Acid Rain Man

By Christine Yackel

Professor Charles T. Driscoll inspects a cargo of wollastonite pellets. The wollastonite, which contains calcium, is added to soil at Hubbard Brook Experimental Forest to determine calcium's role in the recovery of acidified ecosystems.
Civil and environmental engineering professor Charles T. Driscoll has survived the perils of fieldwork, unraveled the mysteries of complex ecosystems, and successfully navigated his way through countless faculty meetings. But nothing in his 22-year career prepared him for the media blitz that followed the March 2001 publication of *Acid Rain Revisited*, a report he wrote with nine other independent environmental scientists that summarizes the advances in scientific understanding since passage of the 1990 amendments of the Clean Air Act. "As soon as the national media got wind of the story, I was overwhelmed with phone calls from reporters," Driscoll says. "I spent the next three weeks briefing the media, giving presentations, and appearing on talk shows."

*Acid Rain Revisited* examines the environmental changes that have occurred since the enactment of regulatory controls mandating a decrease in sulfur and nitrogen oxide emissions caused by motor vehicles and the burning of fossil fuels by electric utilities. The cornerstone of the report is a long-term ecosystem study conducted at Hubbard Brook Experimental Forest in West Thornton, New Hampshire, where the acid rain problem was first documented in the early '60s. This collaborative study, supported by the U.S. Department of Agriculture Forest Service, the National Science Foundation, and many other agencies and groups, involves 75 researchers from several institutions investigating the effects of air pollution, climate change, and clear-cutting on soil, water, trees, and such wildlife as birds and moose. "When acid deposition was first discovered, scientists thought it was a simple problem," Driscoll says. "Now we know that acidifying compounds move through air, soil, and surface waters, setting off a cascade of interlinking consequences that are difficult to understand. The more we learn about acid rain deposition, the more complicated it gets."

Despite a significant reduction in emissions during the past 30 years, investigators found that levels of sulfur dioxide discharged from Midwest power plants remain high. These emissions continue to form hazardous ozone smog and haze that is carried on prevailing winds and falls as acid rain and snow throughout the Northeast. They also discovered that acid rain has had a far greater negative impact on the environment than previously projected. Driscoll says research shows that in addition to killing fish and other forms of life, acid deposition leaches minerals out of the soil, impairing the root function of trees. As a result, there has been a decline of sugar maple trees in central and western Pennsylvania and red spruce throughout the eastern United States. In fact, since the 1960s, more than half of the red spruce in New York’s Adirondack Mountains and Vermont’s Green Mountains, and one-quarter of those in New Hampshire’s White Mountains have died. “The lakes and forests of New England have not recovered as we expected,” he says. “Based on current trends, computer models predict adequate recovery will take at least 50 years.”

**Building Bridges**

Acid rain is a hot topic right now because the federal government may change a key provision of the Clean Air Act that requires existing power plants to install modern pollution controls whenever they upgrade or expand facilities. Legislators are considering reclassifying facility upgrades as “general maintenance” to spare electric utilities the expense of adding modern pollution-control technology. Although many environmentalists believe this regulatory change would jeopardize public health, Driscoll remains neutral. “We have a good
understanding of how ecosystems work and how they may respond, but often decisions that affect the environment are based on political considerations, not on good science,” he says. “It is my job to collect the data, present the facts, and provide computer models that project possible outcomes, so those enacting public policy can make informed decisions.”

The motivation behind Acid Rain Revisited was a desire to bridge the gap between the scientists, who tend to get bogged down in complex details, and the policy makers, who frame legislation.

Driscoll says the 18-month process of translating the complex scientific information, and hashing and rehashing the language in the document, was a painstaking activity. He and Kathy Fallon Lambert of the Hubbard Brook Research Foundation’s Science Links program grappled with several different approaches and bounced drafts back and forth between Syracuse and New Hampshire, going through each page line by line to eliminate scientific jargon, while staying true to the science. “We concentrated on determining the major points and how we could convey them in simple language,” Lambert says. “Then we provided key graphics to support the main ideas.”

Driscoll and Lambert were pleased with the public and media response to Acid Rain Revisited, which was covered in all major U.S. newspapers and featured on National Public Radio and CNN. As official spokesperson for the group of scientists who co-authored the report, Driscoll briefed reporters at the National Press Club in Washington, D.C., and conducted a workshop for congressional staff to discuss the computer-model calculations outlined in the report. He also appeared before a U.S. House of Representatives science committee considering the reauthorization of the clean air bill. “Charley did very well as our spokesperson,” Lambert says. “He’s always been good at communicating with people, and over time he became a real natural at talking with the press and giving presentations.”

In recent months the report has been cited by nine state attorneys general in the Northeast who are threatening legal action to block the federal government’s plans to relax current clean air standards. And New Hampshire Governor Jeanne Shaheen is using it to shape public debate on environmental issues in her state. “We could use more environmental scientists like Charley who can translate scientific data into layman’s terms to inform public policy makers about the pros and cons of pending legislation,” Lambert says. “Charley is a meticulous and accomplished scientist who has a rare ability to see how science can be applied.”

Environmental Stewardship

Driscoll carries this talent into the classroom, where he instills in his students the importance of promoting good communication between the scientific community and the public. Last summer he held a communications workshop for students, media representatives, and researchers because he wants his students—who are the next generation of environmental stewards—to learn how to bring diverse groups together to solve environmental problems. “During our team research meetings we discuss both the science and the challenges of applying our knowledge to environmental public policy issues,” says graduate student Brian Wellington. “Professor Driscoll is an excellent mentor who is knowledgeable in a vast range of topics.”

In a moment of self-reflection, Driscoll admits that he is not always the easiest person to work with. “I try to challenge my students to meet my high expectations without micromanaging them, but sometimes I can be impatient,” he says. His students don’t see him that way. “As a teacher, Professor Driscoll is thorough and always ready to answer questions,” says graduate student Limin Chen. “As a mentor, he is supportive and patient.” Paul Murphy ’02 agrees. “When I began my research with Professor Driscoll, I knew very little about environ-
mental engineering sciences because my background was in physiology," he says. "He was extremely patient with me while I became familiar with environmental research."

Lambert says she hopes Driscoll and his students continue to advance knowledge and build bridges between the scientific and public policy spheres for many years to come. "Charley and his students offer great hope for the future of our environment," she says.

In recognition of his many contributions to the advancement of acid rain research and the field of civil and environmental engineering, Driscoll was named a University Professor last summer. "Charley's work represents the highest standard of excellence at SU, or anywhere else for that matter," says Deborah A. Freund, vice chancellor and provost of Syracuse University. "For his accomplishments, and because his work is at the intersection of engineering and the other sciences, a University appointment seemed the perfect fit."  

A Standard of Excellence

Driscoll first became interested in civil and environmental engineering in 1970 as an undergraduate at the University of Maine. He intended to major in chemical engineering, but wasn't happy with the department and switched to civil engineering, though he knew little about the field at the time. During his junior year he took an environmental engineering course and discovered he liked it because it involved a lot of chemistry. "I loved my limology [the study of lakes] courses and decided I wanted to learn more about the natural environment," Driscoll says. "For my doctoral work, I studied how acid deposition affects water quality and fish life in the Adirondacks. I have been studying acid rain ever since, and I will probably be studying acid rain until I retire. I couldn't ask for a better job."

Driscoll began research on acid rain at Cornell University and the Hubbard Brook Experimental Forest in 1976, and continued after he became a professor of civil and environmental engineering in SU's L.C. Smith College of Engineering and Computer Science in 1979. Initially his research focused on lakes, but his interests expanded to include the chemistry of soils and soil waters, environmental modeling, and biogeochemistry, which is a way of tracking chemical elements and compounds as they cycle through ecosystems. The common thread throughout his work is a desire to understand how human disturbance alters complex ecosystems and how long-term biogeochemical patterns in forest and aquatic ecosystems respond to such upheavals. "We are doing a better job of predicting the effect of human intervention on the environment," he says. "I only hope we will be equally successful at understanding how to help the environment recover."

In addition to studying acid rain, Driscoll has been examining the hazardous effects of mercury in the Adirondack and Catskill mountains and New England, and the impact of nitrogen on coastal regions. He is also looking at Lake Ontario water abatements in western New York and Syracuse's Onondaga Lake, which is one of the most polluted bodies of water in the nation. "There's no shortage of environmental problems to study, and there are so many fascinating aspects to environmental research that I get easily distracted," Driscoll says. "It's my Achilles' heel."

Along with his teaching, mentoring, and research activities, Driscoll has taken on responsibilities as interim chair of the civil and environmental engineering department. He also serves as a consultant to the New York State attorney general's office, DuPont, and the U.S. Environmental Protection Agency. And once again he is collaborating with Lambert on a Science Links publication. This one, Nitrogen Pollution from the Source to the Sea, is scheduled for release next year. "We will conform to the Acid Rain Revisited model for our second publication, but the follow-up will be different," Driscoll says. "Next time we'll have a web site ready to go before the publication is released, and I'll make sure I'm not the only spokesperson."

Driscoll's hectic schedule doesn't allow him as much time as he would like to conduct acid rain research at Hubbard Brook Experimental Forest, where he enjoys doing fieldwork and stays with his family in a rustic cabin in the woods. "These days my graduate students collect most of the soil and water samples for me," he says, "and I largely work with my students and do data analysis in my lab at SU."

While thinking about being out of the office, he recalled a time when he was gathering field samples in British Columbia. Engrossed in his work, he accidentally stepped off a cliff and rolled down a hill into the backside of a sleeping bear. "Even that," he says nostalgically, "was more fun than going to meetings."