursery grounds. Visit a vernal pool on a warm spring evening and wonders abound, from the chorus of wood frogs to salamander courtship dances. Soon, mating gives way to egg masses, tadpoles, and larval salamanders.

In addition to serving as wildlife habitat, vernal pools perform important ecosystem services. By capturing rainwater and snowmelt, they recharge groundwater and subsurface aquifers, replenishing wells and drinking water resources. They also play a role in filtering and retaining floodwaters and cycling nutrients.

Despite their myriad of uses, vernal pools are often unprotected by state and federal regulations, leaving them vulnerable to development. In New York State, only wetlands in excess of 12.4 acres are regulated by the Department of Environmental Conservation.

"Throughout the Hudson Valley, vernal pools and other small wetlands are disappearing, largely as a result of development," comments Dr. Michael W. Klemens, a research conservationist at the Cary Institute and the director of its Metropolitan Conservation Alliance. "Ecologically and economically, we need to identify and conserve high quality vernal pool habitats; time is of the essence."

To help guide environmentally compatible development, Klemens is leading a survey of vernal pools in the Town of Washington, New York. His goal is to help decision makers distinguish between high quality habitats and those less likely to support a diversity of amphibians. A ranking system will also inform site-appropriate conservation strategies.

This spring, under Klemens' direction, citizen-scientists inventoried over 100 vernal pools. Attention was paid to amphibians that require the pools for breeding: Jefferson, marbled, and spotted salamanders as well as wood frogs. Assessments are currently being made of the landscape surrounding surveyed pools, including the amount of undeveloped upland habitat and the presence of roadways.

> Vernal pools are often unprotected by state and federal regulations.

"Vernal pools are shaped by the health of the land that surrounds them," Klemens comments. "High quality pools need intact upland habitat that extends at least 750 feet from the water's edge. Pools in this category need special protection, for the sake of wildlife, water resources, flood abatement, and the character of the Hudson Valley."

The final results of the survey are expected in the fall. Roger Akeley, Commissioner of Dutchess County's Department of Planning and Development, noted, "A vernal pool assessment will help guide land use decision making in the Town of Washington so that development can be designed to keep these special wetland habitats intact."

The Town of Washington is currently considering adoption of a "home rule" wetland ordinance that would extend regulatory protection to vernal pools and other small wetlands.

HIGHLIGHTS

ECOfocus

Ecafocus is published by the Cary Institute of Ecosystem Studies. Our scientists are leading efforts ta understand human impacts on air and water quality, climate change, invasive species, and the ecological dimensians af infectious disease. As an independent, nat-for-prafit arganization, the Cary Institute produces unbiased research that leads ta mare effective management and policy decisians.

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FROM OUR PRESIDENT


Jim Wallace, Duke University Photography

We have witnessed a renewed interest in science's role in the process of policymaking.

To the Friends of the Cary Institute:

Since the January inauguration of President Barack Obama, we have witnessed a renewed interest in science's role in the process of policymaking at the Federal level. In March, I was privileged to brief the Secretary of Agriculture, Thomas Vilsack, on the problems of excessive nitrogen in the environment.

Capitol Hill is also abuzz with talk about limiting carbon dioxide emissions through a cap-and-trade system. Recently, the EPA announced that carbon dioxide was a pollutant, subject to regulation via the Clean Air Act. While it is unclear if a cap-and-trade system or a carbon tax will be invoked, the President has made it clear that it is time for the U.S. to do its part to mitigate the ongoing, rapid change in global climate.

The recent swine flu outbreak was a reminder of how humans are vulnerable to zoonotic diseases—those that can jump from animals to humans. This is a familiar topic at the Cary Institute. Dr. Shannon LaDeau's research, detailed on page 3, deals with how changing ecological conditions influence the spread of zoonoses; her work has focused on West Nile virus.

On a more local front, Dr. Michael Klemens' vernal pool survey, detailed on the cover, is helping to reveal the status of these important wetlands in the Hudson Valley. A science-based ranking system will help balance the valuable ecosystem services vernal pools provide with the needs of a growing population.

The Cary Institute continues to provide excellent public programs to regional audiences. Among our recent offerings was Dr. Sylvia Earle, one of the world's foremost oceanographers. After speaking to a packed house, Earle participated in our Young Environmental Scientists' conference. This annual event gives young scientists (3rd–12th grade) the opportunity to interact with practicing ecologists.

These are exciting times. The fundamental science performed at the Cary Institute is essential to the policy process and the education of informed citizens at all levels.

Dr. William H. Schlesinger, President

RESEARCH

TRACKING THE SPREAD OF ECOLOGICAL PESTS

AN INTERVIEW WITH DR. SHANNON L. LADEAU

by Lori M. Quillen

Cary Institute ecologist Dr. Shannon L. LaDeau is working to understand how environmental conditions influence the spread of undesirable pests and pathogens such as West Nile virus and the hemlock wooly adelgid. This work includes understanding the dynamics of pest communities and taking into account things like land use, climate change, and combined stressors.

As a post-doctoral fellow with the National Science Foundation, LaDeau analyzed bird population data, with the goal of revealing new information about West Nile virus in North America. She demonstrated large declines in common bird species and increased virus transmission in disturbed landscapes.

LaDeau is adding a field research component to her West Nile virus investigations. She is also embarking on a new research program looking at hemlock tree mortality in the Northeast. Recently, we discussed her work.

West Nile virus was detected in New York in 1999; within a decade, it has spread throughout most of the U.S. and Canada, infecting countless birds and thousands of humans. How did it move so rapidly?

When the virus arrived, competent vectors and hosts were already present across North America. For West Nile virus to persist, it needs both mosquito and bird species that can concentrate the virus in their bloodstream at levels high enough to be infective to other organisms. Crows, jays, and robins are among the most effective hosts. We suspect that mosquito movement and migrating birds played a role in facilitating the spread.

To identify how bird populations have changed since the virus emerged, you assessed North American Breeding Bird Survey data. What did that reveal?

American crow populations have had the most drastic and widespread reductions; American robins, blue jays, chickadees, eastern bluebirds, and tufted titmice have also suffered declines. Unfortunately, the virus has probably infected a broader range of birds than we've been able to detect. Most surveys are not designed to estimate populations for things like birds of prey, water birds, or nocturnal species.

How do humans become infected?

Humans only become infected when the virus has built up to high levels in the mosquito-bird cycle. Culex mosquitoes, which are the primary vectors, tend to feed on birds. They move to mammals when birds are scarce. In the Northeast there is evidence that mosquitoes may shift their feeding to favor humans in the late summer, when many birds disperse. This is generally when we see peaks in human epidemics. Virally speaking, humans are a dead end; we don't build up enough of the virus to re-infect mosquitoes.

So understanding mosquito population dynamics is critical?

Very much so. I am currently assessing mosquito abundance and diversity along an urban-to-rural gradient in Baltimore. West Nile virus infections in humans and birds are more prevalent in urban areas; we are trying to understand why. This spring and summer, I will be looking at how land use and climate influence mosquito communities. Vector species may be more adept at colonizing degraded sites. Intact ecosystems have a higher diversity of mosquitoes, many of which are less competent at spreading West Nile virus.

You are also beginning a research project on forest pests and pathogens.

In collaboration with Dr. Gary M. Lovett, I am researching two insect pests in hemlock-dominated forests in the Northeast. We are interested in ascertaining how things like drought and pollution influence mortality in infested trees. Like the West Nile virus research, we are trying to read ecological cues to predict what the future environment will look like.

Lori Quillen

West Nile virus infections in humans and birds are more prevelant in urban areas; we are trying to understand why.

What drew you to this type of research?

It's fascinating to try and unravel how environmental stressors like climate and human development interact to influence pests and pathogens; this type of information is essential to managing ecosystems in a way that supports biological health.

LaDeau, S.L., P.P. Marra, A.M. Kilpatrick and C.A. Calder. 2008. West Nile virus revisited: Consequences for North American ecology. BioScience 58(10):937-946

SPOTLIGHTS

STREAM ECOLOGIST JOINS STAFF

Eric Rosi-Marshall

Emma Rosi-Marshall, an expert in stream ecology, has been appointed as an associate scientist at the Cary Institute. Rosi-Marshall's research looks at how human activities, such as farming, urbanization, forestry, and hydroelectric power, influence the ecological integrity of stream ecosystems.

Rosi-Marshall will join the staff in July 2009; her appointment reflects the Cary Institute's commitment to understanding and mitigating human impacts on freshwater resources. Rosi-Marshall's expertise in pollutants and food webs will strengthen the organization's first-class program in freshwater ecology.

Since 2005, Rosi-Marshall has served as an assistant professor at Loyola University in Chicago, Illinois. Her active projects include looking at how crop residues impact agricultural streams, investigating the effects of pharmaceutical compounds on the functioning of streams near waste water facilities, and revealing how dams influence aquatic species composition.

She received her Ph.D. from the University of Georgia's Institute of Ecology, and her M.S. degree from the University of Georgia's Department of Entomology.

CARY INSTITUTE PRESIDENT ADVISES AL GORE ON CLIMATE CHANGE

Cary Institute President Bill Schlesinger participated in a roundtable discussion with Former Vice President Al Gore in New York City in mid-January. Hosted by the Alliance for Climate Protection, the forum brought together 15 leaders of the environmental field, including Amory Lovins, Anne Lauvergeon, Bill McDonough, Mario Molina, John Pershing, and others, to debate future options in the area of nuclear power, sustainable building design, and carbon sequestration in soils.

Schlesinger provided an overview of the amount of carbon in world soils, both organic and inorganic (caliche), its rate of formation, and opportunities for better management to increase carbon stores. "When organic materials escape decomposition and accumulate in soils, they represent carbon dioxide that might otherwise be returned to the atmosphere," Schlesinger commented.

Gore has been working with a variety of non-profit and business ventures to find solutions to global warming, and this was one of a series of briefings he has held during the past year to keep abreast of the issue and advise the Obama administration on the best avenues to pursue.

CARY CONFERENCE FOCUSES ON EFFECTIVE SCIENCE COMMUNICATION

For nearly twenty-five years, the Cary Conference series has provided a forum for discussing challenging issues at the forefront of ecology. This May, the conference tackled one of the most serious impediments to effective environmental policy and management: the flow of information from scientists to managers, decision makers, and the general public.

Effective Communication of Science in Environmental Controversies
Cary Conference XIII 2009

Given the complexity of society's most pressing environmental problems, it's critical that decisions are based on the most current science available. Scientists often assume that if they inform people of key scientific facts, actions will be taken. But without a solid understanding of what people care about and how they gather and process information about science, messages seldom get through.

Over 65 scientists, policymakers, educators, and communications professionals attended the conference, which explored how scientists can maximize their research impact by partnering with communications professionals and linking environmental problems to issues of public concern, such as health and national security. At the close of the conference, scientists were left with exciting new avenues for engaging colleagues in education and communication sciences in this important endeavor.

Proceedings will be disseminated in a special issue of the journal *Frontiers in Ecology and Environment* (FEE). It will feature recommendations on how scientists, academic institutions, management and policy agencies, and interface organizations can improve the flow of information from science to society.

REACHING OUT

INSPIRING DISCOVERY

The Young Environmental Scientists' Conference

On April 23rd, students from across Dutchess County convened at the Cary Institute to share their environment-themed science fair projects as part of the 2nd Young Environmental Scientists' (YES) Conference. Topics ranged from cleaning oil spills and reusing grey water to revealing how environmental conditions influence American eel migration.

Instead of focusing on competition, the YES Conference introduces students to the collaborative nature of science. Participants received constructive feedback on their projects from two Cary Institute scientists, a mentoring experience that is absent from most traditional science fairs. They also had the opportunity to tour the Cary Institute's labs and listen to a lecture by Dr. Sylvia Earle, a luminary in the field of oceanography.

The 2010 YES Conference will be on Earth Day. It will feature a lecture by Dr. Tyrone Hayes, a U.C. Berkeley scientist who studies how environmental pollutants, such as pesticides, impact amphibian survival. All students completing environment-related science fair projects are welcome to attend. Space is limited; for more information contact Kim Notin at (845) 677-7600 x233 or e-mail notink@caryinstitute.org.

Lori Quillen

From L-R: Laura Hellmich, an 11th grade student from Ossining High School, shares the results of her research project on how environmental factors affect the migration of juvenile American eels with Dr. Sylvia Earle. Also pictured are Dr. Alan R. Berkowitz, head of the Cary Institute's Education Program and Heather Malcom, a senior research specialist who works in the Hudson River.

OUR GROUNDS

Connect With Nature And Learn About Ecosystems

The Cary Institute's grounds are open for the season. We welcome visitors to our trails and internal roadways; they are open from dawn to dusk through October 31st. For those driving into the campus, our internal roadway gates open at 8:30 a.m. daily; gates are locked at 7 p.m.

Sections of our 2,000-acre research campus have been designated for public use. Go bird watching in a meadow, hike along the tranquil banks of Wappinger Creek, cycle with your family on our internal roadway systems, or picnic on the overlook deck in the Fern Glen.

During your visit, consult the Cary Institute's kiosks for campus maps and interpretive information, including insights into the ecology of Lyme disease, succession, and invasive species. A guide and checklist to local butterflies makes a fun summer outing; it will soon be accompanied by a brochure of 100 birds seen on the campus.

Wondering what you can expect to see on trails? Visit Barry Haydasz' weekly trail report, located under the Visitor Information tab at www.caryinstitute.org. It contains five years of observations on plants, animals, and insects seen on our trails. Archived reports are great for planning field observations.

Interested in insects? On June 7th, Haydasz will be leading a weekend program on insect identification. See the calendar on page seven for more details.

As the summer progresses, new signage will be installed along the Cary Institute's trails, with the goal of teaching visitors about what ecosystems are, why they are important, what ecosystem scientists do, and why our research is essential to addressing current environmental issues.

Barry Haydasz

Sights from the Cary Institute's trails: painted turtles, round-lobed hepatica, and a red eft.

DEVELOPMENT

Event Photos by J. Hechler

Guests at the Ames event. Counter clockwise from the right: (1) Ned Ames, Jane Sokolow, Lisa M. Dellwo, and Dr. William H. Schlesinger. (2) Drs. Steven R. Carpenter, Carolyn O. Mattoon, and Thomas E. Lovejoy. (3) Felicity Bontecou, Timothy Bontecou, and Irene Banning. Interested in seeing more photos from the event? Contact Vicki Doyle at doylev@caryinstitute.org for a link to an online slideshow.

HONORING NED AMES

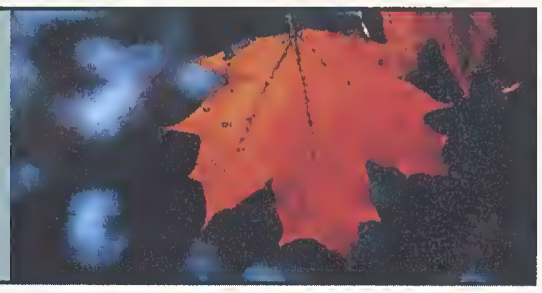
On April 2, over 200 guests gathered at the Colony Club in New York City to honor Edward "Ned" Ames and his lifelong contributions to environmental research, conservation, and the arts. The evening was a success on all fronts. It raised much needed capital for the Cary Institute and it was attended by an energetic crowd drawn from organizations where Ames has left his mark, either as a trustee, a board member, or a passionate supporter. In addition to Cary Institute President Dr. William H. Schlesinger, speakers included Frances Beinecke of the Natural Resources Defense Council and Rick Middleton of the Southern Environmental Law Center.

The Cary Institute owes a special debt of gratitude to Ames. Over thirty years ago, he understood that ecological science was critical to understanding and addressing environmental problems. Working with Dr. Gene E. Likens, Ames moved the Cary Institute from its beginnings as an arboretum to a world-class center for ecological research. Through his role as a trustee at the Mary Flagler Cary Charitable Trust, he enabled a team of bright young scientists to gather in Millbrook, N.Y., where they have made a lasting impact on our understanding of acid rain, the Hudson River, Lyme disease, northeastern forests, and the urban ecosystem of Baltimore, Maryland.

It was a privilege for the Cary Institute to host an event in celebration of Ames and his legacy of caring for the environment.

SAVE THE DATE: AUTUMN GLORY

Aldo Leopold Society Members: This year, our annual Autumn Glory reception will take place on Saturday, October 17th at Irene and Jack Banning's wonderful new home in Pine Plains. Enjoy food, conversation, an amazing setting, and insight into the natural world.



CALENDAR

Weekend Ecology Programs

Our Weekend Ecology Programs are a great way to learn about ecological concepts while exploring our grounds. Please be sure to wear sturdy shoes; most excursions involve hiking on our trails. For additional information contact Pamela Freeman at (845) 677-7600 x121 or freemanp@caryinstitute.org

June 7: Butterflies and Habitats
On Sunday from 12 noon to 2 p.m. visitors will have the opportunity to explore butterfly life while strolling through our fields and hiking trails. Barry Haydasz will provide insight into butterflies and skippers, including where they live, what they eat, and what attracts them to various habitats.

July 18: Wappinger Creek Walk
On Saturday from 4 p.m. to 5:30 p.m. join Cary Institute educators for an interpretive hike along the Wappinger Creek Trail. Sample creek macro invertebrates and learn about water quality issues. This event is part of Creek Week and Dutchess County Watershed Awareness Month.

Summer Scientific Seminar Series

The Summer Scientific Seminar Series is a new addition to the Cary Institute's schedule of offerings. Lectures will be held on Thursdays at 7 p.m. in the Cary Institute's auditorium. A sampling of offerings is below; a complete list is available online at www.caryinstitute.org.

May 28: Spatial Ecology of Prairie Insect Communities, Dr. Brett Goodwin, University of North Dakota

June 4: The Humane Metropolis: People and Nature in the 21st Century City, Dr. Rutherford Platt, University of Massachusetts Amherst

June 11: The Ecology of Information: The Significance of Making Informed Decisions, Dr. Kenneth Schmidt, Texas Tech University

July 9: Spatial and Temporal Dynamics in CO_2 and CH_4 in Open Water Pools in an Ombrotrophic Raised Bog and Possible Responses to Climate Change, Dr. Nicola McEnroe, SUNY Oneonta

August 13: Incorporating Service Learning and Civic Engagement into College Science Courses: How and Why?, Dr. Sarah Haines, Towson University


Barry Haydasz

The Northern Pearly-eye butterfly is a woodland species found on the Cary Institute's campus.

Ways to Support the Cary Institute

The Cary Institute offers two membership levels. **General members** receive an *Ecofocus* subscription and e-mail notification when we hold open lectures and events. **Aldo Leopold Society Members** are a special part of the Cary Institute family. Exclusive privileges include access to invitation-only lectures, galas, and science updates.

General Membership

- ❑ $50 Individual
- ❑ $60 Family
- ❑ $100 Sponsor
- ❑ $250 Club/School

Aldo Leopold Society Membership

For those who want to invest in understanding the natural world.

- ❑ $500 Member
- ❑ $750 Ambassador
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- ❑ $10,000 Director
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ECOLOGY CAMP FOCUSES ON CLIMATE CHANGE SCIENCE

Kim Notin

Campers Andrew Kaiser, Isabel Murray, and Casidy Watt set up a study pond experiment.

The 2009 Summer Ecology Camp will begin June 29th and run through August 21st. Campers will learn how ecologists collect information about past, present, and future climates, while thinking about solutions to mitigate and adapt to changing environmental conditions.

Ecology campers have the unique opportunity to interact with ecologists, participate in hands-on ecology investigations, perform nature crafts and games, and explore our 2,000-acre Dutchess County campus. All camp leaders are trained ecology educators. The experience is tailored to students entering 2nd–4th grade and 5th–7th grade.

For information about camp, including session availability, please contact Barbara Scotto at (845) 677-7600 x101 or email Scottob@caryinstitute.org