

# Acid rain—the dangerous threat to our future

by Greg Pommen

Looking at the latest polls you will find that Canadians are growing more concerned for their environment. One aspect that is particularly worrisome is acid rain. How much do most people know about it? Fortunately we have Dr. David Schindler at the U of A, a professor of Ecology and an expert on acid rain and its effects on lakes to help us out.

He started working in 1973 with the Department of Fisheries and Oceans on their acidification project. At that time, on the logarithmic pH scale from one to fourteen, a pH of five was considered hazardous for a lake ecosystem. Their research found that a far less acidic pH of six would still cause serious harm to about one third of the species in a lake. Since then he has continued to work in the field and has been on several United States and Canadian committees on acid rain.

**What causes acid rain?** Sulfuric acid has been the most recognized component. It is a result of sulfur dioxide being spewed out by smelters, coal fired power plants, and sour gas plants and then mixing with atmospheric moisture to produce sulfuric acid. When it rains the acid then falls to earth.

The effects of the other major component, nitrogen oxide, has more complicated effects. Nitrogen oxides come mostly from automobiles, power plants, and fertilizer plants. When atmospheric nitrogen is burned with fossil fuel it often isn't burned completely and results in nitrogen oxides. Their acidic properties aside, when nitrogen oxides react with certain hydrocarbons (volatile organic emissions) from plants and other sources of combustion they produce ozone.

Ozone is a highly toxic chemical when in contact with organic tissues.

**What are the effects of acid rain?** They are numerous and far-reaching. They disturb the natural buffering of pH in lakes and cause it to gradually grow more and more acidic. The increased acidity kills some plants and small animals outright. Some species of fish popular with sport fishermen are often found to have their growth stunted and reproduction inhibited. The damage is especially severe in lakes without any limestone buffering.

The damage to terrestrial environments is often indirect and not immediately recognized. The acid causes important minerals to be washed out of the soil and away from plants' roots. This can severely inhibit plant growth. Ozone damage alone contributed to about fifty percent of the damage to the lettuce crop in California. It is estimated that about two billion dollars worth of crop damage is caused by acid rain's indirect effects in the United States.

It is hard to put a monetary value on the damage acid rain does to human structures. It causes corrosion of metal structures such as bridges, buildings and automobiles. The acid eats away at all sorts of building materials such as concrete and marble. Statues have been made unrecognizable by its effects. Severe concentrations of acid in rain has been linked to health problems in people with bronchial problems.

Most of the effects in North America have been limited to the northeastern United States through eastern Canada which are areas of heavy industrialization. Southern California is another troubled spot

with lakes in the San Bernardino Mountains being particularly hard hit. Acid rain is expected to increase in the southeastern United States with an increase of industrialization there. Most western European nations have had trouble with acid rain because of their close proximity with each other and inability to come up with any agreements on pollution controls.

Unfortunately, Alberta is projected to increase its output of Volatile Organic Emissions over the next few years.

**What can be done about acid rain?** The future may look bleak but acid rain is a relatively easy problem to solve. It is a fact that when emissions were cleaned up in areas devastated by heavy industrialization. The surrounding lakes were able to return to normal within just a few years.

Lakes that were treated with lime and chemically tested as viable started showing signs of a return to planktonic life and invertebrates. When the lakes were restocked with fish they were again able to grow and reproduce.

"We must take measures now before it's too late," says Dr. Schindler, before it becomes too expensive to reverse the effects of acid rain.

Older factories and refineries can have their sulfur dioxide emissions reduced by using low sulfur coal, coal-washing, and scrubbing filters. The only trouble is immense initial cost. Fortunately when new plants are built to replace them it is far easier and less expensive to implement control measures. The trouble is that it can take thirty or forty years for the old ones to wear out and companies are unwilling to replace them before then.

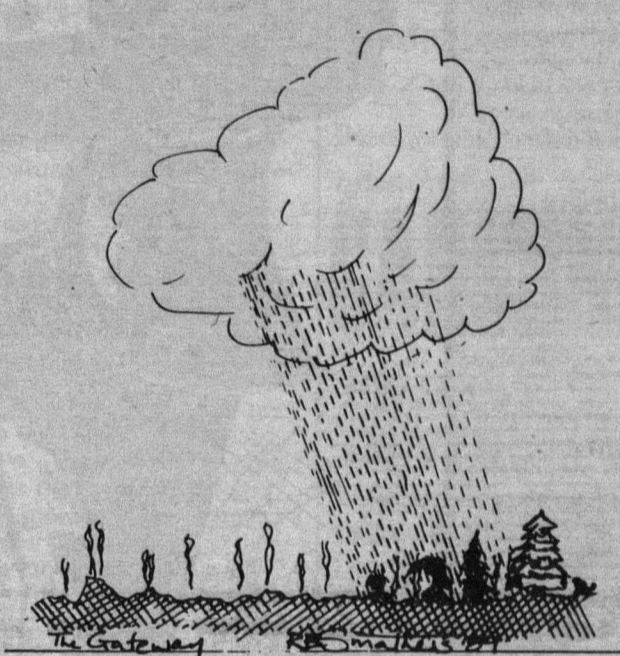
It's possible to make sure that nitrogen oxides are controlled in automobiles with catalytic converters and more efficient combustion techniques involving computer control. The United States has had some of the most stringent laws for automobiles since the early seventies which has resulted in drastic reductions in the amount of pollutants in the air. The problem is that far more cars are on the road now.

Just this spring the United States finally agreed to cut sulfur dioxide emissions by fifty percent over the next ten years. There has been some debate about just how much to cut nitrogen oxide emissions but "most people agree nitrogen oxide controls are now necessary," said Dr. Schindler, "... limits will be set within a few years."

Generally most businesses find being "green" is actually an advantage due to an improved public image. The populace at large seems to be more concerned about their environment and are doing more about it. Dr. Schindler thinks, "I'm a lot more optimistic about the future of the environment... I think this movement is going to last."

Dr. Schindler believes to clean up acid rain completely, society at all levels has to support such measures. Individuals can let politicians know how they feel and participate in programs such as recycling, using alternate fuels like methane, and public transportation. More can be done by government to set, encourage, and enforce pollution controls.

Ultimately there will have to be a move away from fossil fuels altogether possibly to hydroelectric, nuclear, solar, wind, geothermal among other power sources.



## CLUB BULLETIN BOARD / CALENDAR

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1	2	3		5 7:30 p.m. Eucharist Service at the LSC 11122 86 Ave Everyone welcome	6 Music Ed. Student Assoc. <b>OCTUBAFEST</b>	7 ESA Seminar "Testtaking Strategies" Ed South 2-135 9 am-12 Noon Nordic Ski Club Hiking Trip
<b>YOUR STUDENTS' UNION PRESENTS ENVIRONMENT WEEK OCTOBER 2-6</b>						
8 NORDIC SKI CLUB HIKING TRIP	9	10 IVCF Dagwood Supper Tory 14-14 5-7 p.m. Accounting Club C.A. Career Nite 5-8 p.m. LSC \$2.50 Dinner 6 p.m. Topic: Reformers	11 ESA Speaker "Teachers and the Law" Circle K General Meeting 270A SUB 6 p.m. Objectivist Club Lecture 4:30 p.m. TB 60 LSM: Noon Table Talk 158A SUB	12 Linguistics Info Exchange Meeting 3:30 p.m. AH-4-70 7:30 p.m. Eucharist Service LSC 11122 86 Ave. Social time after worship	13 ESA Volunteer Student Teaching Appl. Deadline Circle K - Kiwanis Apple Days Ag Eng Club- Steak Fry 7 pm-1 am. Duggan Hall Dental Stud. Assoc. Cheer Challenge after Game	14 Ling. Info. Exch. Potluck BBQ 2:00 Hawrelak Park ESA Workshop- Improve Study Skills Ed. S. 2-135 9-12 Noon Circle K - Kiwanis Apple Days VACS Programming Contest 9 a.m. Phi Delta Theta Presents The Tragically Hip 8:30 p.m. Dinwoodie
15 7:30 p.m. Communion Service St. Joseph's Chapel Social time after worship Everyone welcome Lutheran Student Movement (LSM)	16 Campus Pro-Life General Meeting 1-7 Humanities 5 pm African Educational Foundation hosts World Food Day Teleconference 9 am-Noon Myer Horowitz Theatre	17	18 CaPS Career Fair - Dinwoodie Circle K Free Pizza Fest 6 p.m. UACS Meeting 5 p.m. Objectivist Club "Philosophy, who needs it?" 4:30 p.m. TB 60	19 7:30 p.m. Eucharist Service LSC 11122 86 Ave. Social time after Worship	20	21
22 7:30 p.m. Communion Service St. Joseph's Chapel Social time after worship Everyone welcome LSM	23	24 IVCF Dagwood Supper Tory 14-14 5-7 p.m. 6 p.m. \$2.50 Dinner at LSC	25 LSM Table Talk in Meditation Room 158A SUB Bring your lunch & join the conversation	26 Vesper Service 7:30 p.m. LSC 11122 86 Ave. Everyone welcome. Doughnuts & conversation follows the service.	27 ESA Presents <b>Doug and the Slugs</b> 8:30 p.m. Dinwoodie	28 Dance Club Halloween Dance 7:00 p.m. Dinwoodie Circle K Fireburgerama Walk for CNIB
29 7:30 p.m. Special Reformation Communion Service St. Joseph's Chapel Social time after worship Everyone welcome LSM	30 Campus Pro-Life General Meeting 1-7 Humanities 5 p.m.	31 Circle K Halloween with the Kids at U of A Hospital 6:00 Halloween Special \$2.50 Dinner at LSC Join the "Great Scavenger Hunt"	<b>CLUBS AND FACULTY ASSOCIATIONS: THIS SPACE IS FREE! CONTACT JEFF EDLUND AT 492-4236 OR 270 SUB FOR INFORMATION ABOUT GETTING YOUR CLUB ON HERE OR FOR INFO ABOUT ANY OF OUR CLUBS</b>			