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# BESIDE

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# THE

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# STILLED WATERS

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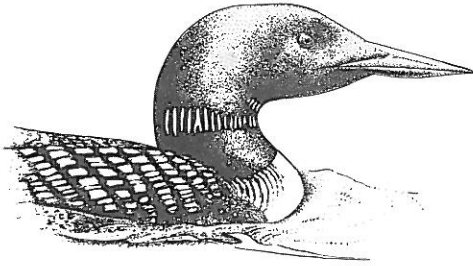


*The forecast for the immediate and distant  
future is bleak. The present and  
potential destruction from acid rain is staggering.  
The consequences of not ending  
this man-made pollution are simply not acceptable.  
But we are not helpless or without hope,  
for the problem can be solved.  
What man has started, man can stop.*

From *Downwind*  
Environment Canada, 1981

# THE ADIRONDACK COUNCIL

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## Open Letter to the Congress and the Administration

I'm sure you have been in a situation where forces affecting your life or your surroundings were out of your control. Such is the case for those of us who live in vast areas of the United States that are suffering the ravages of acid rain.

The people of New York State have for over a century taken extraordinary steps to protect the Adirondack Park, one of the finest natural landscapes on earth. This has included the imposition of strict land use controls on private lands and preservation of the state-owned lands as "forever wild" under the aegis of the state constitution.

Just when it seemed we had achieved a proper balance of preservation and development through comprehensive planning in the early 1970s, the scourge of acid rain began to evidence itself in the form of dead lakes. Dying forests, impaired visibility, and heavy metals in our drinking water became other signs of our plight.

The acidification of land and water is due primarily to air pollutants that are transported here from states downwind of this region. The obvious solution is the enactment of far-reaching and equitable federal legislation to reduce the emissions that cause acid rain.

Many states are both receivers and emitters of acidifying pollutants. And because acid rain is so far-reaching and knows no boundaries, federal intervention is the only way to solve this problem.

We urge you to take action while there is still hope that our environment can recover.

Sincerely yours,

Kim Elliman  
Chairman

Charles M. Clusen  
Executive Director

## **THE ADIRONDACK COUNCIL**

Founded in 1975, the Adirondack Council is dedicated to protecting the Adirondack Park through public education, monitoring and advising government agencies and the State Legislature, and legal action when necessary.

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# BESIDE THE STILLED WATERS



*Dead conifers on the upper slopes of McComb Mountain frame a typical Adirondack vista.*

© Gary Randorf

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**Also to Dr. Michael Oppenheimer for scientific review of the text.**



# *The Poisoned Hills*

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*Polluted clouds envelop a devastated forest of Fraser fir near the summit of Mount Mitchell in North Carolina.*



*All that morning, in the April sunshine, our road carried us through mountain forests, green and lush. Then, like a pleasant dream sliding into a nightmare, the country swiftly changed.*

*The forest thinned away. The trees grew smaller, became stunted, disappeared altogether . . . blighted land replaced the forest . . .*

*All the hills were pleasant here less than a hundred years ago. What had happened? What had left these slopes around us sterile and lifeless?*

EDWIN WAY TEALE  
North with the Spring

**T**eale writes about the southeast corner of Tennessee, where hillsides facing the smelters of the Copper Basin were ravaged by the fumes. In 1907, after years of litigation, the U.S. Supreme Court ruled that the copper companies of the area were responsible for controlling the sulphur dioxide they were dumping into the air. Special equipment was installed to recover sulphuric acid from the emissions, and taller smokestacks were erected to disperse what fumes remained in the smoke away from the immediate neighborhood (to become someone else's problem).

Slowly but relentlessly, the Adirondack Mountains in upstate New York are on their way to becoming "the poisoned hills," as Teale termed the barren slopes surrounding the acid-drenched Copper Basin. And like the tale of that tragic area, which Teale likened to a murder story because "it deals, literally, with the murder of a countryside," the tale of the present day Adirondacks is a classic one of air and land abuse.

As a naturalist, photographer, and professional environmentalist, I have had the opportunity over the past 15 years to see and know much of the six-million-acre Adirondack Park. Changes to the forests and waterbodies of the Adirondacks in recent years have been both dramatic and subtle. Waters became gradually clearer as acidification killed the plankton. Then researchers discovered that hundreds of lakes were fishless, with algae oozing over their bottoms.

In 1983, in the company of acid rain expert Dr. Carl Schofield of Cornell and some Scandinavian scientists, I flew over the southwestern Adirondack Park, which contains the lion's share of the Park's 2,800 lakes and ponds. We skimmed over one dead lake after another. Their eerie, transparent, milky blueness reflected silent lifelessness. Researchers on the ground had previously confirmed devastating acidity levels.

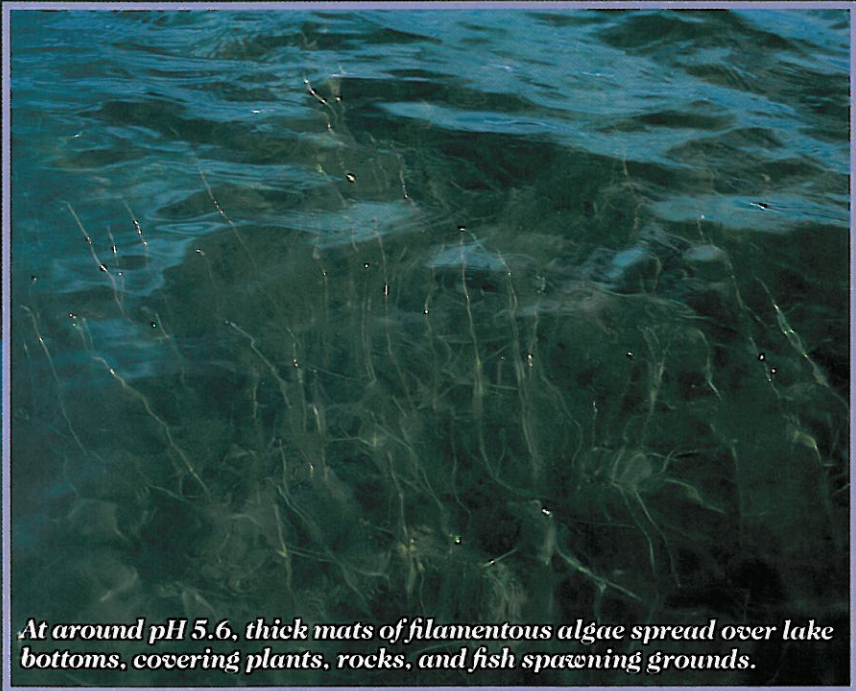
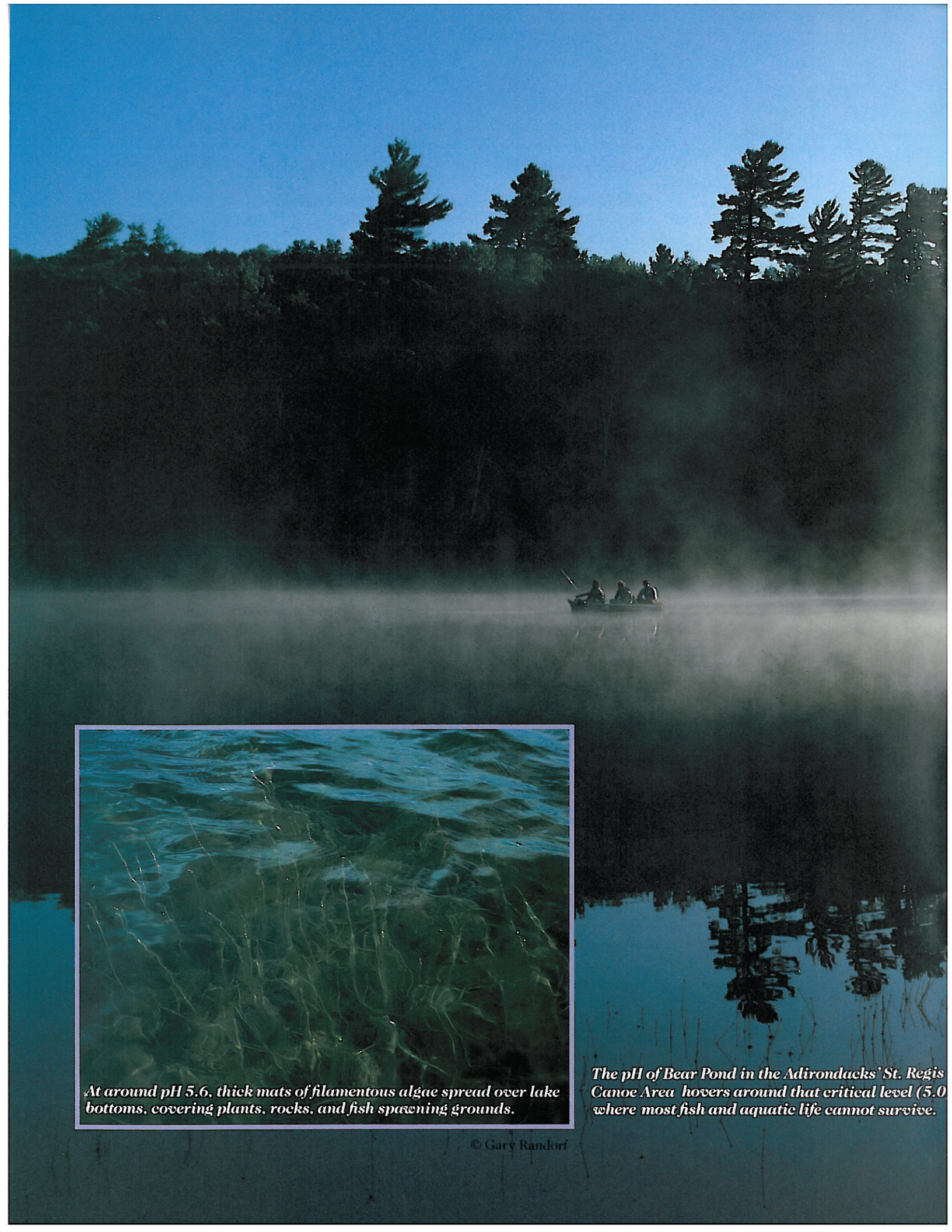
In addition to the 200–300 fishless lakes, approximately that many more are on their way to being fishless as rising acidity approaches that level where most aquatic life cannot survive. Some rivers suffer, too, especially during spring run-off when high levels of acidity trapped in the snowpack flushes downstream.

In 1979, on the top of Haystack Mountain, a friend and I pondered the dying spruce trees on surrounding slopes. Perhaps a quarter of the trees seemed stricken by some strange disease. In the



© John Shaw

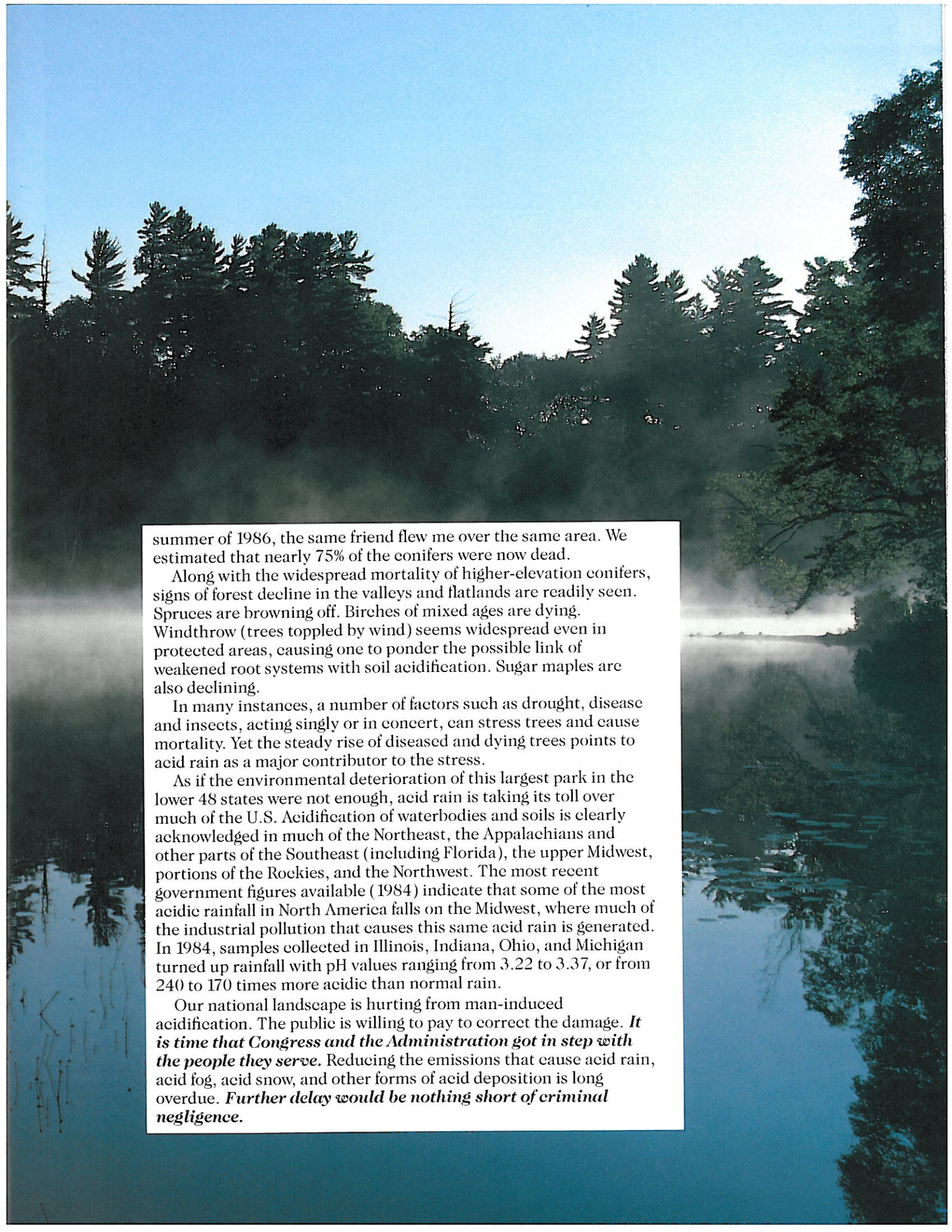




*At around pH 5.6, thick mats of filamentous algae spread over lake bottoms, covering plants, rocks, and fish spawning grounds.*

*The pH of Bear Pond in the Adirondacks' St. Regis Canoe Area hovers around that critical level (5.0) where most fish and aquatic life cannot survive.*





summer of 1986, the same friend flew me over the same area. We estimated that nearly 75% of the conifers were now dead.

Along with the widespread mortality of higher-elevation conifers, signs of forest decline in the valleys and flatlands are readily seen. Spruces are browning off. Birches of mixed ages are dying. Windthrow (trees toppled by wind) seems widespread even in protected areas, causing one to ponder the possible link of weakened root systems with soil acidification. Sugar maples are also declining.

In many instances, a number of factors such as drought, disease and insects, acting singly or in concert, can stress trees and cause mortality. Yet the steady rise of diseased and dying trees points to acid rain as a major contributor to the stress.

As if the environmental deterioration of this largest park in the lower 48 states were not enough, acid rain is taking its toll over much of the U.S. Acidification of waterbodies and soils is clearly acknowledged in much of the Northeast, the Appalachians and other parts of the Southeast (including Florida), the upper Midwest, portions of the Rockies, and the Northwest. The most recent government figures available (1984) indicate that some of the most acidic rainfall in North America falls on the Midwest, where much of the industrial pollution that causes this same acid rain is generated. In 1984, samples collected in Illinois, Indiana, Ohio, and Michigan turned up rainfall with pH values ranging from 3.22 to 3.37, or from 240 to 170 times more acidic than normal rain.

Our national landscape is hurting from man-induced acidification. The public is willing to pay to correct the damage. ***It is time that Congress and the Administration got in step with the people they serve.*** Reducing the emissions that cause acid rain, acid fog, acid snow, and other forms of acid deposition is long overdue. ***Further delay would be nothing short of criminal negligence.***





**A** *Camels Hump, Vermont (A) 1963, (B) 1983*  
*Photos reveal what botanical studies have documented: forest decline has been marked over the last two decades. Increasing evidence points to acid rain as the cause of tree dieback.*

Dr. H. W. Vogelmann/University of Vermont



**C** *Damage assessment impact of Camels Hump, Vermont, acquired 9/9/84. In this satellite image, healthy trees are depicted in light blue (hardwood species such as maple, beech, and birch) and dark blue (conifers such as pine and spruce/fir), while trees in decline are portrayed in orange, pink, and red (increasing levels of damage). Note that the highest damage at the upper elevations occurs on the west-facing slopes of Camels Hump and the mountains to the south. The numbered sites are the location of low damage (sites 1, 2, and 3), medium damage (sites 4 and 5), and high damage (sites 6 and 7) study areas selected on the basis of detailed ground assessment prior to the overflight. The lettered sites were selected for subsequent ground study. Sites A–D are conifer areas while E and F are hardwood stands.*





**B**

T. Scherbatskoy/University of Vermont

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**D** *There has been an alarming dieback of trees on New York's highest mountain (Marcy) and other high peaks of the Adirondack Park over the past half-dozen years. The grey tree "skeletons" are primarily the remains of red spruce.*

Michael Storey/Adirondack Park Agency





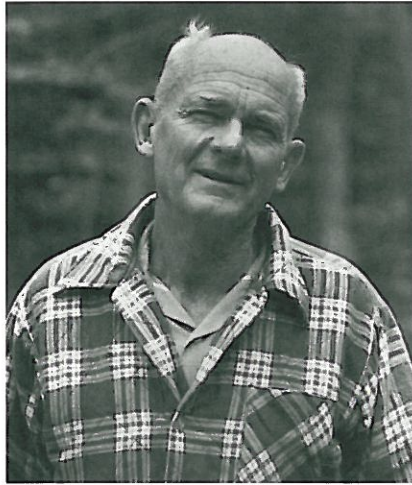
# *The Experience of Three*

## *Who Know and Love The Adirondacks*



*The acidification of Big Moose Lake in the Adirondack Park has caused hardship for many. Fishermen no longer flock to the surrounding inns and camp owners worry about heavy metals in their drinking water. Liming was tried in one of the large bays, but after a year or so the pH dropped back to its previous critical level. Poor lasting ability and high costs made the liming program impractical.*





*C. V. "Major" Bowes came to Big Moose Lake in the Adirondacks in 1951, when fishing was good and waterfowl were plentiful. Big Moose Lake teemed with all kinds of aquatic life.*

## Another American Tragedy

When Grace Brown's body, with its yellow skin and half-opened eyes, was pulled out of Big Moose Lake in the Adirondacks in the summer of 1906, her death and the events leading to it became the subject of Theodore Dreiser's famous novel, *An American Tragedy*. Eight decades later, Big Moose Lake is the scene of a second and far more pervasive American tragedy. This time the victim is the lake itself, an aquatic ecosystem in collapse.

When Chester Gillette rowed his lover, Grace, along the southwest shore of Big Moose, he apparently had murder on his mind. Had he been fishing instead, he might well have caught brook trout, white fish, landlocked salmon, or lake trout. Today, Chester would be out of luck. The acidification of Big Moose has very nearly exterminated these fish. Crayfish, freshwater shrimp, frogs, hooded mergansers, and otters are rarely seen. All that thrives there now are perch, bullheads, and mud fish. Like hundreds of other Adirondack lakes, Big Moose is the victim of acid rain!

Several years ago, from the top floor of the old main hotel at Covewood Lodge on Big Moose Lake, the young daughters of "Major" and Diane Bowes, the proprietors, called down to their folks: "Please bring up some good tasting water."

"What kind of nonsense is this?" thought their parents. "They're drinking the same good water as we are."

A short time later one of the daughters suffered stomach upset and diarrhea. The Bowes had their water tested. The findings showed five times the lead fit for human consumption, and revealed copper contamination as well! The acidified water was leaching copper out of the pipes and lead from the solder joints. The copper also caused problems with Covewood's sewer system by destroying the necessary anaerobic bacteria.

About that time, state fishery and biology experts had concluded that the demise of fishing in Big Moose was not, as previously believed, the result of tannic acids from beaver activity and forest decay. It was due to acid precipitation.

The Bowes have added limestone to their drinking supply to make it healthful again. But others, unknowingly, continue to drink water laced with heavy metals.

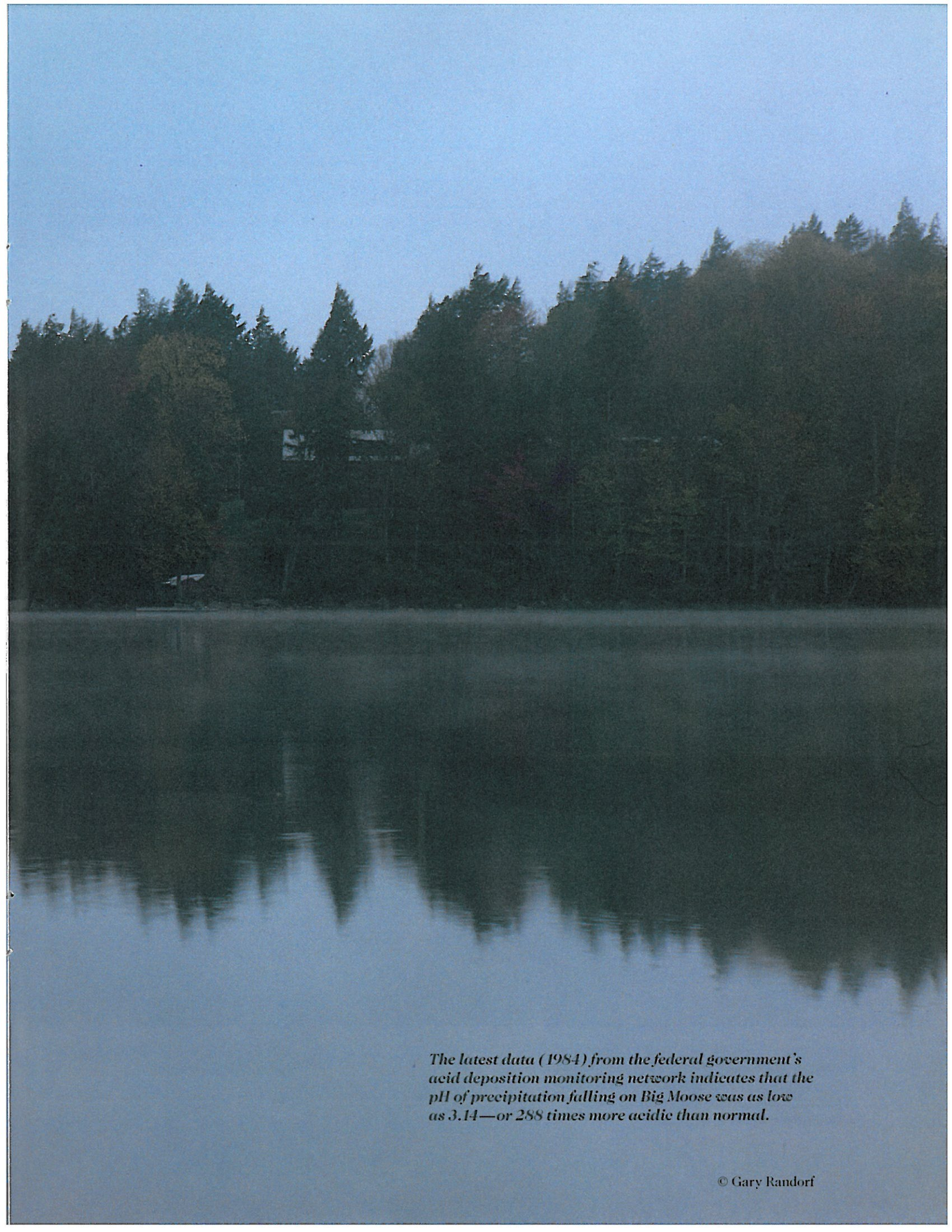
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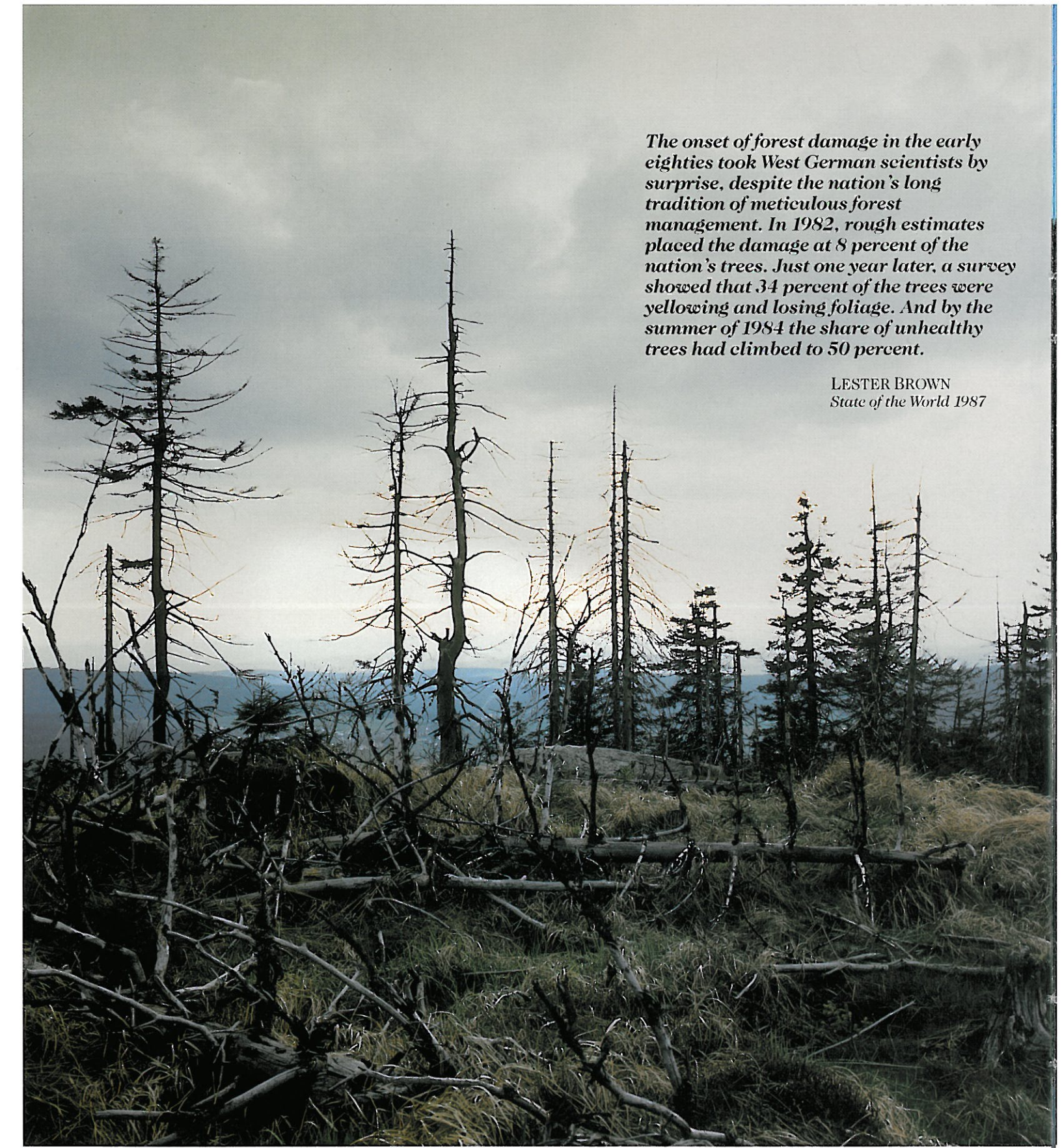
*One of several inlet streams that feeds Big Moose Lake. As in many mountainous areas of the U.S., soils are thin and bedrock is granitic. The land has little ability to neutralize the acids which are deposited from the sky.*





*The latest data (1984) from the federal government's acid deposition monitoring network indicates that the pH of precipitation falling on Big Moose was as low as 3.14—or 288 times more acidic than normal.*





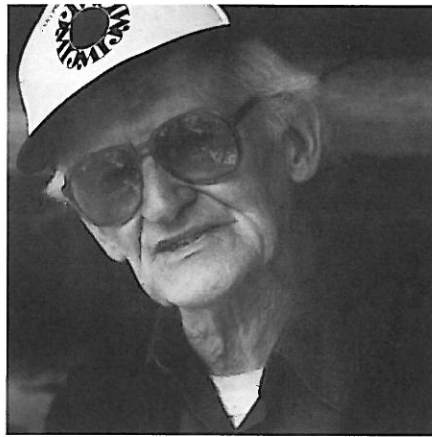
*The onset of forest damage in the early eighties took West German scientists by surprise, despite the nation's long tradition of meticulous forest management. In 1982, rough estimates placed the damage at 8 percent of the nation's trees. Just one year later, a survey showed that 34 percent of the trees were yellowing and losing foliage. And by the summer of 1984 the share of unhealthy trees had climbed to 50 percent.*

LESTER BROWN  
*State of the World 1987*

*This should be a clear warning to Americans. Scientists such as Dr. Hubert Vogelmann of the University of Vermont calculate that North America is only a few years behind the devastated condition of Europe!*

Karl Peters/Nuclear Research Laboratory  
Jülich, West Germany





*Ray Fadden founded the Six Nations Indian Museum in Onchiota, New York. He spends more time watching the trees and wildlife in his neck of the woods than most people spend watching TV. He sees an environment in trouble.*

## What Do Rainbows Bring?

Sitting across the kitchen table from Ray Fadden in his modest home in Onchiota (an Indian name meaning rainbow), you know that his clear, twinkling eyes have seen many changes come to this quiet corner of the Adirondack Mountains. Ray is an observer. He is outside every day observing, as he replenishes his 225 wildlife and bird feeding stations. And what he sees saddens and sickens him. Fadden is a gentle, soft-spoken man who is angry and frustrated at the government's failure to enact legislation to shut off the acid rain.

Ray, who founded the Six Nations Indian Museum in Onchiota, is married to and thinks like an American Indian. He feels a kinship with the natural world. And so it grieves him to see its collapse—to watch the steady, tragic decline of fish, mink, otters, loons, blue herons, toads, frogs, and darned needles.

"Half of the birds and wild animals are gone, and the rest could follow," he says. "The forest is ailing. The cores of young evergreens are rotting. I have to really scrounge now to find cones and seeds."

He has recently read in the newspapers that electric bills will rise if acid rain controls are enacted. "So what?" he asks incredulously. "Isn't it worth it to save the earth?" In the 60s and early 70s he was shocked by the environmental damage wrought by hardcore pesticides, particularly DDT. (For years DDT had been placed in surrounding streams to kill blackfly larvae.) About the time the residual effects of DDT were finally lessening, the more pervasive and insidious acid rain began taking its toll. Onchiota rainbows now signal devastation. Pots of gold are a thing of the past.

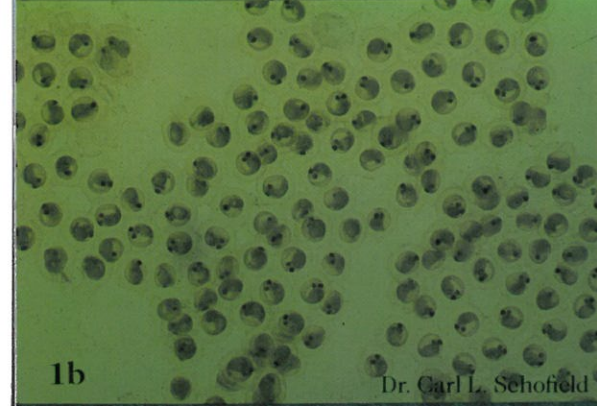
Ray Fadden is a perplexed man. "Why haven't we learned from Europe and Canada, and realized where we are headed? Why don't we think about the future and what will happen to our children and grandchildren?"

Despite the sickness of his environment, Fadden still feels fortunate. Bears occasionally come to his back door and birds eat out of his hand. And if you want him to share his wisdom before an audience, he will not ask for payment. But he *will* ask you to contribute to his larder of sunflower seeds and cracked corn for the birds, squirrels and chipmunks—to help sustain nature through these troubled times.



1a

Dr. Carl L. Schofield



1b

Dr. Carl L. Schofield

**1a** Yellow perch larvae in the process of hatching in neutral Moss Lake.

**1b** Yellow perch eggs from the same parents as those shown in 1a that were transferred from Moss Lake to acidic Big Moose Lake shortly after fertilization. Embryos are at same stage of development as in Moss Lake. However, larvae are compacted, deformed, and unable to hatch as a result of acidity-induced rigidity and loss of elasticity of the egg membranes.



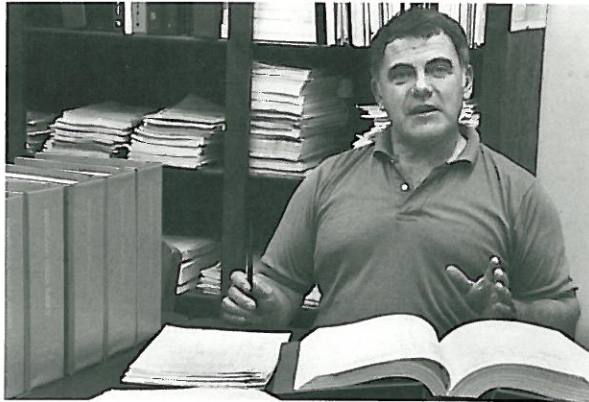
**DEADLY BLUE:** Honnedaga Lake lies deep in the woods in the southwestern Adirondacks. It is dead because of acid rain. The strange blue color results from the absence of plankton and other microscopic life.

© Gary Randorf

**2a** Electron micrograph of a section of gill from a young brook trout held in neutral Adirondack stream water.

**2b** Electron micrograph of a section of gill from a young brook trout held in acidic Adirondack stream water. Note erosion of gill tissue and coagulum of mucous and cellular debris between gill filaments and lamellae. This damage was caused by high aluminum concentrations in the acidic stream water.





*Walter Kretser heads up the Adirondack Lakes Survey of 1,200 waterbodies. Of the first 827 surveyed, 230 are dead and fishless. Kretser found more dead lakes in 1986.*

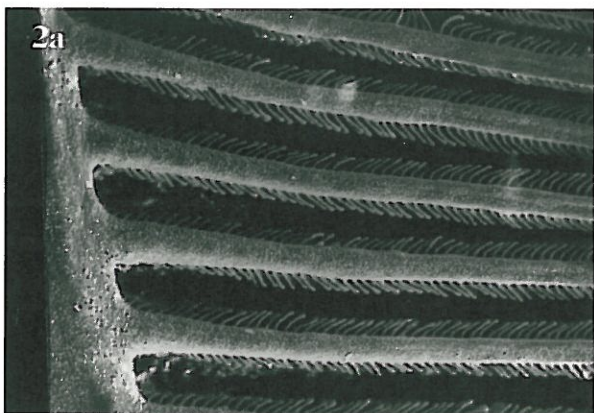
## Collecting the Evidence

**T**he last two times I visited Walter Kretser, the forester-biologist who directs the Adirondack Lakes Survey, I toted away almost more data than I could carry. These 80 pounds of fine print describe in great detail the physical, chemical and biological condition of 827 Adirondack lakes and ponds. A total of 1,200 will be surveyed over three years. The study was prompted by earlier investigations that found a number of Adirondack lakes so acidified as to be devoid of fish.

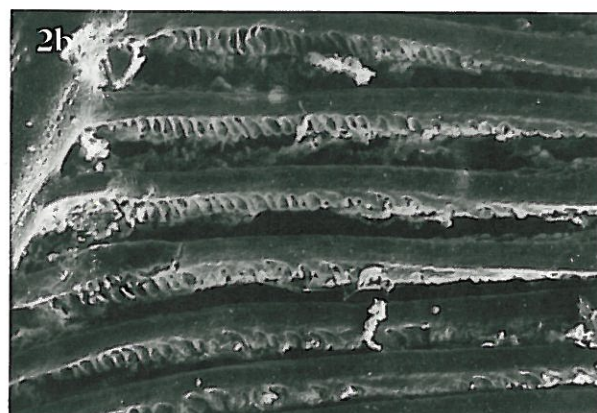
Of 404 waterbodies examined in 1984, approximately 34% had a pH of 5.0 or less, the "critical" level below which most species of fish and other aquatic life cannot survive. Netting failed to turn up any fish in 33% of the waters investigated. Of 423 additional lakes and ponds examined in 1985, 22% were found to have a pH of 5.0 or less. Intensive netting efforts failed to turn up any fish in 23% of the waters.

Thus 230 of 827 lakes were pronounced virtually dead from acidification. Walter Kretser, who has evaluated Adirondack waters since 1978, found more dead lakes this past summer (1986). And he knows that more will die.

Kretser worries even more about the condition of forests than aquatic ecosystems. For the future of forests is even more uncertain. Kretser wonders about the impact of acidification on forest soils and the loss of nutrients and trace elements essential to healthy forests. One thing is certain, however the longer Congress and the Administration procrastinate, the greater will be the risk and the damage.



Dr. Carl L. Schofield



Dr. Carl L. Schofield



# *A Final Plea*

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*On Hurricane Mountain in the Adirondack Park, fog, mist and clouds drench forests with moisture more acidic than vinegar.*





© Gary Randorf



© Gary Randorf

**T**he Adirondack Park is a blend of mountains, rivers, lakes, valleys, forests, and wetlands that is unmatched anywhere on earth. State-owned lands within the Park constitute the “forever wild” Adirondack Forest Preserve. The Adirondack Park itself was established in 1892. Two years later, the Forest Preserve was given permanent protection under the state’s constitution. In 1973, the Park’s private lands came under the most comprehensive statewide zoning ever imposed on so wide a geographic area. Taken together, the Park’s 2.5 million acres of Forest Preserve and 3.5 million acres of privately-owned lands make up the largest park outside of Alaska.

The Adirondack Park is the East’s last great wilderness. And today it is a wilderness under siege.

Acid rain is falling on vast areas of the United States. The damage is widespread and it is worsening. Monuments and stone buildings are being eroded, soil nutrients and minerals are being leached away, waters are acidifying (sometimes poisoning drinking water supplies with toxic heavy metals), and sulphate particles are exacerbating respiratory ailments in human beings. The contaminated air has also impaired visibility—from the “Arctic haze” to the dirty brown pall over Lake Champlain.

For several years, scientists have recognized the cause, effects, and severity of acid rain, and they have recommended controls over the industrial and automotive emissions that cause the problem: sulphur dioxide and nitrogen oxides. In public opinion polls, most Americans accept the recommendations of these scientists. The great majority of Americans want clean air and are willing to pay the cost of higher utility rates to achieve it.

In areas of the United States and Canada most affected by acidification the pH is often below 4.3. This is twice as acid as the critical level of 4.6 to 4.7 set by the National Academy of Sciences. Acid deposition needs to be reduced in these areas by at least 50 percent. Legislation to achieve such a reduction has been introduced. The cure is available and affordable; the necessary emission controls can be implemented in a fair and efficient manner.

**So please, Congress and Administration, let’s get on with it. It’s time to get in step with the nation’s top scientists and the American public. We have no more time to lose!**



# *The Adirondack Park*



© Gary Randorf

**I**n size, diversity and ownership pattern, the Adirondack Park is unique in the United States.

The Park contains six million acres and covers one-fifth of New York State. It is equal in size to neighboring Vermont. The Park is home for 120,000 permanent and 210,000 seasonal residents, and hosts an estimated nine million visitors annually.

The western and southern Adirondacks are a gentle landscape of hills, lakes, ponds and streams. In the northeast are the “high peaks,” 42 of them above 4,000 feet, nine of them with alpine summits.

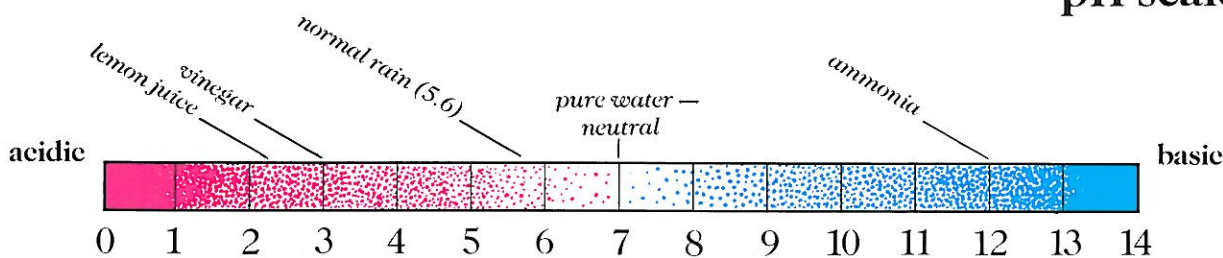
The Adirondacks form the headwaters for most or part of five major drainage basins: Lake Champlain and the Hudson, Black, St. Lawrence and Mohawk Rivers. Within the Park are 2,759 lakes and ponds and more than 1,000 miles of rivers fed by an estimated 30,000 miles of brooks and streams.

The Park offers superb opportunities for boating of all kinds, camping, hiking, mountaineering, hunting, fishing, swimming, bicycling, nature photography, downhill and cross-country skiing, ice skating, ice boating, horseback riding, and scenic motoring on some of the nation’s loveliest highways and backroads.



# Acid Rain Primer\*

pH scale



## What is Acidic Rain?

Natural rain is slightly acidic. It dissolves atmospheric carbon dioxide to form weak carbonic acid. Rain is also affected by natural air pollution from volcanoes, sea spray, and blowing soil.

Acid rain, however, is more acidic than normal because of sulphur dioxide and nitrogen oxide pollution.

Coal and oil burning, ore smelting, industrial furnaces and petroleum refining all create sulphur pollution. Vehicle exhausts and fossil-fueled power plants emit nitrogen pollution.

A 1983 U.S.-Canada report shows that human activity produced 50 million tons of acid-rain-causing air pollution in 1980: 43.4 million tons by the U.S. and 6.6 million tons by Canada.

## How is Acidity Measured?

The acid level of a solution is measured in pH units on a scale from 1 to 14. The lower the number, the more acidic the pollution. A pH of 7.0 is neutral, being neither acidic nor alkaline. A decrease of one unit represents a tenfold change in acid content. For example, a lake that measures pH 6.0 contains ten times more acid than a lake with a pH of 7.0. Pure water, in equilibrium with carbon dioxide in the atmosphere, has a pH of about 5.6. This is regarded as the normal pH value of rainfall in the absence of other chemical influences.

The pH of polluted rainfall may be as low as 3.0—or 400 times more acidic than normal rainfall.

Acidic precipitation evolves in three stages: 1) sulphur and nitrogen are emitted; 2) long-range atmospheric transport allows the transformation of oxides into acid; 3) the precipitation falls to earth in rain, snow, dry particulates, ash or gases.

## Why is Acidic Precipitation a Problem?

Acidified waters threaten many fish species by disrupting spawning. Acidification leads to aluminum poisoning of fish. Acidification also kills aquatic life that fish feed on. Heavy metals such as mercury, cadmium and lead can be found in high concentrations in fish from acidified waters, making them unfit for human consumption.

Fish may be destroyed by acid shock during spring run-off when the pollutant-laden snow suddenly melts into waterways. Heavy rainstorms can also cause acid shock.

Acid rain harms forests, vegetation, paint, buildings, cars, historical statuary, and human beings with respiratory ailments.

The damage documented in northeastern North America, Canada, Europe, and Asia shows the need for quick abatement action. The worldwide use of coal and petroleum has increased greatly since the end of the Second World War. Special control measures are necessary to reduce fossil fuel emissions to prevent what may be irreversible damage to the environment.

\*Source: *Countdown Acid Rain*, published by Ontario Ministry of the Environment.





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Dr. Richard Klein  
John Shaw  
Michael Storey  
Dr. Bernhard Ulrich



*On closer examination, the use of the environment  
as a free garbage dump reveals it  
is only free in the eyes of the polluter.  
The costs of pollution are being paid  
by the tourist operators who are losing their jobs,  
by reduced property values, impaired human health  
and, more importantly, the destruction of  
the most important resource we have—  
the fragile environment on which we depend.*

Waterloo Public Interest  
Research Group





*Big Rock Lake lies at 2,300 feet elevation in the Adirondack Mountains. Many lakes above 2,000 feet are particularly vulnerable to acid rain since they often have small watersheds and are surrounded by thin and rocky soils.*

© Gary Randorf