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Pollution of Water

BECAUSE water is such an intimate part of our daily lives, most of us give little thought to it. But few if any problems are more closely woven into the fabric of our modern society than the control of water pollution.

Clean water is essential to life. Moreover, it is necessary to industry, to agriculture, and to the conservation and use of the many natural resources upon which our richer life depends.

Here is a paradox: amid our seemingly increasing ease and safety, amid the proliferation of comforts and gadgets to make physical life happier, the danger to life itself is increasing day by day as the result of pollution of our water supplies.

There is world-wide concern with the menace to human life arising from scarcity of water in places where it is needed and the pollution of water used by people and by the creatures we use as food. Two hundred scientists from thirty-three countries met in Paris last year to discuss the problem. As to scarcity of water, they found that in some places water is being taken from the ground about a thousand times faster than it is being replenished by rainfall. As a result, water must be used over and over again.

The water passing down the St. Lawrence, drawn into domestic water systems and industrial plants, has been used and discarded by hundreds of cities. Distances between waste outfalls and water intakes are being wedged closer and closer together by expanding population and the growth of new industrial and residential centres.

There is nothing criminal or morally wrong in this development of industries and cities. It is the product of man's constant effort to adapt his physical environment to his changing economic and social needs. What would be wrong would be to continue taking water for granted without doing anything effective to repair the damage caused to it by our own acts. We

have to learn to come to terms with the poisons we make. Up to now we seem to have bypassed the question: "How much poison can I stand and still live?" and we have contented ourselves with calling upon science to give us some corrective and preventive prescriptions.

Causes of pollution

Pollution comes chiefly from two sources: human sewage and industrial waste. It endangers health, it steals from us our sports fishing and our bathing, it robs us of our shellfish foods and commercial fish supplies, it reduces property values by impairing the appearance and the usefulness of our land, it makes our drinking water nauseating and raises offensive odors. It damages our bridges, docks, boat hulls and buildings.

It is a shocking thought that few people in industrialized areas have ever seen streams of any size that were completely free of man-made pollution.

We have, in the past, relied trustingly upon nature to protect us, but to burden a stream or other body of water with gross polluting material and expect safe and attractive water to be immediately returned is demanding of nature that it do more than its share.

Before our population-industrial surge pollution was not a serious problem, because the wastes from every city were diluted by the flowing water, oxidized by the bacteria, used as fertilizer by the water plants, and filtered through the river sands and gravel, so as to reach the next user in fairly clean condition.

Multiplication of cities and their discharges has loaded the water with an insupportable amount of poisons from the factories, offal from the slaughterhouses, raw sewage from the homes. These kill the cleansing plants, use up the purifying oxygen in the water, and clog the filtering gravels with filth.

We have been accepting all that supinely, and expecting our municipal filtration plants to transform

the dark coloured fluid, sometimes half sewage, into water for drinking. It is a grievous reflection on the intelligence of those who permit the condition to endure.

What is pollution?

It should be made clear that we ourselves are responsible for pollution of our water supplies. Pollution is the discharge of material that unreasonably impairs the quality of water for maximum beneficial use in the overall public interest.

Of what does this material consist? It is made up of body wastes, used bath and dish water, washings from restaurants and laundries, refuse from hotels and hospitals, and wastes from other establishments serving our needs. That is our personal contribution. In addition, there are industrial wastes, like acids, chemicals, greases, oils, animal and vegetable matter.

For centuries, if water did not offend the senses it was considered usable for any purpose. People avoided bitter or smelly or coloured water. Today, we know from the discoveries of Leeuwenhoek, Pasteur, Koch and Lister the dangers that may lurk in clear, odorless water. The bacterial yardstick as a measure of pollution has been expanded to include the viruses. Now we need a formula to measure the harmful effects of numerous chemical substances which may resist treatment by conventional or known methods. Any evaluation of present day chemical pollution must take account of wastes from new organic chemicals such as detergents, insecticides and weed killers, as well as of radioactivity.

Industrial waste

Today's progressive factory owner has just about as much at stake in the matter of clean water as has any tap-water user. Many a community has lost industrial opportunities because the water available was not suited to factory needs. Too many communities insist upon industry achieving low levels of contaminants in used water, while the municipalities themselves pollute the streams with untreated or inadequately treated municipal sewage.

In the past twenty-five years industry has for the most part assumed its responsibility in the conservation of water faster than have municipalities. It spends many millions of dollars on waste disposal and in research to improve its methods.

More and more, the cost of waste control facilities automatically becomes a part of plant installation cost and the operation is an integral part of the operating costs of the plant. The chemical business in the United States is spending forty million dollars a year to control its wastes; pulp and paper manufacturers have invested nearly a hundred million dollars in

treatment systems in the past decade, cutting their pollution per ton of paper to half of what it was. At a Quebec plant there has been installed a bark burning machine, destroying 150,000 pounds of a pollutant which would otherwise have floated down the river in a day.

Research people are at work constantly in the search for improvements. New control methods must be developed progressively if they are to keep pace with our changing economy.

Pesticides

Insects are man's greatest competitor for the food he eats. Our survival demands that we control them effectively.

However, this does not demand that we spray-kill everything that crawls, flies, bites or bores. In too many cases we have also killed birds, animals, fish and bees, and we have poisoned the streams from which we drink, and the fruit and vegetables we eat.

Pesticides, wisely applied, have done much to improve agriculture and give us better health, but their use involves a calculated risk and demands widespread education. Farmers have a definite responsibility for safe use of chemicals, and those who instruct them in the use of chemicals have even greater responsibility.

Unknown ten years ago, there are now on the market well over 12,500 brand name products and more than two hundred basic control compounds. These, while fulfilling their function on land, may enter our water supply by direct application to the water surface, by drifting on to the water surface from treated fields, or by seepage from the watershed. This offers death to fish, to birds, to aquatic animals, and, it may be, danger to man. As a speaker said at the National Conference on Water Pollution in Washington in December 1960: "We are running an unnecessary risk when we just blithely go ahead and use these things because we have not died yet." The report of this conference is available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., for \$2.25.

We need pest control, but it is imperative that it be guided by responsible and objective leadership and that other interests be appropriately co-ordinated with the objectives of control.

As a start, public education and education on the county agricultural representative level should demonstrate to users of sprays and insecticides of all sorts that the material is extremely toxic to fish life and must be excluded from our waters. A strong declaration on the national level and by provincial governments would have a beneficial effect in the public interest.

There is proof aplenty of the need. Several years ago severe mortality occurred among coho fry, trout and

steelhead yearlings when a western province forest was sprayed to control the blackheaded budworm. Ninety-one per cent of young salmon were killed in an eastern province when a forest was sprayed against spruce budworm, and aquatic insects wiped out at that time had not re-established themselves even sixteen months later.

Coming closer to everyday life, we find that synthetic chemical contaminants, impossible at this time to remove by sewage treatment or by normal water purification practices, are taking their toll of aquatic life. A Massachusetts Institute of Technology professor told a pollution conference that the chemical industry should be asked to create household detergents that can be destroyed in city waste treatment plants. As it is, some new chemicals have been traced downstream as far as 1,000 miles.

Research on detergents, using rats as subjects, has shown that these creatures do not suffer any health hazard from detergent residues. However, scientists add: "...we do not know the long-range effects of these contaminants. We may not know some of these effects for generations."

Disease-carrying water

Dr. Gustave Prévost, head of the biological bureau of the Quebec Fish and Game Department, said in February: "People have become so used to living with polluted water that they have become indifferent to the problem and accept it as a necessary evil."

Everybody relies upon the undoubted fact that science has conquered the great water-borne diseases, but the reality remains that the source of the diseases — pollution — has not been stopped.

The protective wall built by science keeps epidemics from ravaging our cities, but in small ways pollution is slipping through the wall. Vague intestinal symptoms put us to bed for a few days, and we learn on getting back to the office or factory that others, too, have been laid up.

It is no wonder such things happen. How can the grey and greasy and scummy water we see along the shore, or the filthy conglomerate we find on the bottom of the stream, be turned without fail into sparkling and pure tap water to fill our drinking glass?

It is time we started to take stern preventive measures. Consider the fact that it was sixty years after scientists had discovered the link between cholera and sewage-polluted drinking water before methods for the purification of water began to bring typhoid, endemic diarrhea, and dysentery under control. It will take us a long time to restore our streams by cleaning the water we return to them.

Wildlife and recreation

Turning to non-human sufferers, we find that pollution vitally affects birds and fish and other wildlife. It threatens the existence of aquatic vegetation, the small aquatic insects, the mollusks and the crustaceans on which our waterfowl, game fish and water-loving mammals depend.

There have been heavy losses of waterfowl to pollution on the Great Lakes and in their connecting waters. On one occasion some ten thousand ducks, mostly the scarce canvasbacks and redheads, were destroyed on the Detroit River by the release of untreated sewage.

In the United States, the area of fish and wildlife habitat rendered unproductive every year by pollution is greater than that created by all public agencies conducting fish and wildlife restoration programmes.

Interest in the relationship of fish population to water pollution is not by any means restricted to academic research. The supreme interest in the subject is expressed by the angler who discovers a stream full of dead fish, and by the commercial fisherman who finds his fishing area barren.

These people — those who respect and value fish and fishing for food or recreation — are increasingly demanding that authorities give effect to at least the minimum guarantees. All the replenishment of fishing grounds by hatchery stock will be futile if the environment of the fish is not right.

There are three types of waste affecting fish: organic wastes causing oxygen depletion; wastes that are directly toxic; and non-organic wastes which cause some mechanical change either to the fish directly or to their habitat. For example, sawdust has all three types: it demands much oxygen, it exudes toxic substances, and it can directly injure gill filaments through mechanical abrasion. In addition, sawdust settles to the bottom of the stream and is capable of burying spawning gravels and bottom organisms. Soil erosion also contributes to sediment pollution, damaging the stream habitat for all the more desirable fish. Thousands of miles of otherwise fine fishing waters have been taken out of production because of the acid damage from coal mines or the poisonous effluent from industrial plants.

Oil pollution has its place in the roster of practices damaging fish. Sooner or later ships, particularly those using our inland waterways, must be so designed that the wastes can be pumped ashore for treatment or treated on board.

Sewage disposal

The state of affairs involving pollution of our rivers by sewage got out of control before the magnitude of

the problem was realized, and we have not been aggressive enough with our treatment programmes to catch up, let alone get ahead of the grim condition.

The methods of sewage treatment have now been developed to a high degree of efficiency. Primary treatment removes some thirty-five per cent of the pollutants by screening and sedimentation. Secondary treatment removes, by such means as trickling filters or the activated sludge process, the wastes that are in solution or in colloidal suspension. As a result of primary and secondary treatments, around ninety per cent of the organic matter originally present can be removed before the effluent is discharged.

Why is this treatment not universal in Canada? It is safe to say that there are two reasons: the need has not been appreciated, and the cost is not relished. The first excuse can be eliminated by education: the second is not so serious when the facts are obtained. The cost, spread out over thirty to fifty years, said Dr. Prévost, would be less than a cent a day per person. There are, he said, 350 such plants in Ontario. While there were about forty sewage treatment plants in Quebec, only about three or four of them treated sewage completely before flushing it into rivers and streams.

Whatever the cost, authorities across Canada are showing signs of shrugging off the inertia that has held back action.

The Prime Minister declared in November 1960 that pollution of Canada's rivers and streams is "one of the most potentially dangerous threats to our whole economy." In March it was announced that the federal government has voted \$100 million to help, and is prepared to lend up to 66 per cent of the construction costs and to make a gift of 25 per cent of this amount to any municipality that finishes its work before March 31, 1963.

A 16-man national committee of prominent engineers and scientists is at work studying the use, conservation and pollution control of Canada's water resources, with a final report due at the end of this year. This committee was set up by the Engineering Institute of Canada and the Canadian Institute on Sewage and Sanitation.

Ontario is putting its shoulder to the job of eliminating pollution of its streams at a cost the Premier says will be six times that of the St. Lawrence Seaway.

In Quebec, briefs were presented to the government in March telling the seriousness of the situation in this province and emphasizing the urgency of remedying it. In May, the government decided on appointment of a permanent water purification board having extensive

investigating and regulatory power, and offered financial aid to municipalities in the form of a one-sixth subsidy. In June, Dr. Gustave Prévost was appointed chairman.

Responsibility

Where does the responsibility ultimately lie? The answer is plain and simple: every city and town, every industry, is responsible for cleaning up the pollution it creates. Stream sanitation is a co-operative responsibility, involving everyone along the banks.

Cities and towns and industries need to call upon the professional and technical people who have knowledge of these matters. In turn, the people who plan the remedy must take into consideration all the users of water.

Pure tap water and clean water for industrial processes are essential: so is the wildlife of our streams and lakes. Society suffers if one segment of our resource base is managed alone without consideration of all others.

After competent engineers collect the data and make recommendations, then the force of public opinion enters. The lag between the decision to do something effective and the start of work on the projects must not be long.

The antipollution movement offers an outstanding opportunity for country-wide co-ordination, dynamic leadership and effective action.

Pollution control fits into the purposes of nearly all civic organizations, business, conservation, service and industrial. They can all assist, and not only by passing resolutions. They can use their own interest, whether boating or swimming, hunting or fishing, irrigating or draining, or just enjoying nature, to press for action.

Positive pollution control

Pollution control in the past has been mostly corrective; in the future it must be preventive. Gross pollution is an offence to human decency, and it can be corrected only by positive methods and controls.

Science and technology have provided the tools, and are capable of providing better tools as we need them. All we have to do is get at the job in dead earnest.

We should do so in a spirit of maturity of judgment, and not in panic actions which will provide half-measure solutions.

Then, within our lifetime, we may see our ruined streams so rehabilitated that they no longer offend the nose and eye; we may enjoy our beaches; we may see birds and fish and small creatures return for our enjoyment — all this, if we sincerely desire to meet water quality demands.