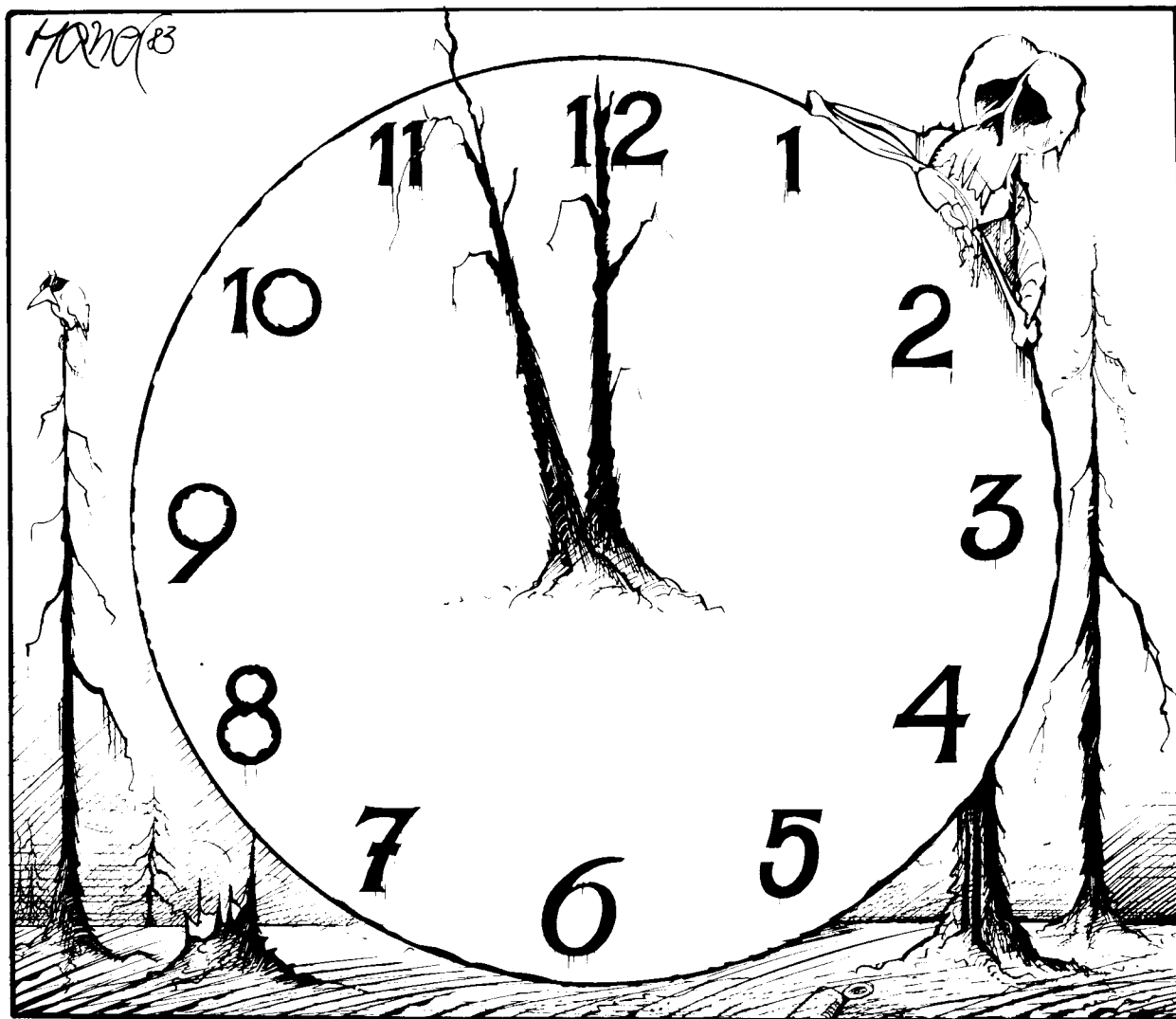


Acid News

No 1, March 1985

A Newsletter from the Swedish and Norwegian NGO Secretariats on Acid Rain



International Acid Rain Week

The third week in April will be the time for a concentrated drive to stir up opinion for a reduction of pollutant discharges into the atmosphere — in order to save our forests and check acidification of the environment.

The effect of concerted action last year was encouraging — not least on account of the coverage gained in the media. Such publicity is essential if we are to suc-

ceed in bringing home our message both to the public and to those in authority.

As previously, the success of the campaign week will be almost entirely dependent on the efforts of the various organizations. Each organization must decide what it will or will not do at the level on which it operates, whether local, regional, national, or international.

Mass mailing of postcards

Such mailings are already being organized in several European countries. The usual method is for organizations to distribute pre-addressed cards with a pre-printed text to their members, by enclosing them for instance with their periodicals. The distribution can of course be extended to other persons as well. In any



Acid News

A newsletter from the Swedish and Norwegian NGO secretariats on acid rain.

ACID NEWS is a newsletter produced jointly by the Swedish and Norwegian secretariats on acid rain. The secretariats' and the newsletter's main task is to provide environmental and nature conservation organisations and others with information on the subject of acid rain and acidification of the environment.

Anyone who is interested in these problems is invited to contact the secretariats at the address below. Any questions or requests for material will be dealt with to the best of our ability.

In order to make Acid News interesting, we are dependent on information on what is happening elsewhere in the world. So if you read or find out about something which might be of general interest, please write or send us a copy of it.

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THE SECRETARIATS

The Norwegian secretariat, "The Stop Acid Rain Campaign/Norway", is organized by six non-governmental organisations concerned with the environment:

- Nature and Youth (Natur og Ungdom)
- The Norwegian Forestry Society (Det Norske Skogselskap)
- World Wildlife Fund/Norway (Verdens Villmarksfond)
- The Norwegian Association of Anglers and Hunters (Norges Jeger- og Fiskeforbund)
- The Norwegian Society for Conservation of Nature (Norges Naturvernforbund)
- The Norwegian Mountain Touring Association (Den Norske Turistforening)

Address:

The Stop Acid Rain Campaign/Norway
P.O. Box 8268, Hammersborg
N-OSLO 1 NORWAY

Telephone: 02-42 95 00

"The Swedish NGO Secretariat and Acid Rain" is organized by four non-governmental organisations concerned with the environment:

- The Environmental Federation (Miljöförbundet)
- The Swedish Angler's National Association (Sportfiskarna)
- The Swedish Society for the Conservation of Nature (Svenska Naturskyddsföreningen)
- The Swedish Youth Association for Environmental Studies and Conservation (Fältbiologerna)

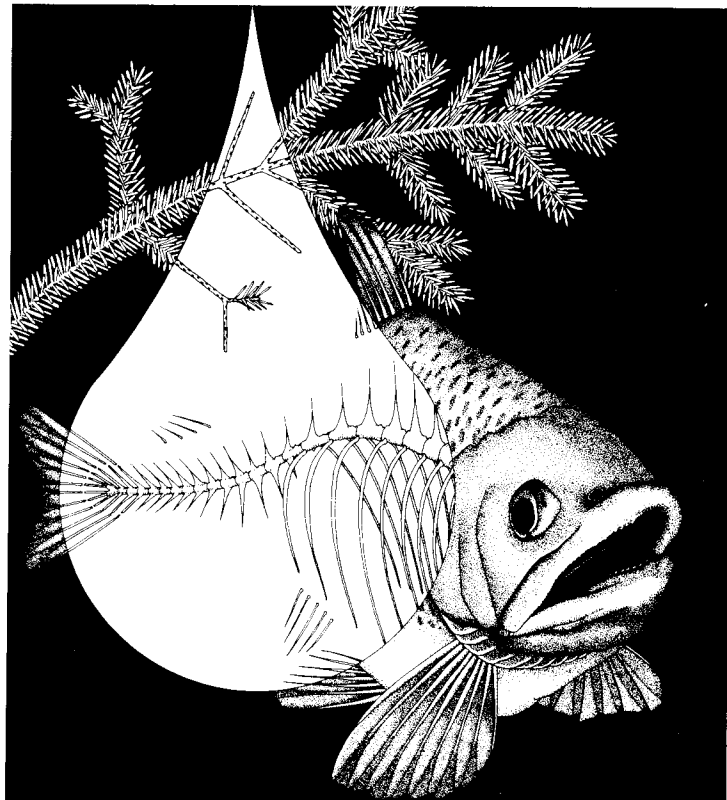
Address and telephone: see above!



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International Acid Rain Week

April 15-21, 1985



Drawing: Jan Veuger/IVF

→case all anybody needs to do is to sign and mail the card. The cards are best addressed to the heads of state in those countries that are responsible for most of the pollution landing in the senders' environment.

An even more effective method would of course be to write personal letters urging a reduction of emissions.

Effects already seen

As a result of last year's efforts we could note considerable progress in the form of increased public awareness as well as increased activity on the part of those who can influence opinion. A start has been made on reducing emissions, especially of sulphur dioxide, in several countries. In most European countries there is now a general awareness of the necessity for reductions; the question is simply how much and how quickly.

On the other hand there is, we regret to say, still a marked reluctance in most countries to tackle the whole problem of air pollution — to set going definite schemes for reducing all the various pollutants that contribute to

forest dieback and the general acidification of the environment. This applies above all to sulphur and nitrogen oxides, hydrocarbons, and heavy metals.

The fact also remains that there is all too little understanding of the long-term problems, requiring international solution. It must be asked, and asked again, whether we have the right to completely plunder the limited resources of our planet in the form of raw materials and fossil fuels in the course of a few generations — leaving a ravaged and polluted environment to our successors.

We have this in view, too, when we now seek to mobilize effort in a drive against air pollution. Our hope is that as many organizations as possible that are engaged in conservation or protection of the environment will take action to draw attention to the connected problems of air pollution, acidification, and forest damage during the Acid Rain Week in April.

Every single organization is an important link in the chain. Let none snap off!

Christer Ågren

Tips on Activities

Collaborate!

- ☐ Start up "Stop Acid Rain" **working groups**, whenever possible in collaboration with other organisations.

Gather facts and acquire know-how

- ☐ Collect and **study** the information material available.
- ☐ Invite people with a knowledge of the subject to give **lectures** at your meetings.
- ☐ Carry out your own **investigations**, making for instance:
 - * Inventories of lichens, which give an indication of the quality

of the air.

- * Inventories of the damage to forests.
- * Investigations of lakes and streams.
- * Tests of drinking water.

Assemble the available facts together with lists of information material, tips on activities, etc., in order to **make a "Guide to Activities"**.

Create opinion

Present the results of your studies and investigations to the general public, e.g. in the form of an **exhibition** or **articles in the press**.

- ☐ **Arrange excursions** for politicians, officials, and the general public to affected areas. Demonstrate the effects, and present proposals for action.

☐ Call on **local politicians**, and put forward your demands.

☐ Arrange **lectures**, and show slides and films for the general public.

☐ Organise **hearings** with politicians and decision-makers, panel debates, and similar arrangements for the general public.

☐ Write **letters** and send **articles** to the newspapers.

☐ Work out an **alternative energy plan** for local authorities.

☐ Draft a **local "sulphur budget"**

By charting your local emissions of sulphur dioxide and comparing them with the fall-out, you can see whether there is a net export or import of sulphur pollutants. This will also give you information as to those responsible for the major emissions, which will in turn show you where pressure has to be brought in order to reduce the emissions.

☐ Arrange a **"tips on pollution" walk**, a nature trail, for the general public. Put questions on the subject of acidification and air pollution.

☐ Act publicly!

* **Disseminate information** at public places.

* **Disseminate picture postcards** with preprinted addresses to the governments both of your own country and the countries causing the most pollution in your country.

* **Plant a dead forest** in the middle of town, and spread information to passers by.

* **Protect** trees, statues, buildings etc., from air pollution, by covering them with protective fabric. Be careful to explain just what you are doing and why.

In the back issues of Acid News you will find further tips in the descriptions of actions carried out in a variety of countries. Good luck!

Christer Ågren



Photo: Dan Rapp

"A fool sees not the same House of Commons

The story so far: Britain, the largest producer of sulphur dioxide in western Europe and one of the biggest emitters of nitrogen oxides, has steadfastly refused to acknowledge the scale and severity of acid pollution, and is one of the six remaining West European countries which are not taking deliberate action to reduce acid rain. The British Government has taken a stance that more research is needed before costly remedial action is taken. The British Department of the Environment has confidentially advised that the UK should join the 30-per-cent club, but has been overruled by the Treasury and the Prime Minister.

In the meantime, the House of Commons Select Committee on the Environment had decided to study acid rain. The Committee, consisting of seven Conservative MPs, three Labour, and one Liberal, visits Germany and Scandinavia and commissions reports from the surveyors of several of Britain's cathedrals and historic monuments. These reports indicate that buildings in Britain, including York Minster, Lincoln Cathedral, Westminster Abbey and St Paul's are suffering severe corrosion from acid rain. The reports, together with the evidence presented both in the UK and abroad, lead the Committee to a unanimous recommendation that the UK should join the 30-per-cent club and also support the EEC draft directives on the limitation of emission of pollutants into the air from large combustion plants. The Government refuses to accept these two recommendations, but promise the Committee that the issue would be debated in the House of Commons.

Party political issue

The Government is embarrassed over the subject of acid rain: it is an accepted view in Westminster

that the "green vote" will be increasingly important in the next general election, and all the political parties are trying to identify themselves with the environmental approach. The costs of desulphurisation have, however, fallen foul of the Government's commitment to control of public expenditure — and the last thing that the Conservatives wanted was a recommendation by a Conservative-dominated committee that the UK should join the 30-per-cent club and support the EEC initiatives. This embarrassment has been compounded by the enthusiastic adoption of the Committee's recommendations by the Labour, Liberal, and Social Democratic parties. Acid rain has now become a party political issue.

Debate

The sensitivity of the debate was highlighted by its timing — at 9.30 a.m. on the first Friday of the new session, two days after Parliament had re-opened. Many MPs from the outlying areas of Britain had not returned from their Christmas break. Nevertheless, there was a five-hour debate at which twenty parliamentarians spoke. The Government's case was put forward by the Under-Secretary of State for the Environment, William Waldegrave, and wound up by the Under-Secretary of State for Scotland, Michael Ancram. Of the eighteen other speakers (nine Conservative, seven Labour, one Liberal, one Scottish Nationalist), only one supported the Government's position.

The Government's case is that more research needs to be done, that the UK has reduced its SO₂ emissions by 40 per cent since 1970 of which 20 per cent since 1980, and that it would achieve a further ten per cent reduction on this figure by 1999, that the damage to lakes in Scandinavia may

be linked to sulphur dioxide emissions, but that the destruction of the European forests is primarily an ozone-linked phenomenon that could not be solved by reductions of SO₂ emissions, and that the damage to historic monuments that the Environment Committee had found was damage that had occurred until recently, but was no longer happening.

Diplomatic and economic damage

The Opposition's argument linked the current reductions in emissions with the industrial recession, and asked what would happen if the economy picked up. They further pressed the Government to explain precisely *how* the remaining 10 per cent reduction in emissions was to be achieved if the government continued to refuse the installation of pollution-cleaning machinery in Britain's power stations. They described in graphic detail the damage being done to the European environment by the continuation of this pollution, and castigated the Conservative party for ignoring the diplomatic and economic damage that was being done in western Europe. Here are some quotes to give an idea of the strength of the debate:

"The Committee commenced its inquiry with a completely open mind, and came to the unanimous conclusion that action needed to be put in hand without delay to combat the effects of acid rain... It is therefore inexplicable that the Government should refuse to accept the Committee's recommendations to join the 30-per-cent club." -Sir Hugh Rossi (Conservative, Chairman of the Environment Committee).

Chemical warfare

The Government's statement on acid rain is "contradictory, eva-

tree that a wise man sees". debates acid rain

sive, procrastinating, repetitive and, more important, completely wrong in its conclusions... In essence it is — I choose my words carefully — waging chemical warfare on our neighbours, and not only on our neighbours but on our country." -Dr David Clark (Labour, leading the Labour response).

"In a nutshell, the Select Committee asked itself what was the major cause of acid rain, who was the main culprit and what could be done to minimize the appalling damage that is being inflicted on our forests, lakes and buildings. The Committee put most of the blame at the door of the Central Electricity Generating Board. It identified its emissions of sulphur and nitrogen as a major factor..." The Government's "decision to delay will lead to irreversible damage and they will be judged as lacking responsibility and wisdom. In the case of this Government, how true are the words of William Blake, who wrote:

"A fool sees not the same tree that a wise man sees."

...the Government have allowed themselves to be wooed by Sir Walter Marshall and Peter Chester of the CEGB. The board's propaganda machine has been working at full capacity to disseminate information. In the process, it has

conned the Government." -David Alton (Liberal, member of the Environment Committee).

Action needed quickly

"The weight of evidence in Germany, Scandinavia, and the United Kingdom was that action was needed quickly if we were not to continue to pollute Scandinavia, West Germany and other parts of Europe, and if we in the United Kingdom were not to arrive in the same sort of crisis that has occurred in central Europe and Scandinavia. We should learn from what has happened there and take action before it is too late." -Allan Roberts (Labour, member of Environment Committee).

"I do not think that any of the members of the Select Committee who went to West Germany to see the results of environmental pollution there will ever forget our visit to a forest on the north west escarpment of the Black Forest, where five years ago there was luxuriant tree growth. There was a living, vital, and extremely attractive forest. That area now looks like Passchendael..."

If, as the Government and we hope, the economy shows an upturn in the next five to ten years and the recession turns round so that we have an industrial base again, what is the potential upturn

in sulphur dioxide production that the Government expect if there is not a specific effort to reduce sulphur dioxide emission at source?" -Chris Smith (Labour, member of Environment Committee).

"...pollution is wrong in principle. There is no question but that these are toxic substances, and that means that we have a moral obligation to take every opportunity to reduce the level of pollution that we are giving out." -Robert B. Jones (Conservative).

"The information that I received was from the surveyor of the fabric at York Minster. There were two specific examples. Five or six years ago, Norman stone exposed to medieval air for 200 years on the north side underneath the vergers' vestry was revealed. Although it had been covered at about 1380, during all that time there had only been a darkening of dirt. There was no erosion or decay of the stone... The second example is stone put in only seven years ago, which has already lost one eighth of an inch of its surface. This is a staggering example of what is happening to a major historical and religious building." -Conal Gregory (Conservative).

Steve Elsworth

Steve Elsworth's book *Acid Rain* was published in September 1984. It is available for 3.95 pounds from Pluto Press, 105A Torriano Ave, London NW5 2RX.

Urgent pleas to Mrs Thatcher

At their meeting in December, the prime ministers of the five Scandinavian countries united in a message to the British government, urging adherence to the so-called 30-per-cent club — the group of nations, now numbering eighteen, that have pledged a reduction of their emissions of sulphur dioxide by at least 30 per cent by 1993.

In the message the prime ministers also emphasized the need

for limiting emissions of nitrogen oxides, from stationary plants as well as from road vehicles.

Direct talks urged

In January a letter went out from the Nordic Council to the five prime ministers, referring to their message to the British government and the apparent disinclination of the latter to adopt measures for limiting the emission of pollutants. In its letter the

Nordic Council urged the prime ministers to take the initiative by proposing direct talks with the British government, concerning the possibilities of reducing emissions of sulphur dioxide and nitrogen oxides.

Speaking through its president, the Swedish MP and former Foreign Minister Karin Söder, the Council noted that the British response was highly disturbing as well as unsatisfactory.

FRG sets dates for exhaust controls

As from 1989, all new petrol-driven cars in West Germany will have to conform to the US-83 requirements, which restrict the emissions of nitrogen oxides, hydrocarbons, and carbon monoxide. For cars with more than 2-litre engines the rules will apply a year earlier.

At present catalytic converters provide the most effective means of fulfilling the US-83 requirements. In order to hasten developments, as from July 1985 all new cars so equipped will be free of tax for four to ten years, depending on engine size. This will mean a saving of about 3000 D-marks, which is more than the cost of a catalyzer.

Tax alleviation

There will also be tax alleviation for existing cars that have been altered so as to reduce their emissions of nitrogen oxides — those benefiting being models

from 1980 onwards. One way to fulfill the requirement will be equip cars that can run on unleaded petrol with unregulated converters — that is, catalyzers without either a sensor for detecting the composition of the exhaust gases, or the electronic equipment for controlling it. It is estimated that such a device would cost the car owner about 1500 D-marks and reduce nitrogen-oxide emissions by at least 50 per cent. The alternative would be an arrangement for recycling the exhaust gases, costing 400-500 or so D-marks. This would decrease the emissions of nitrogen oxides by about 30 per cent. It is also applicable to cars that have to use leaded fuel.

Unleaded petrol

Unleaded petrol was available here and there in West Germany as early as 1983. At the end of last year about a quarter of the

filling stations along the autobahns were selling it, and it could be had in over a hundred cities as well.

As from July 1 the tax on unleaded petrol will be reduced by 2 pfennigs per litre, and raised by the same amount on the leaded kind. It is estimated that at least a third of the 25 million passenger cars in West Germany can use unleaded fuel.

Diesel oil

West Germany is also going to reduce the maximum permitted sulphur content of light fuel oil and diesel oil from 0.3 to 0.15 per cent. The government is also considering the possibility of applying the very much stricter US-87 requirements for diesel-driven vehicles — which would mean a considerable reduction of the emissions of nitrogen oxides and soot, and thus of carcinogens.

Austria leads the way

Austria will be the first country in Europe to apply the US-83 requirements for controlling emissions of nitrogen oxides, hydrocarbons, and carbon monoxide from passenger cars, as a result of a government decision in January this year. Low-octane unleaded petrol will be on sale from April 1, and by September 30 it must be available at all of the country's filling stations. Since unleaded petrol costs rather more to produce than the leaded type, the tax on the latter will be raised so as make the prices about equal. High-octane fuel will still not be affected.

As from January 1987 all new passenger cars with more than 1.5-litre engines must fulfill the US-83 requirements. With present technology this means that

they must be fitted with three-way catalyzers, which require lead-free fuel to operate satisfactorily. The following year the regulations will be applied to small cars as well.

Encouraging car owners

In order to hasten the change-over to environmentally adapted cars, anyone buying a new car after October 1, 1985, that conforms with the US requirements will receive the equivalent of about 1000 D-marks. The amount of the premium will gradually be reduced until it disappears altogether in 1987.

Although at present the stricter controls will apply only to passenger cars, new requirements for buses and trucks are already under consideration.

EEC: Unleaded petrol from 1989

The matter of unleaded petrol and exhaust-gas cleaning was on the agenda at a meeting of the environment ministers of the EEC countries in Brussels on December 6. It was agreed that the unleaded 95-octane Eurograde should be generally available in all EEC countries as from October 1, 1989. Any member nation should however be at liberty to introduce unleaded petrol earlier if it so desired. No agreement could be reached however on stricter controls for exhaust emissions — either as regards the most suitable technical method or the date for the introduction of such controls.

At a new meeting of the environment ministers on March 8 these discussions continued, again without reaching any further agreement.

Wash it here

ACID RAIN SAVE YOUR CAR



WASH-IT-HERE

Q. What is acid rain and why should I be concerned about it?



WHY?

Environmental experts agree that acid rain is caused by rain, snow, fog, or dry particles that contain solutions of Sulphuric or Nitric acid.

Q. I am not aware of this problem in my immediate area so why should I worry?

A. Acid rain is being blown by winds everywhere and it is no longer just a regional problem. Damage to paint on cars by acid rain is a growing national and international problem.

Q. What happens if I don't do anything about this?

A. One of the concerns of the experts is that most people do not notice the damage from acid rain until there is discolouring on the bonnet and roof. This is the first stage of damage.

Q. What is the best way to prevent this damage?

A. Use your car wash at least once a week no matter what the weather because it's your best insurance policy against damage from acid rain or from rusting.

Q. Why should I take the word of the car wash operator? After all, he has a special interest.

A. Don't take just his word for it — not only are there many scientific reports under way but you must have read articles like those in The Times reporting acid rain in the U.K. being "six times as acidic as vinegar".

SO REMEMBER ... WASH-IT-HERE

"Wash it here" is the title of a campaign by the British Car Wash Association to persuade U.K. motorists to wash their cars every week at — you've guessed it — a British car wash station! Perhaps every motorist will not be persuaded that the car wash operators are as concerned about the problem of Acid Rain as readers of this newsheet

may be.

Nevertheless the campaign, whilst gaining a few more customers for the cleaning service, does provide a publicity outlet for the problem of acid rain. No doubt thousands of British motorists will pick up a leaflet when paying for their petrol and read of the problem, simply stated on the leaflet. It is probable that

many of them will not have heard of the acid rain debate before. Commercial enterprise may thus inadvertently foster greater awareness of the pollution problem. One may note that the leaflet does not indicate the source of the acidity. After all, they are selling petrol for cars as well as washing the paint work!

Philip Neal

Asylum

A group of Young Liberals applied for political asylum at the Swedish Embassy in London on 18 February. The reason given was concern about the UK's lack of environmental concern. "We are seriously worried", said Felix Dodds of the Young Liberals Ecology Group, "by our government's

lack of action on acid rain. We feel guilty about the damage we are doing to the lakes and trees of Europe. The British Government refuses to recognise the ecological disaster that confronts us." In Berlin, Young Liberals demonstrated outside the British Consulate; and similar action was taken in Strasbourg.



Luxembourg

Deciduous trees most affected

Last August a nationwide survey of tree damage was made by the forests administration in Luxembourg. It followed approximately the same procedure as in West Germany, examining stands at regular intervals and classifying the damage according to a five-degree scale.

It turned out that about 19 per cent of the trees showed signs of damage, and that 4 per cent were badly damaged. Worst affected were stands of mature trees, where almost 30 per cent were damaged.

Among the worst hit trees were beech, oak, spruce, and pine, and of the forest areas those in the southwestern parts of the country were consistently the most affected.

Since 1983 continuous observations of the damage have been made in fifteen selected stands of spruce, comprising in all some 1900 trees. In one year, from

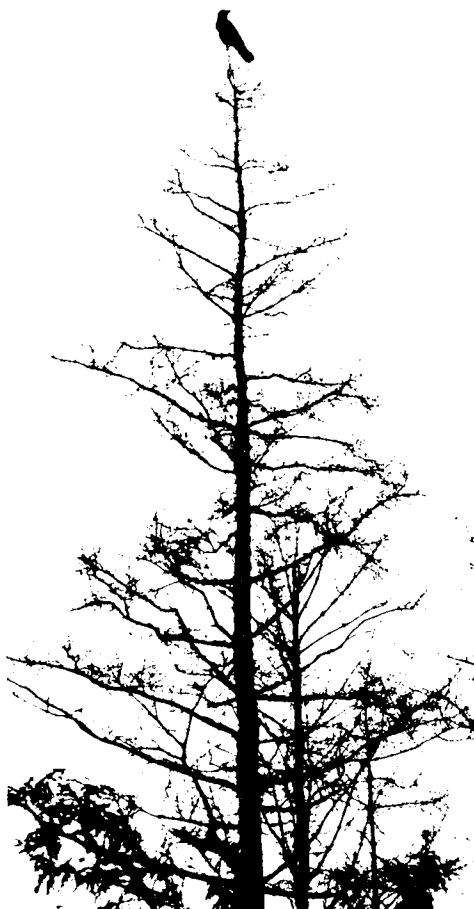


Photo: Christer Agren

September 1983 to September 1984, the proportion of damaged trees increased from about 5 per cent to somewhat more than 50 per cent. It should be noted however that these stands were selected as being on especially exposed sites.

The intention is now to follow up with a further survey, where aerial photography with infrared film will be used in order to provide a still more accurate basis on which to draw conclusions.

According to the Luxembourg report¹ the only effective way to check forest damage will be to radically reduce the emission of pollutants into the atmosphere. It adds that this will involve widespread effort — private, national, and international.

1 "Entwicklung der neuartigen Waldschäden in Luxemburg". Published by the Direction des Eaux et Forêts, Boite postale 411, 2014 Luxembourg-Ville, Luxembourg.

An unexplained blight saps maple trees

Maple syrup producers are puzzled by a new malady afflicting their trees. First leaves begin dying, then branches, and within six years the entire tree. Maples expected to live 350 years are dying before they reach 100, and they are not being replaced.

Scientists at the University of Vermont report that the number of young trees — those less than an inch in diameter — has dropped 84 percent since 1965 in their test area on Camels Hump near Burlington. This is apparently both because young trees have died and because of a decline in reproduction by older, diseased trees. The size of the

maple stand, as measured by the total volume of wood in the living trees, has declined by 25 per cent, according to botanist Hubert Vogelmann. He likens the trees' disease to "premature aging" but says that the cause is still unknown.

Two prime suspects are acid rain and the forest tent caterpillar. Arc Jones, a forestry professor at McGill University in Montreal who has detected similar problems on Canadian maple farms, says that maples are especially sensitive to acid rain and other pollutants. He suggests that pollution weakens a tree, making it unable to recover from an at-

tack of defoliating caterpillars or a spell of severe weather.

The specter of dry pancakes doesn't loom in the immediate future, though. A maple tree won't yield syrup until it is 40 years old, so the recent decline in the number of young trees has not yet affected output. Although the loss of mature trees has hurt some producers, most have compensated by moving into previously untapped forests. But as trees keep dying, Vogelmann says, "the producers are worried that in 10 years there'll be nothing left to harvest".

Science, December, 1984

Swiss in trouble too

A further investigation of forest damage took place all over Switzerland between July and September 1984. The results are to be found in a report published by Bundesamt für Forstwesen, the federal forest administration.

In this last survey some 27,000 trees were examined, on 2,500 separate sampling areas. It turned out that altogether 34 per cent were damaged, and that 8 per cent were either more badly damaged or dying. Conifers had suffered most, with 38 per cent damaged, while the deciduous trees had come off rather better, having 25 per cent damaged. Varying degrees of damage were however found in all species (see table and chart).

Only in about 2 per cent of the trees could clearly identifiable causes of damage be found, such as attack by insects or fungi, or snow breaks. This means that the remaining 32 per cent had not suffered damage from any previously known natural cause, biological or nonbiological.

The worst sufferers

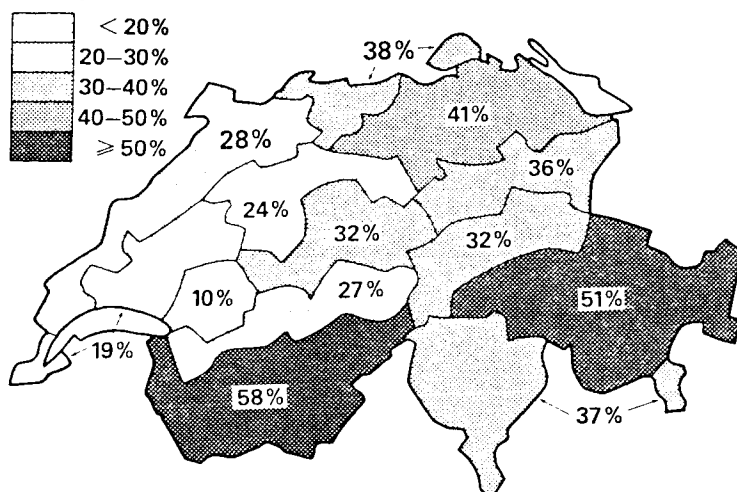
Worst damaged of the conifers were pine (53 per cent), followed by silver fir (39 per cent), larch (36 per cent), and spruce (35 per cent). Not only did pine have more damaged trees than any other sort, it also had most in damage classifications 3 and 4 (badly damaged or dead). Every fifth pine tree fell into one of these categories.

Oak was the most affected of the deciduous trees, 34 per cent showing damage. Next came beech (30 per cent), followed by ash and maple (each 17 per cent).

Most affected areas

While damage has been observed all over the country, it increases as one goes from west to east in the northern Alpine region, and the worst damage is found in the southern Alps. There, in the cantons of Grisons and Valais, between 50 and 60

Proportion of damaged trees of all kinds in each forest region of Switzerland



Extent of forest damage in Switzerland

	By classification				
	No visible damage (Healthy)	Slight damage (Sickly)	Medium damage (Sick)	Badly damaged (Dying)	Dead (Dead)
All species	65,8%	26,3%	6,8%	0,5%	0,6%
Conifers	62,4%	28,0%	8,2%	0,7%	0,7%
Deciduous trees	75,1%	21,7%	3,0%	0,1%	0,1%

per cent of the trees show damage.

Silver fir has been seen to be declining in some parts of the country during the last twenty years. Over a long period, too, damage has been noted to various species especially in Valais, probably due to emissions from local sources.

Even as late as 1982, the damage in the Swiss forests only amounted to a few per cent. In 1983 a circular was sent around, asking the local forest authorities to report on damage in their area, and from the replies it appeared that on an average 14 per cent of the forest was damaged. Then came the 1984 survey, showing 34 per cent.

This latest survey report¹ also compares the situation as it now appears in Switzerland with that

in neighbouring states of West Germany, Baden-Württemberg and Bavaria. There damage had been observed somewhat earlier than in Switzerland, and by 1982 it was estimated to be 10 per cent in the former and 7 per cent in the latter. Surveys in 1983 revealed damage amounting to 49 and 47 per cent respectively, increasing to 66 and 57 per cent a year later.

The Swiss survey employs the same classification system as in West Germany, as well as approximately the same survey method — that is, sampling at the intersection of a network with squares measuring 4 × 4 kilometres.

¹ Ergebnisse der SANASILVA Waldschadeninventur 1984, issued by the Bundesamt für Forstwesen, Postfach 1987, CH-3001 Bern, Switzerland.

New U.S. study directly links sulphur dioxide to acid rain

A study by an influential group of U.S. lawyers and scientists has found there is a direct relation between sulphur dioxide emissions and levels of acid rain that can be measured hundreds of kilometres away.

The study — by the citizens' lobby group Environmental Defence Fund — flies in the face of statements by U.S. President Ronald Reagan that more research is needed to prove the effect of sulphur emissions before action can be taken.

The Environmental Defence Fund study — completed a month ago and presented to outgoing Environmental Protection Agency Administrator William Ruckelshaus — deals specifically with pollution in the western inter-mountain "air shed" of Arizona, Colorado, Utah and Wyoming.

'Direct link'

But the findings, says co-author Michael Oppenheimer, prove the direct link between the amount of sulphur emissions and acid rain deposits.

Oppenheimer, an atmospheric physicist at the Environmental Defence Fund in New York, and Robert Yuhnke, of the organization's Rocky Mountain office in Boulder, Colo., compiled information from southwestern copper smelters and recording stations of the National Acid Deposition Program.

Using daily outflow charts available from the acid deposition program — it measures pollution deposits in any given area on a daily basis — the scientists were able to determine fluctuations in the measure of acid-rain pollutants.

These fluctuations — based on three years of data — were then correlated with smelters' operations.

The conclusion was that acid

rain pollution was worse on days of heavy smelter activity, and less on days when the smelters were operating at lower production levels.

This confirms that as much sulphur comes down in the form of acid rain as goes up in gaseous form; and that the polluting process occurs in definable areas, or "air sheds".

Canada and New England states have been demanding for years that Washington enforce its own environmental protection laws to stop the ravages acid rain causes to land, forests and lakes.

Reagan's administration, since taking office four years ago, has insisted that what goes up does not necessarily come down; and even if it does, nobody knows where.

'Spurious' argument

This argument — dismissed as spurious by the National Academy of Sciences, among others — has been used to fend off Canada and New England governors who are demanding immediate action to reduce the amounts of sulphur spewed into the atmosphere by coal-burning power plants massed in the Ohio Valley.

Using the Environmental Protection Agency to shield its inaction, the Reagan administration has insisted there is no proof that sulphur from coal-fired power plants in the Ohio Valley is responsible for the acid rain ravaging Canada and the north eastern states.

The only way to prove a cause-effect relationship, the administration has insisted, would be to shut down the power plants. Because that is utterly impractical, the administration is doing nothing, Oppenheimer said in a telephone interview from New York.

But the Oppenheimer-Yuhnke study, entitled *Sulfur Pollution Strategy for Preventing Acid Pollution Damage in the Intermountain Air Shed*, knocks the wind out of the administration's "we don't know enough" argument.

Having plotted acid rain deposits and sulphur emissions from copper smelters in Arizona, Utah, Nevada, Idaho and New Mexico, the study says:

"The variations in sulphur concentrations at all monitoring stations are consistent with the variations in smelter emissions."

Mexican smelter

"...A separate analysis demonstrates that variations in smelter emissions can account for virtually all the variations in sulphate concentrations when the NADP (national acid deposit program) station responses are precipitation weighted and averaged by year."

The group's study was conducted to estimate the effects of a proposed Mexican copper smelter near the U.S. border. The smelter would be the second biggest source of sulphur pollution in North America after the nickel smelters in Sudbury.

The Mexican smelter would double the amount of acid rain in the inter-mountain states, the study says.

Ironically, the Reagan administration is expected to demand that Mexico equip the proposed smelter with smokestack scrubbers in order not to poison American air.

However, such a request would expose an American double standard: one showing Washington insisting on acid rain protection it refuses to extend to Canada.

Bogdan Kipling

Toronto Star, December 28, 1984

Research money refused

In January two groups of scientists in Sweden decided not to accept money from England for research connected with acidification. Together they stood to receive GBP 140,000 for their part in a joint project administered by the Royal Society and the Academies of Science in Sweden and Norway. The project is being financed by the Central Electricity Generating Board and the National Coal Board to the amount of GBP 5 million for research extending over five years into such matters as the acidification of surface waters in Scandinavia.

Back of their refusal is a suspicion that the UK is using this offer as an excuse for delaying measures to reduce emissions of air pollutants.

"It is indeed bitter to have to refuse funds for research — research that one knows to be important. But what is most important is to reduce emissions now, in order to save the environment", says Dr Sten Bergström, sectional head at SMHI, the Swedish Meteorological and Hydrological Institute in Norrköping. His group was the first to say no to the donation.

"The British are using standard tactics for delay. We are not willing to work for five years while they continue to dump pollutants on us.

"We have already provided quite sufficient proof that the acidification of thousands of lakes and streams in Sweden is due to the deposition of pollutants from other countries, and not least from Great Britain. Although we shall probably never be able to give an exact description of every detail of the process, the causality is already quite clear. Atmospheric pollution harms soil, water, and vegetation alike.

"It is our duty as scientists to help safeguard health and the environment — and that is why it is so necessary just now to demand a curb on the emission of pollutants to the atmosphere. We can-

not allow England to use the fact that research is in progress as an excuse for continuing to pour out smoke over the rest of Europe. We cannot in good conscience accept this money."

Not only meteorologists

The other group that is refusing to accept any grant consists of scientists at the University of Agricultural Sciences in Uppsala. There Per-Erik Jansson, who would have headed the work, says quite frankly that they do not want to be a pawn in a political game. In his view, too, the aim of the British offer is primarily to exonerate the UK from its responsibilities in regard to the environment.

Academies' attitude

On February 13 the matter of continued collaboration in this research project was brought up for discussion within the Swedish Academy of Science for two reasons. One was the critical attitude of a number of environmental scientists in Sweden, the other the difficulties experienced during 1984 in working with the British program director in the so-called Management Group. This group consists of eight highly qualified research scientists, of whom four are British, two Norwegian, and two Swedish, plus a British chairman. Its function is to allocate funds to suitable research projects in the three countries concerned. Observers from the CEGB and the Coal Board are also present at its meetings.

Having discussed the matter, the Swedish Academy of Science decided to continue to take part in the overall project. Despite similar objections in Norway, the Academy there is also following the same line.

New books

The Acid Rain Controversy (1985)

By N. Dudley, D. Baldock and M. Barrett, Earth Resources Research Ltd. 150 pages with 10 figures and 13 tables. The book gives a balanced overview of the various factors involved in the acid rain problem. Part I assesses the impact on natural ecosystems, agriculture and materials. Part II focusses specifically on sulphur dioxide control and evaluates various strategies, including a case study of pollution in Central Electricity Generating Board power stations. Current cost estimates are found to be pessimistically high and a "least risk strategy" proposed, whereby relatively cheap steps could be initiated immediately and more costly measures taken later if continuing research shows this to be necessary. The book also considers alternative ways of tackling pollution, including energy conservation, vehicle speed limits and forest management.

Price: 6 pounds per copy plus a charge for postage and packing. Order from: Earth Resources Research Ltd, 258 Pentonville Road, London N1 9JY, U.K.

Stop Acid Rain (1984)

By Friends of the Earth Ltd. 33 pages. An updated summary on the acid rain situation in the U.K. by December 1984: sources, effects, politics and a strategy to reduce emissions.

Price: 1 pound. Order from: Friends of the Earth Ltd, 377 City Road, London EC1, U.K.

Belgian Research on Acid Deposition and the Sulphur Cycle (1984)

Proceedings from a conference arranged by the Belgian National SCOPE Committee, edited by O.L.J. Vanderborght. 300 pages. Can be ordered from: Dr. sc. J. Vangenechten (SCK/CEN), B-2400 Mol, Belgium.

Acid rain in Latin America

The mountains near the industrial city of Cubatao in south eastern Brazil are littered with dead and stunted trees. The barren earth slips away in frequent landslides. Scientists say the forest was killed by acid rain.

Some 3,800 kilometres away in Central Chile, farmers in the town of Los Maitenes are abandoning their homes and fields. The acidity of the rain due to unchecked pollution has corroded their machinery and poisoned livestock and crops.

Acid rain until recently detected only in North America and Europe is now affecting Latin America.

The phenomenon is so new here that many people, even government officials, have never heard of it. It is not a public issue and not widely seen as a problem.

But environmentalists warn that acid rain is already causing health problems, defacing archaeological treasures and poisoning water and farmland across the continent.

Lack of knowledge

"It's very serious", Paulo Nogueira Neto, head of Brazil's special secretariat for the environment, said. "In some areas the damage is obvious, but it could be occurring in other places that we don't know about."

Scientists believe acid rain is caused mainly by air pollution. Waste gases of sulphur and nitrogen dioxide in the atmosphere change chemically to mild but corrosive solutions of sulphuric and nitric acid which return to the earth in rain.

Acid rain survey

An *Associated Press* survey of the region found acid rain is a serious problem in Brazil, Mexico and Chile. It has also been reported in Peru and Argentina. In Venezuela and Bolivia, where the prevailing winds blow air pollution away from cities, its effects

are not known.

The survey showed that in Latin America, as in the United States, coal-burning plants are cited as a major cause of acid rain. But it also turned up other sources, including copper smelters, high-sulphur Mexican oil, and even a volcano.

Throughout the region, air and water quality controls were found to be lax, ignored or non-existent.

Most Latin American countries, many of them with stagnant economies and large foreign debts, have put more emphasis on development than on pollution control. In Brazil, a 1982 report by the powerful Sao Paulo Federation of Industries said the president *"must choose between pollution and recession."*

Here are some of the effects of acid rain in Latin America:

Chile

The worst recorded rain is in the central town of Ventanas, where a state-owned copper smelter and coal-burning generator dump sulphurous gases over a 19-km radius. The houses of surrounding towns are visibly corroded. In nearby Los Maitenes, farmer Antonio Fernandez says acid rain has killed his cows and destroyed his crop of wheat, beans, peaches, figs, apricots, pears and grapes. *"Since the smoke started coming out, just about everything around here has died"*, Mr Fernandez, 77, told the newspaper *La Tercera*. His farm has failed and Mr Fernandez and his wife now live on their pension and handouts from relatives.

Environmental secretary Antonio Luiz Crema in Criciuma in the heart of the Coal Belt estimated 80 per cent of hospital cases are for respiratory ailments caused by pollution. Two-thirds of the region's rivers, lakes and reservoirs are highly acidified. Says Criciuma agriculture secretary Luiz Dal Farra, *"Within five years we'll have a major tragedy here if this problem is not re-*

solved."

In charges, to the north, a copper smelter owned by the mining subsidiary of Exxon, the US oil company, is affecting the country's important wine industry. Farmers are forced to cover their fields with huge plastic sheets to protect crops from the rain. Exxon has paid out some damages and raised the smelter's smokestack to disperse gases, but environmentalists say that it only means farmers farther away are being affected. Legal pollution limits exist, but they are so lax that even the worst polluters do not exceed them.

Brazil

Acid rain was first noted in Cubatao, notorious as one of the most polluted places in the world. Dozens of factories spew sulphurous gases, which are trapped by a wall of mountains and dumped back on Cubatao, population 80,000, as acid rain.

"It's a no-win situation", says Dr Licia Moreira-Nordemann of the National Institute of Atmospheric Research. *"The rain is dirty but it cleans the air. When 20 days go by with no rain in Cubatao, we have a state of alarm"* because of stagnant pollution.

A bizarre and more serious problem exists in the coal-mining region of southern Santa Catarina state. Open-pit mines pile up mounds of a sulphur-rich reject ore called pyrite, which oxidizes upon contact with the air, spontaneously bursts into flames and pours sulphur fumes into the air. The resulting acidity attacks house paint, curtains and household appliances.

This country has some of Latin America's toughest anti-pollution laws, but they rarely have been enforced. In August, however, the Sao Paulo state environmental office announced a four-year program for reducing air pollution in Cubatao by 90 per cent. The estimated cost to industries is 150 million US dollars. In Santa Catarina, no quick solution is

→ in sight. The federal environment secretariat says it is collecting data but has no funds to start a clean-up program.

"Unfortunately the program is being treated politically", says Mr Crema. "The state representatives are linked to the big mining interests, so results are very slow."

Mexico

Acid rain is increasing yearly in the high valley of metropolitan Mexico City. The principal cause apparently is high-sulphur bunker fuel used by power plants. Acid rain in Mexico City has defaced pre-hispanic and colonial monuments. Archaeologists have had to replace 50 per cent of the stones in restorations, because acid rain has worn the original pieces down to shapeless lumps. Mexico has no laws of any kind regulating gas emissions. However, President Miguel de la Madrid has created a new ministry to develop studies and legislation on ecology and urban pollution.

Peru

The northern cities of Chiclayo and Chimbote report acid rain caused by smoke from fishmeal plants but its impact is not yet known. In Arequipa, a southern city of half a million people, residents complain of sulphur gas pollution from the nearby active volcano Mt Misti. The congress is studying a bill that would require cities of 200,000 or more to have government pollution-control stations and would set fines for violators.

It is not clear whether acid rain in Latin America is crossing international borders as it does in Europe and North America.

In some areas, geography has created natural barriers. Chile's high Andean mountain border keeps the country's pollution from spreading to its neighbours.

—AP

Peter Muello

Business Times, February 15, 1985

Ruhr emergency on account of smog

The most far-reaching emergency measures ever taken in West Germany on account of pollution in the atmosphere were applied in the Ruhr on January 11. This was the first time that a third-degree smog alarm had been issued.

Driving by private motorists was prohibited, and production had to be temporarily stopped or reduced in many factories. Schools and day nurseries were closed, and operations at several city hospitals were postponed in order to be ready to treat persons suffering from the effects of polluted air.

The weather was cold at the time, but a so-called inversion layer of warm air over the cold acted as a lid to prevent pollution from escaping. The waste gases from industries and vehicles, which normally get blown away, hung over the area so that the air became ever more polluted, especially by sulphur dioxide.

Emergency

Some first steps to deal with the threat had already been taken on the previous day, Thursday. People were urged not to use their cars, and individuals liable to heart and respiratory troubles were advised to stay indoors. In the course of Friday the situation got steadily worse, so that by afternoon a smog alarm of the third and highest degree had to be sounded.

One of the officials on the emergency staff who had been on duty since Thursday evening declared:

"We broke down on information. For the most part people do as we tell them, but they don't believe it is really necessary."

All the same, few had complied with the request to leave their cars where they were, and a check by the emergency staff

revealed that not a single family had bothered to reduce their home heating.

During a preliminary prohibition on driving in the early morning motorists waited with their engines idling in kilometre-long queues until 10 o'clock when the barriers were lifted.

"We shall have to make it compulsory", say the emergency officers. "That is the lesson this experience has taught us."

Stricter measures needed

The recorded concentrations of sulphur dioxide during the January episode exceeded 1,500 micrograms per cubic metre. It has been proved that adults can experience difficulty in breathing even at concentrations of 110 micrograms, if there is also a large amount of dust in the air.

The Ruhr emergency rules set a limit of 800 micrograms of sulphur dioxide per cubic metre for a first-degree alarm. This is to be reduced to 600 micrograms, although the reduction has yet to come into force. A first-degree alarm means that the public are warned and urged not to use their cars. Subsequent intensification of the measures leads to a total prohibition of private driving in degree three, together with temporary stoppages for the worst industrial emitters.

The smog in the Ruhr has given further impetus to the demands for an earlier introduction of controls on the waste gases from industrial plants as well as vehicle exhausts.

The requirements that are now scheduled for catalytic converters on all petrol-driven cars from 1988-89, together with stricter controls on emissions from new power plants, are seen as not having much effect until some way into the nineties.

The long fight to shed light on acid rain

Farmers in France, without having a name for it, knew and complained of it as far back as the seventeenth century: clouds, containing sulphuric fumes floating over from England, were ruining their vines in flower.

Two English men of letters, London writer John Evelyn and John Graunt, the founder of statistics and demography, wrote about the harmful effects of air pollutants as early as 1662 and 1666.

About 60 years later, the situation was given further expression by another London researcher, S. Hales, who observed that dew and rain "contain salt, sulphur, etc. For the air is full of acid and sulphuric (sic) particles."

In 1852, Robert Angus Smith, living and working in Manchester, England, was the first to scientifically analyze and name the ingredient — he called it acid rain.

Until recently, it was as if none of this had occurred. Little was known of Mr Smith, who was a fellow of the Royal Society and the first to launch widespread studies of the urban-industrial nature of acid rain.

The evidence which he amassed, much of it still relevant today, was ignored — not only by the public and the industrial interests who cared little for his disclosures, but by his colleagues.

Yet, according to Ellis Cowling, a professor at North Carolina State University and chairman of the U.S. National Atmospheric Deposition Program, "he enunciated many of the principal ideas that are part of our present understanding" of acid rain.

There was raw evidence even earlier. Pollution by coal smoke, says Canadian-born ecologist Eville Gorham, now with the University of Minnesota, goes back in England to "at least the thirteenth century". With the coming

of the industrial age "the problem appears to have become extremely serious by the end of the seventeenth century."

Damage to the ecology from metal smelters also has this lengthy history. C.V. Linné of Sweden in 1734, when visiting a then 500-year-old smelter at Falun in the Swedish province of Dalarna, pointed to long-term destructive effects. "We felt a strong smell of sulphur", he wrote, "rising to the west of the city ... a poisonous pungent sulphur smoke, poisoning the air wide around ... corroding the earth so that no herbs can grow around it."

A more devastating and telling report was delivered in Belgium some 125 years later. During the mid-1800s, researchers were commissioned to study the effects on plants of acid emanations from chemical industries. The commission members described, and showed experimentally, examples of the different forms of waste and ruination taking place, including leaf spots and bleaching of chlorophyll, marginal leaf damage, early leaf fall and damage to buds and young twigs.

Except for Angus Smith, who included this evidence in a book on acid rain he later published in 1872, hardly anybody of importance took notice of the Belgian study. Unfortunately for our trees, 175 years were lost. Only in recent years have forestry experts rediscovered what the Belgians had unearthed: forests, and not only lakes, are subject to ruination by acid precipitation.

It is likely, too, that fewer people would be facing a shorter life had John Evelyn's work on the effects of fumes been accorded the respect it merited. In his book, *Fumifugium*, published in 1661, he strongly suggested that airborne fumes from coal combustion were serious factors in human mortality, and notably in

lung diseases; he thought remedial steps were appropriate.

Only in 1959 was this charge raised anew; this time by Mr Gorham, when he was conducting studies in England. Mr Gorham also linked chest ailments and other illnesses to the acid fallout. His conclusions, too, were brushed aside.

The subject since has been reopened. In June of last year, the U.S. Congressional Office of Technology Assessment presented to Congress a massive study, referred to as Acid Rain and Transported Air Pollutants. The researchers claimed there was a likelihood of an annual rate of 50,000 people dying earlier in the United States and Canada because of acid rain and accompanying air pollutants; the amount is equal to 2 per cent of the total yearly deaths in both countries. While some studies continued in the 1800s, the most significant did not occur until the turn of the century, about 50 years after Mr Smith had originally aired his findings. From 1911 to 1913, scientists again called attention to the results of acid rain. These were C. Crowther, A.G. Ruston and J.B. Cohen.

Like Mr Smith, most of their research was conducted in and around a heavy industrial district, generally near the city of Leeds in northern England. Mr Crowther and Mr Ruston demonstrated that agricultural products were being inhibited and reduced in quality because of the factory-ejected waste filling the air.

Mr Cohen and Mr Ruston pointed to the clogging of leaves by soot and the narrowing of tree rings due to emissions from shale works and because of changes in the soil caused by acid-rain leaching of minerals.

It may be that their scholarly examination of the environmental damage might have had some impact on the public and the

Dippers inhibited by acid water



Photo: Axel von Arbin

Recent research suggests that the breeding abundance of the dipper — that curious bird that can both swim and walk under water — is being restricted in parts of its traditional breeding

habitat. And increased acidity of mountain river water caused by conifer plantations appears to be the ultimate cause (according to a paper to be published in *Bird Study*).

The aquatic insects that are fed to young dippers, and which also make up a substantial part of the adult's diet, are sensitive to water acidity. The research team, Stephen Ormerod of the University of Wales Institute of Science and Technology, Stephanie Tyler of the Royal Society for the Protection of Birds, and J. Lewis, collected information on the number of these food insects, the acidity of the water and the number of breeding dippers in the upper reaches of several Welsh rivers.

They found that the rivers draining the Black Mountains and the River Ithon had normal pH values, and a plentiful supply of insects and dippers breeding along their favoured fast-running stretches. In contrast, however, the upper reaches of the Rivers Irton and Wye had high acidity levels, much less insect food, and a distinct lack of dippers. In contrast, on similar stretches of other, non-acidic rivers, the dipper has actually increased in numbers.

New Scientist 20/27 December 1984

→ government had there not been a world crisis culminating in the First World War. In any event, it was not until the 1950s, after the Second World War, that the present era of acid rain really begins.

Not that scientists were entirely avoiding the field of study; some continued to be concerned. But the new age actually starts in 1955 with Mr Gorham, a native of Halifax, N.S., educated at Dalhousie University and the University of London, England.

He was the person, Mr Cowling states without reservation, "who built the major foundations of our present understanding of the causes of acid precipitation and its impact on the aquatic ecosystems". Mr Gorham's empirical studies took place in England,

Canada and the United States.

Mr Cowling goes on to say, however, that Mr Gorham's "pioneering research, like that of Smith a century before, was met by thundering silence from both the scientific community and the public at large". In Canada, his name and discoveries are barely known. He is probably one of the most unrecognized Canadian scientists.

It was not until the late 1960s that the subject was finally removed from its state of limbo. This was largely due to Svante Odén, a Swedish soil scientist. In his writings he sought out not only the scientific journals but cried out against the "chemical war" of acid rain in a major Swedish newspaper; he went public and the public was soon

alarmed to learn what was happening.

It was the print media, along with environmentalist groups then emerging, that started what Mr Cowling calls "the process of public education about acid precipitation" — a process that is continuing.

Unlike the farmers of France, the public now, at least, knows what it is called; an accomplishment that took 100 years. Despite the delay and the existing obstructions, scientists are hopeful and optimistic. "A clean environment", Mr Gorham maintains, "is within our reach if we have the political will to attain it".

Dan Daniels

Toronto Globe and Mail, January 7, 1985

Meetings

The **International Citizens Working Conference on Acid Rain** will be held from **May 20 to 25** in **Eerbeek, the Netherlands**. It is planned to be a worldwide Non-Governmental-Organization conference, and is arranged by Friends of the Earth International. For further information, contact: FoE International Secretariat, *Pieter Lammers*, Box 17170, NL-1001 JD Amsterdam, Netherlands. Phone: 20-838 955 (see also *Acid News*, No. 5/84, page 14)

The Effects of Air Pollutants on Forest Ecosystems is a major scientific conference, coordinated by the Acid Rain Foundation. It will be held in **St. Paul, Minnesota, U.S.A.** in **May 8-9**. The purpose of the conference is to pre-

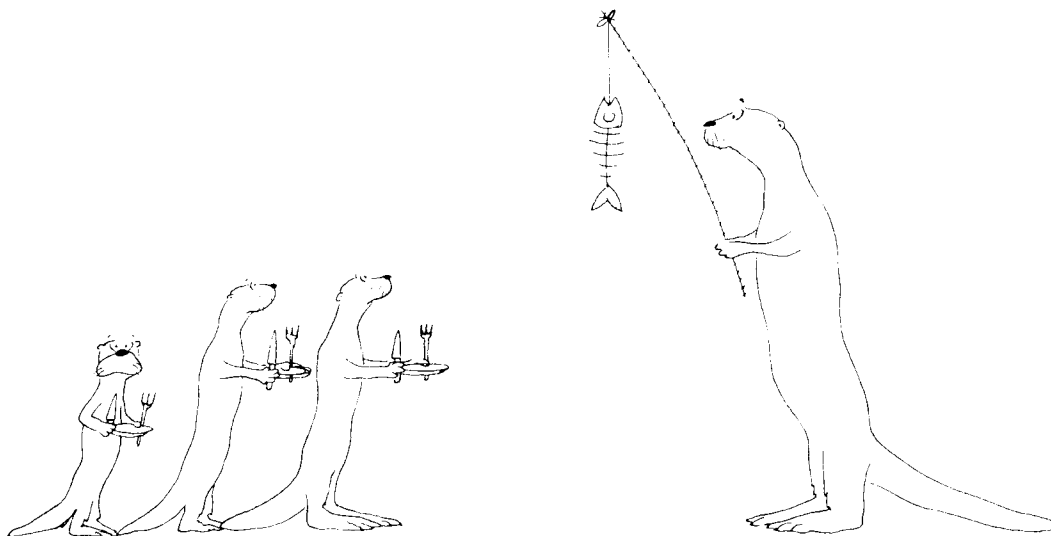
sent, compare, and contrast recent scientific findings about symptoms, causes, and effects of air pollutants on forests in Europe and North America. There will be presentations by invited speakers, plus a poster session. There will also be a special evening session for the general public, with an international panel giving an overview of the subject. For further information and registration material, send a stamped, self-addressed envelope to: The Acid Rain Foundation, Inc. 1630 Blackhawk Hills, St. Paul, Minnesota 55122, U.S.A. Phone: 612-455-7719

The **European Environmental Filmfestival** will hold its third concourse in **Dortmund, F.R.G.**

from **April 12 to 17**, on the theme **"Industry and Environment"**. At the festival will be presented 85 films from 18 European countries. Among the main themes are "Acid rain and decay of the forests", "Energy", "Water", and "Environment in the Third World". In the framework of the Film Festival will also be held a forum on "New Technologies - Clean Industry" in April 15 to 17, arranged by the Institute for European Environmental Policy.

For more information, contact: Biennale Européenne du Film sur l'Environnement, Fondation Européenne de la Culture, *Bertrand Moullier*, 55 rue de Varenne, F-75341 Paris Cedex 07, France. Phone: 1-222 12 34

ONLY ROTTENS STARVE OTTERS



Acid rain kills fish: especially trout, salmon and sea trout. 70% of acid in British rain is due to sulphuric acid, and over 56% of sulphur pollution comes from the power stations of the Central Electricity Generating Board.

The otter is entirely dependent on freshwater life such as trout for its food. Its population has declined by over 90% since the war — mainly due to habitat destruction and pesticides. Now its chances of recovering from the brink of extinction are threatened by acidification.

Birds such as the dipper are also at risk — and declining in Wales, southwest Scotland and northern England, as breeding streams become too acid to support the mayflies and other creatures on which they feed.

For more information contact: Chris Rose, Friends of the Earth, 377 City Road, London EC1V 1NA