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T. Pawlick, A Killing Rain, The Global Threat of Acid Precipitation

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Book Review

A KILLING RAIN, THE GLOBAL THREAT OF ACID PRECIPITATION

By Thomas Pawlick. San Francisco, California: Sierra Club Books, 1984. Pp. 206. $14.95.

There seems to be no end to books about acid rain. At least five, including one co-authored by this reviewer, have appeared in the last few years. Now the latest entry in the field is *A Killing Rain, The Global Threat of Acid Precipitation* by Thomas Pawlick, a U.S. born journalist now living in Canada.[1]

As one might expect from the title, Mr. Pawlick has a definite point of view to offer. His writing has a vigorous prosecutor's edge to it. On occasion he appears to overstate the actual damage by presenting suspected damage as confirmed fact (for instance, his assertion that acid rain causes the death of trees and sensitive crops is, as of yet, unconfirmed by scientists). Overall, Pawlick succeeds in his case of demonstrating the destructiveness of acid rain through graphic descriptions of the damage done by acid rain.[2] Acid rain does pose problems of appalling dimensions in North America and Europe, and if hard-hitting books on the subject proliferate, it is because the stakes are enormous and the politicians are unable or unwilling to act.

Some knowledge of basic chemistry is essential in understanding the acid rain phenomenon. Acid rain is the popular name for what is also known as acid precipitation or acid deposition. By whatever name, it is set into motion by the combustion of fossil fuels that emit sulfur and nitrogen oxides into the atmosphere. Power plants, industrial boilers, smelters, refineries and motor vehicles are the main sources. Aloft in the atmosphere, these oxides can be converted to sulfuric

1. Thomas Pawlick, A Killing Rain, The Global Threat of Acid Precipitation (1984).

2. *Id.* at 13.

and nitric acids. When they fall to earth, they can have a devastating impact on sensitive lands and waters that have little total alkalinity or buffering capacity. These lands include much of the north eastern quadrant of North America, as well as the southern Appalachians, northern Minnesota and Wisconsin, the Rockies, the Sierra Nevadas and the Cascades.

Acidity is measured on the pH scale which runs from zero to fourteen. Seven is the neutral point, with every number above being increasingly alkaline and every number below being increasingly acidic. The pH scale is logarithmic, and thus pH 5 is ten times more acidic than pH 6, and pH 4 one hundred times more acidic than pH 6.

"Ordinarily," Pawlick writes, "unpolluted rainfall in most temperate regions is usually mildly acidic—around pH 5.6—due to the presence in the air of small amounts of naturally formed carbonic and acetic acids. Both are relatively weak compounds whose effects are easily offset, or buffered, by the normal alkalinity of lakes and soils. Sulphuric and nitric acids, in contrast, are strong inorganic compounds whose presence can drastically lower pH and whose effects are not easily neutralized. Only an area with a relatively thick organic humus layer, or one formed from limestone or other calcareous bedrocks, has sufficient reserves of alkalinity to counterbalance these two inorganic compounds for more than a few years. Dissolved in rain and snow, they constitute both a quantitatively and qualitatively new force."[3]

Thirty years ago, the annual average pH of rain in the Northeastern United States had dropped from pH 5.6 down to pH 4.5-5.0. Now the average pH of rain in the region is between 4.0 and 4.3. Moreover, the acidity is spreading. By 1976, the average annual pH of rain as far south as the Carolinas and as far west as Mississippi had fallen to 4.5, and a single storm may yield rain far more acidic than the yearly average. Pawlick notes, "One storm in Wheeling, West Virginia, produced rain at an incredible pH 1.5—the equivalent in corrosive strength to the acid in an automobile battery."[4]

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3. *Id.* at 10-11.
4. *Id.* at 12.

"Gradually," Pawlick continues, "at a rate of several hundred miles every few years, a blanket of acidified air, laced with intermittent pulses of lethal potency, is spreading like an amoeba west and south across the country.

Rain, snow, fog—every form of moisture that falls from the sky east of the Mississippi—has now become acid: acid mist, acid smog, acid sleet, acid hail. Even the dust that flies is acid. Its sulphur-laden particles, described by scientists as 'dry deposition,' when they fall, contribute a substantial share to the overall burden of acidity building up on the land."[5]

And what are the effects? The most extensive documented damage has occurred to fish and other aquatic animals in vulnerable bodies of water.[6] At least nine Nova Scotia rivers have lost their Atlantic salmon, and almost a dozen more rivers are threatened. Hundreds of lakes in Ontario and the Adirondack Mountains of New York have lost their fish, and thousands of other lakes and streams are considered at risk. In Ontario alone, some estimates are that in twenty years more than 40,000 lakes could be affected.[7]

Pawlick describes people already victimized by acidification. "The fishing's gone," says Mrs. Donald Strath, a retired office worker who is selling her home on Dickie Lake near Baysville in the heart of Ontario's famed Muskoka/Haliburton vacation country, 100 miles north of Toronto.[8] The house overlooks a bay that is fouled with a dirty, slimy, greenish muck of filamentous algae.[9] The Ministry of Natural Resources identified the algae as mostly "*Mougeotia* water." By way of reassurance, the ministry noted that the algae did not pose a health problem. "I wouldn't swim in it, hazardous or not," says Mrs. Strath. John McClennan, a teacher and trap-

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5. *Id.* at 12.

6. A year ago, in an article in *Sports Illustrated,* I offered the hypothesis that acid deposition is significantly responsible for the dramatic decline of striped bass larvae and other fishes in poorly buffered tributaries of Chesapeake Bay. *See,* Robert H. Boyle, *A Rain of Death on the Striper?,* Sports Illustrated, April 23, 1984, pp. 40-54.

7. *Id.* at 18.

8. *Id.* at 17.

9. *Id.* at 15-16.

per, fished for rainbow trout on nearby Pine Lake in the 1960's. Now rainbows introduced into the lake can't even live there for twenty-four hours. Aluminum mobilized by the acid water kills them. McClennan now lives on Paint Lake, which has its own problems. Starting in 1969, he had to rake up dead bullfrog tadpoles that smelled up the beach. He no longer needs to rake; bullfrogs haven't reproduced since 1973. The lake has also lost its freshwater clams.[10] Recently McClennan received a notice, headed "BULLETIN," in huge green letters from the Ontario Ministry of the Environment warning:

> Your private water supply system draws water from a lake or well located in an acid-sensitive area. If water is left stagnant overnight, copper, lead and zinc may accumulate in metal plumbing systems. Since drinking water with high accumulations of lead may cause human disorders, a limit has been developed. . . .Cleansing, by running the tap from which drinking water is being drawn for approximately one minute, will remove accumulations of these metals from the system.[11]

But acidification can mobilize metals that affect creatures that can't read a ministry bulletin. The livers of raccoons in the region contain 4.5 parts per million of mercury, five times higher than those of raccoons in non-acidified parts of Ontario.[12] "In short," Pawlick writes, "the destruction of life in acidifying water systems is not bounded by the shoreline but spreads beyond it, in the air and on land."[13]

Acid rain is suspected of playing a role in the die-back of sugar maples in Quebec. Similar destruction of various tree species is underway in the Green Mountains of Vermont, in Czechoslovakia, Poland and West Germany, where as much as one-third of that country's forests may be affected. Although scientists are not united in pin-pointing the exact cause or

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10. *Id.* at 19.
11. *Id.* at 20.
12. *Id.* at 34.
13. *Id.* at 34.

causes, circumstantial evidence indicating sulfur dioxide as the cause of acid rain is so strong that in 1982 the West German government announced it would order a reduction in sulfur dioxide emissions.[14] The Interior Minister called the link between sulfur emissions, acid rain and forest damage "unequivocal."[15] In Canada, where one out of every ten jobs is connected to the forest industry, there was heightened concern in 1982 when the Reagan administration rejected a Canadian offer of a fifty percent cutback in sulfur dioxide emissions in both eastern Canada and the U.S.[16] Understandably, many Canadians viewed the U.S. action as one made in bad faith.

Acid damage to buildings and monuments is well documented. In Washington, acid rain has pitted the white Lee marble of the Capitol with craters a quarter of an inch or more in diameter, and the Library of Congress has installed small "scrubbers" to filter incoming air to protect its collections.[17] Pawlick quotes an engineering consultant to the Air Force who blames acid rain as one of the major sources of corrosion of B-52 bombers. The consultant states that corrosion is so bad "you can pop the rivets right out of the wings with your fingers."[18]

Pawlick admits that "the potential effects of current levels of acid rain on agricultural soils are unknown."[19] He then adds:

> But to conclude from this that no one has any inkling what acid deposition might do to soils and the plants that grow on them would be a mistake. The basic laws of chemistry, earlier studies of naturally acidic soils and the small but growing number of field and laboratory observations of actual pollution effects show that some of the impacts could be brutal.[20]

Pawlick may well be right, but his comments should be read

14. *Id.* at 49.
15. *Id.* at 50.
16. *Id.* at 181.
17. *Id.* at 94-95.
18. *Id.* at 92.
19. *Id.* at 72.
20. *Id.* at 72.

with caution.

The effects on human health may take various routes. In addition to consuming metallically-polluted water or mercury-contaminated fish, humans can inhale microparticulates of sulfate and nitrate materials that can penetrate into the lungs. Asthmatics and those suffering from other respiratory disorders are particularly vulnerable. One report cited by Pawlick blames atmospheric sulfates for approximately 187,686 deaths per year in the U.S.[21] Another report estimates that about two percent of the annual deaths in the U.S. and Canada might be attributable to atmospheric sulfur particulate pollution. The estimates vary as no hard epidemiological studies have been done, but as Pawlick concludes, "the potential for trouble is too obvious to be ignored."[22]

To a great extent the problems posed by acid rain are being ignored, at least when it comes to action in the United States. In 1982, the White House Office of Science and Technology Policy appointed a nine member committee to review the current "state of knowledge about acid rain" and to advise the president.[23] Most observers assumed that the committee would support the Reagan administration's stance that not enough is known to warrant action. The committee report stunned the White House. It stated that "the phenomena of acid deposition are real and constitute a problem for which solutions should be sought."[24] Although the committee agreed that scientific understanding of acid deposition was "incomplete," it noted, "Recommendations for inaction pending collection of all the desirable data entail even greater risk of damage. . . . It is in the nature of the acid deposition problem that actions have to be taken despite incomplete knowledge."[25]

No one knows when action will be taken. The Reagan administration continues to argue that more studies are needed

21. *Id.* at 102.
22. *Id.* at 108.
23. *Id.* at 163.
24. *Id.* at 163-4.
25. *Id.* at 164.

and it has allies in the coal and utility industries. Members of Congress are split not by party, but by region, with Democrats and Republicans from the Midwest in strong opposition to their rained-upon colleagues in the Northeast. It is probable that acid rain will only be curbed when politicians in the Middle Atlantic states and the Southeast realize parts of their region are being devastated.

A Killing Rain does a service by helping to inform the public of what is known to be at risk, and, one hopes, it will also help to hasten the day for remedial legislation. But sad to say, even if everyone in the Reagan administration and Congress agreed today on the need for action, it probably would take at least ten years to cut emissions to the no-damage level. Parts of the U.S. and Canada are in for some rough times.

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