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POLICYMAKERS URGED TO ADOPT BIOFUEL STANDARDS

by Lori M. Quillen

The United States lacks the policies needed to ensure that cellulosic biofuel production will not cause environmental harm, says a distinguished group of international scientists. The paper, published in the journal *Science*, urges decision makers to adopt standards and incentives that will help ensure that future production efforts are sustainable, both energetically and environmentally.

Policymakers have the opportunity to implement science-based standards before large-scale crop production begins. Early preventative policies could play a major role in minimizing the unintentional side effects of large-scale crop production, such as fertilizer and pesticide pollution, soil erosion, invasive species spread, the fouling of waterways, and species loss.

Dr. Kathleen Weathers, an ecosystem scientist at the Cary Institute and one of the paper's authors, comments, "Society is in a race to find renewable sources of carbon-neutral energy. Cellulose-based biofuels hold promise, but we need to proceed cautiously and with an eye toward minimizing long-term ecologi-

cal impacts. Without a sound plan, we could wind up doing more environmental harm than good."

Grain-based ethanol has served as a lesson in the perils of embracing energy solutions before their environmental effects are understood. Most of the commercial ethanol produced in the United States is made from corn. When large parts of the landscape are converted to resource-intensive, monoculture grain crops, as is the current model, the scientific consensus is that the environment suffers.

If cellulosic ethanol is to emerge as a feasible source of renewable energy, a vast amount of land will need to be used for its production. This land conversion, estimated to be as large as the amount of land in row-crops today, will change the face of the global landscape. Production standards and incentive programs could help minimize negative impacts and, in many cases, help farmers choose crops that provide valuable ecosystem services.

Weathers notes, "There is real potential for science to inform sustainable cel-

"Cellulose-based biofuels hold promise, but we need to proceed cautiously."

lulosic crop strategies; it's about picking the right plant, or plants, for a given landscape and managing crops in a minimally invasive way." No-till farming can slow erosion and enrich soil; cover crops can sequester soil carbon and minimize nutrient run-off; and buffers can support beneficial insects such as pollinators.

But this won't happen without making environmentally sustainable growing practices widely available and establishing incentives to farmers that adopt the techniques. The authors stress that as cellulosic biofuel technology improves, and efforts become commercialized, industry and legislators must adopt policies that reward sustainable crop production.

Twenty-three internationally-recognized scientists contributed to the paper. Weathers concludes, "I hope decision makers heed our recommendations. They emerged from a collaborative effort that cut across disciplines and ideologies, and we came to a strong scientific consensus."

HIGHLIGHTS

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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



At all levels, science education plays a critical role in making informed choices about the environment.

To the Friends of the Cary Institute:

Over the last six months we've had lots of excitement at the Cary Institute. Our new scientist, Dr. Shannon LaDeau, highlighted in the last newsletter, has now moved in and is ready to begin advancing her research programs, which explore West Nile virus in birds and the hemlock wooly adelgid in northeastern forests.

We are also pleased to announce the appointment of Dr. Michael Klemens, who joins the staff as a research conservationist. As the founder of the Metropolitan Conservation Alliance, Michael has a strong record of connecting land managers with stewardship practices that protect and preserve functioning wetland ecosystems.

On the public outreach front, this spring the Cary Institute began a new public lecture series, with the goal of bringing quality environmental programs to the Millbrook community and its environs. To date, guests have included conservationist Dr. Stuart Pimm, environmental policy expert Dr. John Holdren, and Nobel Prize winner Eric Chivian, M.D. Upcoming speakers include ecologist and author Dr. Sandra Steingraber and undersea explorer Dr. Sylvia Earle.

This summer, Staff Scientist Dr. Gary Lovett was the lead author on Threats from Above, a report on air pollution published in collaboration with the Nature Conservancy. Gary and his co-author identified serious ecosystem impacts and called for more effective policy measures. The report and the Cary Institute were referenced by Sen. Hillary Clinton in recent Senate testimony on power plant emission legislation.

The Cary Institute's studies and analysis of environmentally responsible alternative energy sources, such as biofuels, are important contributions to the education of policymakers on the path forward. At all levels, science education plays a critical role in making informed choices about the environment. We continue to work with teachers to help ensure that ecological literacy is a reality for K-12 students.

Important times; important issues. When you give to our annual appeal, you help connect Cary Institute research to the public, policymakers, and the media, so that environmental decision making is based on strong science.

Dr. William H. Schlesinger, President

SUMMER INSTITUTE FOR TEACHERS

CONNECTING K-12 EDUCATORS WITH ECOLOGICAL CONCEPTS

by Lori M. Quillen

Teacher training can infuse classrooms with current scientific thinking. When teachers are confident and engaged in new concepts, students benefit. With this in mind, the Cary Institute's Ecosystem Literacy Initiative, led by Dr. Alan Berkowitz, recently launched a Summer Institute for Teachers.

Created to provide free professional development to K-12 educators, the week-long sessions immersed participants in ecosystem science. Twenty-seven teachers took part in the pilot effort, with attendees drawn from schools throughout Southern New York, including Dutchess County, Ulster County, Manhattan, the Bronx, and Queens.

In addition to exposure to the Cary Institute's scientific staff, participants were given the opportunity to strengthen their analytical skills and learn methods of integrating ecosystem concepts into their lesson plans. The training took place in July at the Cary Institute's 2,000-acre Millbrook campus and nearby field sites.

Two sessions were offered. The first, led by Cary Institute educator Ms. Cornelia Harris, was tailored to high school and middle school teachers. Using curricula that she helped develop for the Changing Hudson Project, Harris provided participants with a framework for teaching the fundamentals of ecosystem ecology.

Each day, teachers interacted with Cary Institute scientists and engaged in experiments that could be replicated in the classroom. A field trip to the Hudson River reinforced lessons about how human activities have altered the river's ecosystem. Some of the data used for the lesson plans was drawn directly from Cary Institute research.

Elementary school teachers were the focus of the second session, led by Cary Institute educator Ms. Kim Notin. Using water budgets and food webs, K-5 teachers honed their ability



Lia Harris

to teach young learners about ecosystems. Hands-on activities included calculating carbon footprints, documenting food chains, creating a solar oven, and using farms and homes to understand ecosystem connections.

Each teacher crafted an ecosystem lesson plan for the upcoming school year. This fall, classroom visits by Cary Institute educators will help ensure that new concepts are successfully integrated into instruction. After-school teacher workshops, offered throughout the school year, will further strengthen techniques learned over the summer.

So far, the prognosis for classroom application is good. Participant Mr. Jon Dolan, an environmental science teacher at Dover High School in Dover Plains, expressed, "Knowledge that I gained during the Summer Institute is already enriching my classroom. When teaching about the ecological impact of

"Knowledge that I gained during the Summer Institute is already enriching my classroom."

invasive species, I can draw on local examples and exciting facts about the Hudson River. Undoubtedly, this makes lessons more interesting to my students."

Based on the success of this year's program, a Summer Institute is being planned for 2009. In the meantime, all teachers are encouraged to join in the discussion at the Teaching Ecosystem Literacy Website. Moderated by Cary Institute educators, it is a forum for sharing lesson plans, posting grant opportunities, and keeping in touch with like-minded colleagues.

Teaching Ecosystem Literacy Website: A forum for educators

<https://sites.google.com/site/teachingecosystemliteracy/Home>

The Changing Hudson Project: A curriculum designed by teachers and scientists

www.ecostudies.org/chp.html

SPOTLIGHTS

RESEARCH
CONSERVATIONIST
JOINS STAFF

MCA Photo Archive

Dr. Michael Klemens, founding director of the Metropolitan Conservation Alliance (MCA), has been appointed as a Research Conservationist at the Cary Institute. Klemens has spent over a decade improving conservation planning at local and regional scales, with an emphasis on minimizing suburban sprawl impacts.

The Cary Institute will become the MCA's new formal host; Klemens will continue his pioneering work bridging the gap between conservation science and land use planning. His hiring reflects the Cary Institute's ongoing commitment to connecting decision makers with science-based environmental solutions.

Klemens founded the MCA in 1997, during his tenure at the Wildlife Conservation Society. Technical papers authored by Klemens and colleagues are widely used by planning boards and land managers in New York, Connecticut, and New Jersey.

A herpetologist by training, Klemens received his Ph.D. in conservation biology and ecology from the University of Kent in the U.K. He has published extensively on reptile conservation and suburban sprawl; his most recent book, *Nature in Fragments: The Legacy of Sprawl*, is widely praised.

\$750,000 EPA GRANT TO
INVESTIGATE DISEASE ECOLOGY

Cary Institute animal ecologist Dr. Richard Ostfeld has secured a \$750,000 grant from the Environmental Protection Agency (EPA) to investigate how differences in animal community composition affect the risk of Lyme disease transmission. The funding will expand on existing studies that have revealed increased Lyme disease risk in fragmented landscapes with low mammalian diversity.

The grant is part of an \$2.25 million EPA initiative geared at revealing how changing land use patterns influence the rise and spread of infectious diseases. The goal: to support research programs working to understand the links among environmental stressors, the loss of biodiversity, and the transmission of infectious diseases to people.

"Biodiversity loss and emergence and reemergence of infectious diseases are both of great concern," said George Gray, EPA Science Advisor and assistant administrator of the Office of Research and Development. "With these grants, we can explore the possible linkages, so that policymakers can make better decisions on land use and development."

THREATS FROM ABOVE

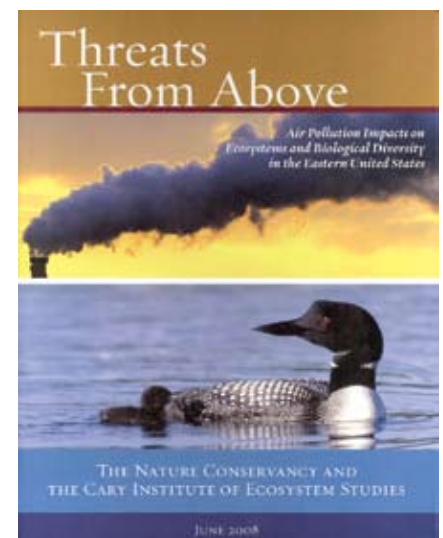
A report by the Cary Institute and The Nature Conservancy has found that air pollution is degrading every major ecosystem type in the northeastern and mid-Atlantic United States. It is the first report to analyze the large-scale effects that four air pollutants are having across a broad range of habitat types. Over 32 experts contributed to the effort; the prognosis is not good.

"Everywhere we looked, we found evidence of air pollution harming natural resources," comments Dr. Gary Lovett, an ecologist at the Cary Institute and the lead author of the report. "Action is needed if we plan on preserving functioning ecosystems for future generations."

The pollutants assessed—sulfur, nitrogen, mercury, and ground-level ozone—largely originate from smokestacks, tail pipes, and agricultural operations. While initially airborne, these pollutants eventually return to the landscape, where they contaminate the soil and water.

"To safeguard ecosystem health, we need a new way of thinking about air pollution, one that moves beyond measuring what is put up in the air, and captures actual impacts to natural areas, wildlife, and the services they provide," Lovett notes.

The authors urge U.S. policymakers to establish air quality standards that are based on critical loads. This is defined as the maximum level of deposited pollution that ecosystems can tolerate before harmful effects occur. By establishing thresholds, pollutants can be regulated in a way that preserves functioning ecosystems.



A PDF of the report is available on our website:
www.ecostudies.org/Threats_from_Above.pdf

WHERE WE WORK

NOTES FROM THE FIELD

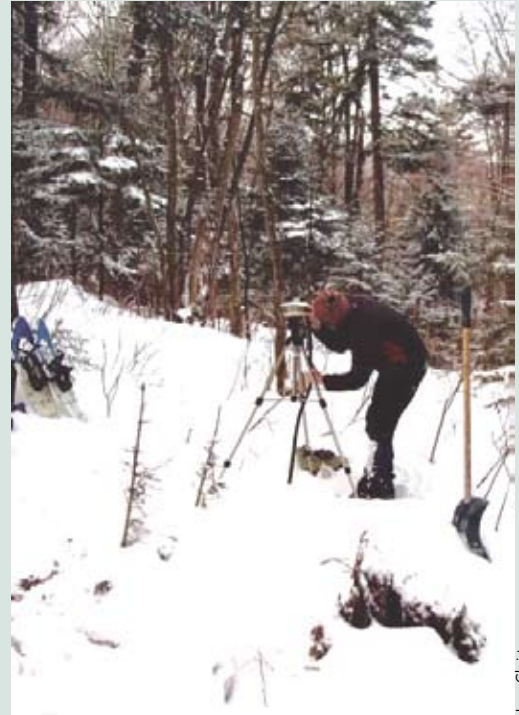
by Dr. Peter M. Groffman, Microbial Ecologist
HUBBARD BROOK EXPERIMENTAL FOREST

At first glance, there is nothing inherently spectacular about the Hubbard Brook Experimental Forest. Tucked within the White Mountains of New Hampshire, the 3,160-hectare forest is covered with the northern hardwoods and conifers that characterize the region. But to ecologists, this site holds special significance.

It was here, over forty years ago, that Dr. Gene E. Likens and colleagues began to utilize a series of gauged catchments set up by the USDA Forest Service to study how forest ecosystems are connected to hydrologic and atmospheric cycles. Careful monitoring of forest soil, air quality, and stream water has revealed a wealth of information, including how forest ecosystems respond to human stresses, such as logging and air pollution.

I began working at Hubbard Brook in 1992. One of my long-term projects involves investigating how delayed snowfall, an expected outcome of climate change, impacts forest soils. In a nutshell, warmer climates will lead to colder soils. Snow insulates the ground; without it, soils freeze and plant roots are damaged. To understand how reduced snow cover influences forest soil fertility and nutrient cycling, I manage a series of snow removal experiments.

Each year, dedicated research assistants snowmobile to remote sites, hike into the forest, and remove snow from 10-meter by 10-meter plots until February. Over the past twelve years, we've learned that cleared sites experience more soil freezing and root damage. When fewer plants survive, during spring thaw there is an increase in nitrogen runoff, which reduces the fertility of the forest and pollutes nearby streams.



Lynn Christenson

A research assistant collects data at a Big Freeze plot. Sustained collaborative research has made the site an ideal laboratory for ecological research.

GROUNDS UPDATE

New Signage Will Convey Ecological Themes

A new strategic plan has been developed for the grounds and trails of the Cary Institute—one that is focused on creating an interpretive program that will address four main goals. We want visitors to our 2,000-acre campus to learn:

- What an ecosystem is
- Why ecosystems are important
- What we do as ecosystem scientists
- Why our research is important to current environmental issues

Staff are working to create signage for the Wappinger Creek Trail that explains forest change, environmental monitoring, the ecology of Lyme disease, and deer impacts to forest ecosystems. Content will be based on research programs that are active on our campus.

A donor has provided the funding needed to create trail signage. To help convey information in a visually engaging way, we will be collaborating with a graphic artist. The new signs will be in place when our trails open in the spring of 2009.

This season we debuted our new extended hours. To encourage visitation, our trails are open from dawn to dusk from April 1st to October 31st. Orientation kiosks were also updated with new trail maps, brochures, and announcements for our varied public programs.

The Dutchess County Waterman Bird Club held several bird walks on the grounds, recording over 100 bird species.

Observations will be crafted into a brochure and checklist that will help orient bird watchers.

Over the summer, the Cary Institute added 33 acres to its campus. A parcel of land purchased from the Olson family fills a gap in the property's northern perimeter. The acquisition adds old field, wetland, and forest habitat to our campus. More importantly, it protects a 900-foot section of Wappinger Creek from potentially incompatible land use.

New activities were made possible by phasing out the Cary Institute's horticultural programs and focusing resources on providing visitors with insight into our core mission: understanding ecosystems.

DEVELOPMENT

DEVELOPMENT
OFFICE CORNER

Supporters,

The bustle of fall activities is underway at the Cary Institute. Over the past several months, we've hosted some extraordinary lectures, book readings, and fund raisers. Attendance and enthusiasm has been unprecedented. I hope you visit our website regularly (www.ecostudies.org) and take advantage of these valuable programs.

This year the Cary Institute is celebrating 25 years of excellent, unbiased ecological research. Response to our spring open house was incredible, with 200 people touring the labs and enjoying a reception and panel discussion. We are working to make this an annual event, to welcome the community and promote ecological understanding.

In these turbulent times protecting the things that matter most—clean air, water, and human health—is the priority of an informed society. Science has the opportunity to surge to the forefront and lead the world into a new future where thoughtful environmental and energy policies are the order of the day.

Please join us in our efforts by supporting our Annual Appeal (an envelope is enclosed), or make a gift of membership to a family member or friend. Your donation supports important field research and discovery, award-winning education programs, and the essential operation of the Cary Institute.



Kind regards,

Diana Salsberg
Development Officer



Lori Guillen

AN ALTERNATIVE ENERGY COLLOQUIUM

Fossil fuel dependency is at the heart of many of today's environmental problems, from climate change to air pollution. There is a tremendous need for society to develop alternative energy sources that are renewable and environmentally benign.

This summer, the Cary Institute held an Alternative Energy Colloquium, with the goal of outlining the ecological impact of several alternative energy options. The event, was hosted by architect Allan Shope, a Cary Institute Trustee and a member of the Aldo Leopold Society.

Sixty-eight participants convened at Shope's Listening Rock Farm in Amenia, NY. Guests were given a tour of the farm, which runs its vehicles and furnaces on discarded vegetable oil. They were also invited into Sinpatch1, a carbon-neutral home. Constructed on a hillside from reclaimed building materials, such as recycled copper, it is fueled by solar energy.

Sinpatch1 is the first in a series of green homes that Shope is building. All will be built sustainably and powered with renewable energy; future construction will explore geothermal and wind power.

Following a brunch made from local ingredients, Dr. William H. Schlesinger, President of the Cary Institute, provided ecological insight into biofuel, wind energy, and solar power. In certain settings, wind is a feasible source of renewable energy. Moving into the future, solar power is expected to become more effective and accessible. Corn-based ethanol, currently the most popular form of biodiesel in the U.S., was described as unsustainable. Production is energy-intensive and feasible only with subsidies.

Dr. Charles D. Canham, a forest ecologist at the Cary Institute, provided an overview on cellulosic ethanol. This biofuel, made from plant biomass such as young forests, crop waste, and switchgrass, holds promise because it can be made from a diversity of sources. Generating the amount needed will require technological innovation and environmental oversight.

Weaning off our fossil fuel diet is essential to the health of the planet. Initially, clean energy will come at a higher cost. This can be offset by reduced consumption. In Schlesinger's words, "It's now time to make energy decisions that put the environment at the forefront."

CALENDAR

Ecology School Programs

The Cary Institute's school programs are an exciting way to immerse K-12 students in ecosystem explorations. Sessions can be held in the classroom or at our 2,000-acre ecological research campus in Millbrook, NY. Workshops for teachers are also offered. For more information or to register contact Kim Notin at (845) 677-7600 ext. 303 or notink@ecostudies.org.

Programs include:

- Primary Producers
- Water Life
- Botanical Bounty
- Water on the Move
- Schoolyard Ecosystem Explorations

Descriptions are available online at www.ecostudies.org/ed_eco_field_programs.html



Community Meeting

Ecosystem Based Management in New York State

January 2009, TBA

This special workshop will convene parties that are interested in learning about the Department of State's new report on employing ecosystem-based management strategies in New York State. To be held in the Cary Institute's Auditorium. Write to freemanp@ecostudies.org to receive additional details as they become available.

Save the Date! Earth Day Lectures

In celebration of Earth Day, the Cary Institute will be featuring two public lectures.

April 23th at 4 p.m.

Dr. Sylvia Earle, *Deep Sea Explorer*

April 24th, evening, TBA

Dr. Sandra Steingraber, *The Ecology of Pizza*

Thursday Scientific Seminars

Seminars are held at 4 p.m. in the Cary Institute auditorium from September until early May. For more information, including directions, visit www.ecostudies.org/thursday.html

November 20: Ecological Literacy: What Difference Does It Make in People's Lives? How Do We Measure It? How Do We Help Others Achieve It?, Dr. Mary Ann McGarry, Hubbard Brook Research Foundation

December 4: Forest Decline Syndrome: Cascading Effects of Exotic Earthworm Invasions in Northern Hardwood Forests of the Great Lakes, Dr. Cindy Hale, University of Minnesota, Duluth

EcoFocus Online

Our scientists write a column in the *Poughkeepsie Journal* called Ecofocus. View past articles online at: www.ecostudies.org/ecofocus.html



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

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

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Visit us online at www.ecostudies.org

DON'T MISS OUR PUBLIC EVENTS!

The Cary Institute is committed to connecting the public with ecological insight. Over the past year, we've initiated a new public lecture series that has brought some of the nation's top scientific thinkers to the region. We've also partnered with Merritt Bookstore to host ecological-minded authors. For a list of upcoming events, visit www.ecostudies.org/events.html.



LEFT: Nobel prize-winning scientist Eric Chivian, M.D., signs a copy of his book, *Sustaining Life*.



RIGHT: Educator Lia Harris teaching about invertebrates during Millbrook's Community Day.