



THE POLAR BEARS OF DUTCHESS COUNTY

Text and photos by Hillary Harvey

Amidst the hustle and bustle of global warming politics, there is an independent, cutting-edge, scientific research facility set in the tranquil woods outside the village of Millbrook. The Institute of Ecosystem Studies aims to place itself squarely in the midst of that debate. Debate may be the wrong word. As Jules and Maxwell Boykoff documented for *Fairness and Accuracy In Reporting (Extra!)*, November/December 2004, the practice of covering opposing sides in the case of global warming actually creates a superficial balance and informational bias. The vast majority of scientists are in agreement about the reality, causes, and potential effects of climate change. And with its newly appointed President, Dr. William Schlesinger, IES's climate research is set for an increased focus on global warming and its intersection with politics.

The 2,000 acres of IES was originally the Cary Arboretum, a collection of 14 farms purchased by Standard Oil heiress Mary Flagler Cary and her husband, Melbert in the 1930s. The ensuing estate was left in trust in 1967 and bestowed to the custodial care of the New York Botanical Gardens in 1971. Recognizing its potential, the organization proposed establishing an ecology center on the site and began an international search for an appropriate scientist to head it.

Dr. Gene Likens, known for connecting the relationship between fossil fuel combustion with the concentration of sulfuric and nitric acid in precipitation, leading to the identification of acid rain in North America, was hired to direct the institute, in 1983. (IES still gets 44 percent of its funding from the Mary Flagler Cary Durable Trust; the other 55 percent comes from research and federal grants and private philanthropic gifts.) As its name suggests, IES research comprises an ecosystem approach. Initiated by Likens, IES's 20 resident and visiting scientists look at the sources and fates of things as they interrelate in the environment, focusing, too, on human impacts within the larger interaction web.

THE MAPLE AS CLIMATE MARKER

In fact, the Hudson Valley is facing an imminent extinction. Staying true to its mission to share its analysis, IES regularly hosts international visiting researchers who, as part of their tenure, lead Friday slide lectures, which are open to

the public. This past June a visiting researcher and naturalist with the Wildlife Conservation Society, Jerry Jenkins, walked a group of Tupperware-toting scientists and laypersons through his research on the impacts of climate change in the Adirondacks. He outlined the ways in which plants and animals respond to changes in climate, first exhibiting increases and decreases in abundance and timing. Then, mobile southern species move north. "And maybe the last thing is that northern species start to go extinct," Jenkins says. One of the issues all the scientists at IES are concerned about is the expected loss of maple trees due to climate change.

It was Mary Flagler Cary who first took a special interest in the maple trees on her property. Maples are an abundant species in the Hudson Valley at present, but the trees are finicky about climatic conditions and vulnerable to insect onslaughts. Die-back occurred in the southern ranges in the 1990s when acid rain decreased soil fertility, summer droughts produced strain, and then, once they were stressed, maples were vulnerable to insect attack. Insects were what John Broekema of Sugarbrook Maple Farm in Kerhonkson noticed. The forest tent caterpillars have been defoliating his maples for the past three years, as part of their natural population cycle, along with the gypsy moth and fall canker worm. But he said what's really doing them in is the weather. "We don't have any normal weather anymore," Broekema says. "We either have drought or tons of rain; warm weather or really cold. We're getting extremes. And that's really affected maple syrup production." According to the "Indicators of Climate Change in the Northeast" report of 2005 published by Clean Air-Cool Planet and Cameron P. Wake of the Climate Change Research Center at the University of New Hampshire, this type of weather scenario is just what the scientific models have been predicting: "Climate change models suggest that a warming planet will likely experience increasing storm intensity and frequency."

The ideal weather for maple sugaring has been the middle of February, when 40-degree days couple with mildly freezing nights. That fluctuation would bring on sap runs until the end of March. Some departures from that scenario could be tolerated, but once it gets above 50 degrees, the sap holes start to dry up, and



OPPOSITE: BRAD ROELLER, GROUNDS AND DISPLAY GARDENS MANAGER AT THE INSTITUTE FOR ECOSYSTEM STUDIES, INSPECTING COMPARATIVE TRIAL BEDS.
 ABOVE: DR. RICHARD OSTFELD SWEEPING THE FOREST FLOOR FOR TICKS, PART OF HIS ONGOING RESEARCH INTO LYME DISEASE.

the trees start to bud. “When the trees bud, the sap’s not fit for making maple syrup anymore,” Broekema says. With the unpredictability of the weather in recent years, Broekema’s had to tap the trees a week early, around February 7, to insure a productive sap run.

All the scientists at IES think there’s good reason to believe maple trees will cease to be a component of the forests in the Hudson Valley. They say it has little hope of keeping pace with the climatic shifts. Trees can’t pick up their roots and migrate. Their only means of relocating is limited to seed dispersal. Right now, the maples live in the Eastern Deciduous Forest (deciduous trees drop their leaves in the fall), which occupies the eastern half of the US and southeastern Canada. The northern boundary blends into the Northern Boreal Forest in New England and southern Canada, which is dominated by hardy, cold-loving conifers. As Jenkins points out, the boundary between the two is a deep one. “It’s a boundary between two different soil types, different amounts of rockiness. And it’s a boundary between species with very different ballgames, different ways of being a species.”

The affects of that change are really best-guess predictions, and those predictions are what fuel the debate on global warming. The culture of science is to ask questions, intended to encourage further study. This uncertainty can be capitalized on to create a media debate. For instance, Jenkins points out, “It may be that, for a tree, being out of equilibrium with climate has occurred for the major part of its geological history, rather than being a death sentence for it. Being 500 miles from where you’d like to be for a slow-moving organism may be business as usual.” On the other hand, IES’s Dr. Richard Ostfeld expresses the pessimistic view that even if the sugar maple isn’t killed outright, as the climate warms, it will get out-competed by other tree species that are more tropically adapted. “Uncertainty exists,” he says. “We shouldn’t claim that it doesn’t. Our uncertainty, though, is about how bad global warming is going to get and, in the meantime, we don’t have the luxury of endless time.” As the polar bears’ vanishing habitat is to the Arctic, so the maples are the Hudson Valley’s best example of climate change impacts.

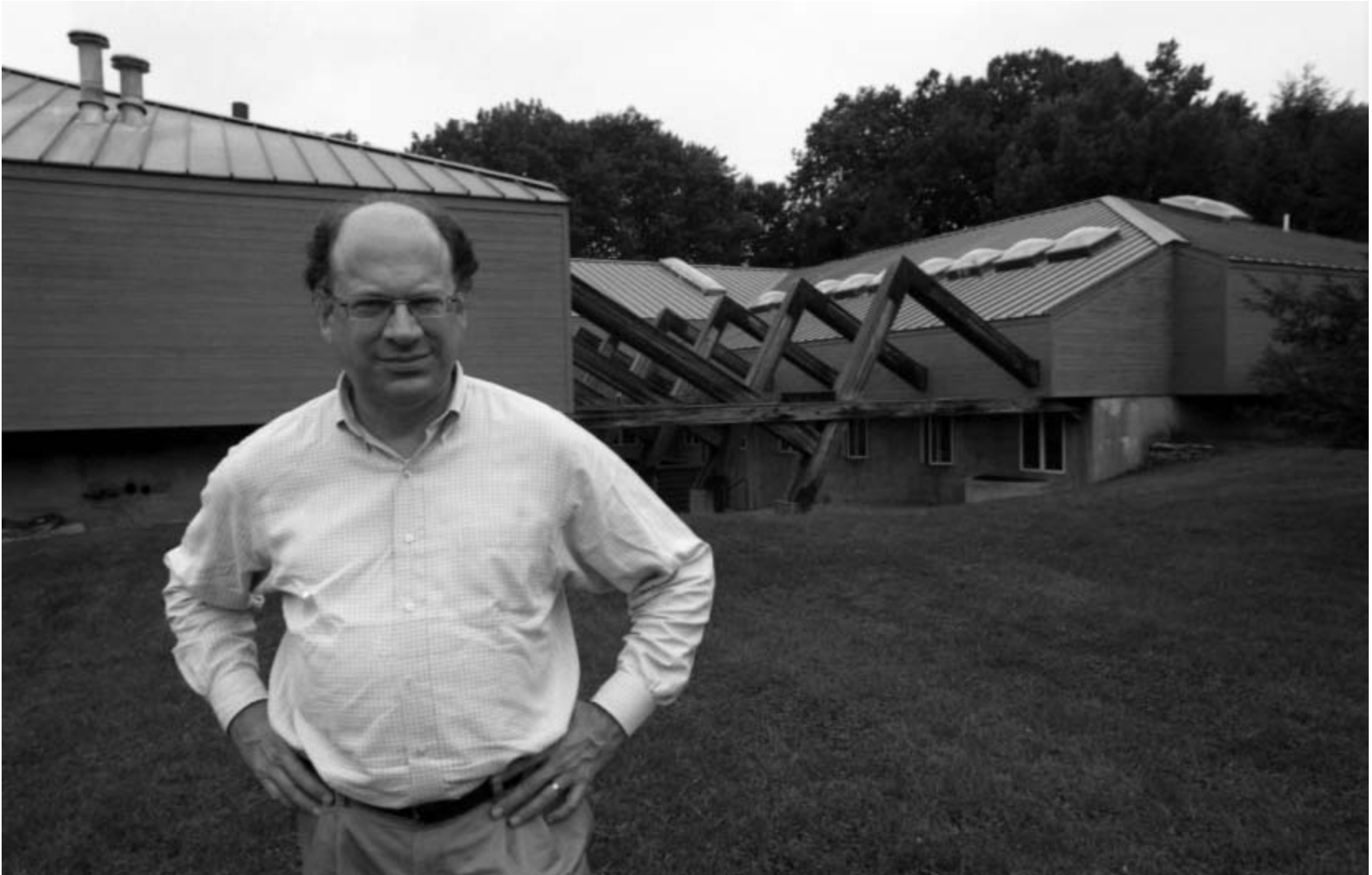
GLOBAL WARMING AND LYME DISEASE

Ostfeld is a senior scientist and animal ecologist at IES. For the past decade and a half, he’s monitored the relationship between elements in the forest ecology and Lyme disease. Fifteen years—a very brief time on the ecological scale—is beginning to be a sufficient amount of time for Ostfeld to document real climate change in the interaction web he studies.

Every few years, the oak trees, which are dominant in the Hudson Valley, produce a bumper crop of acorns. White-footed mice, which are ubiquitous forest rodents, favor acorns as a food source. And the mice, it turns out, have a large impact on the ecology of their habitats. “They are the main source where ticks pick up the bacterium that causes Lyme disease,” says Ostfeld. So if there are a lot of mice, ticks are more likely to pick up the bacterium, and the risk to humans increases. “And where climate change comes in,” Ostfeld says, “is in possibly increasing the frequency with which these oak trees produce the acorns.” There’s usually two or three years between acorn events. According to scientists’ calculations, it takes a certain length of time to store enough carbon through photosynthesis to have the energy to devote to reproduction—which is what acorns are. “If that carbon storage hypothesis is true,” says Ostfeld, “then almost certainly as the climate warms, we expect these acorn years to be more frequent or potentially more intensive when they happen.”

This year, for the first time in IES’s records, acorns were produced two years in a row, and mouse populations are at unprecedented levels. “Lyme disease seems to be growing fairly rapidly in Ulster County right now,” says Ostfeld, “but Dutchess and Columbia Counties have among the highest numbers of cases and rates of anywhere in the world.”

An additional component of the ecological web Ostfeld studies is forest fragmentation. By inserting housing developments, industry, and recreational facilities into fractured forests, people are placing themselves in the centers of highly risky environments. Increasing carbon emissions, excessive acorn production, and an exploding white-footed mouse population has created a “perfect storm” for the proliferation of Lyme disease.



DR. WILLIAM SCHLESINGER, PRESIDENT OF IES, IN FRONT OF THE PLANT SCIENCES BUILDING AT THE INSTITUTE'S MILLBROOK CAMPUS.

This concerns Ostfeld not only from a public health standpoint, but also in terms of its self-perpetuating properties. IES's scientists regularly engage in grant proposals, and Ostfeld described one he was writing for the National Science Foundation. Bringing together a team of natural and social scientists, the study seeks to investigate the questions: Does the imminent threat of Lyme disease influence human attitudes about nature? When faced with a natural threat, will people continue to find the environment ethically and aesthetically important to protect? Or will they experience a fear-induced alienation causing them to cease caring and even seek to destroy or undermine the natural world? If the latter is true, then ongoing forest fragmentation and development could become a self-perpetuating outcome of climate change.

INFLUENCING POLICY

One of Schlesinger's major goals as director of IES is to push its research beyond the rarefied realms of science and into the world of public policy. "IES does impeccable work here and generally puts it into scientific literature and then moves on to the next project," says Schlesinger. "It's required advocacy groups to find it," he told me. "Time is short for a lot of these problems, and so I'm going to try to encourage people to come out of their shells." In May he testified in Washington at a House subcommittee hearing on the carbon cycle. Schlesinger says it was discouraging to realize how dimly uneducated many politicians often are on environmental issues. Sometimes what the elected officials believe is whatever their staff comes up with. "So this one holds up a graph," Schlesinger says, referring to a congressman at the hearing, "and says, 'Look at these fluctuations in CO₂. They go back to the Pleistocene Era. Why are we worried about this?' The graph was handed around, and it turns out that they had completely misread the axis on it. It wasn't the absolute levels of CO₂ through geologic time, but change per year. It didn't support the point he was making at all."

On a recent morning at town hall in Rhinebeck, Schlesinger explained the

reasons for high ozone levels in Dutchess County to a group of concerned residents. The suburbanized scenery (excessive landscaping and car use) and the prevalence of coal-fired power plants upwind generate ideal conditions for ozone formation. (Dutchess County consistently gets poor marks on ozone levels from the American Lung Association in its annual air quality report. This year, the county received a C, a step up from 2006's failing grade of F.) Volatile organic carbon (VOC) is naturally released from trees and shrubs. Fossil fuel combustion, such as from car exhaust, releases oxides of nitrogen. Together those elements, under ultraviolet light from the sun, produce lower atmospheric ozone. The reaction happens more in summer, when it's warmer and the sun is out longer and its rays more direct. Schlesinger predicts that in a warming climate this reaction will be exaggerated. The summer growing season will be longer, and if the future contains higher levels of carbon from pollution, the VOCs will also increase as plants grow faster. Tropospheric ozone is a toxic air pollutant and, while unproven, impacts asthma and allergy rates. "There is at least one recent study that shows a direct link between ozone levels in cities and heart disease. And ozone is well-known to exacerbate various respiratory conditions," Schlesinger explained. "The problem of ozone appearing in semi-rural areas is not unique to Dutchess County. Indeed, it's quite widespread. But Dutchess is at the upper end of severity."

As Schlesinger points out, most of the ecosystems on the planet are distributed based on the climate. Species have physiological tolerances resulting from long-term evolutionary selection. If the climate changes over millions of years, they could adapt. But in the case of maple trees, beyond eliminating the livelihood of maple syrup makers, a central component of the forest is disappearing. We have no idea what the environmental response will be. "The climate change we're talking about is likely to play out over decades to a century," Schlesinger said. "So in historical comparisons, it's very fast. We are essentially dramatically altering the long-term natural ecosystems that are in the Hudson River Valley. Is that ok?" ●