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EPA JOURNAL

The Great Lakes

Ontario Ministry of Industry and Tourism

Silhouetted against the waters of Lake Superior, strollers enjoy the sunset in Ouimet Canyon Provincial Park, Thunder Bay, Ontario.

The Great Lakes

Fifteen years ago, it was widely believed that the Great Lakes were dying. This issue of *EPA Journal* examines the situation now. What cleanup progress has been made? What remains to be done?

In the first article, Valdas Adamkus takes an overview. He is Administrator of EPA Region 5, and is Co-Chair of the Water Quality Board of the U.S.-Canadian International Joint Commission (IJC).

The next article focuses on the personality of the Great Lakes region, describing its history, culture, and economy. The piece is by Jack Lewis, Assistant Editor of the *Journal*.

Congressman Henry J. Nowak, D-N.Y., forecasts the environmental fortunes of Lake Erie, which borders his home city of Buffalo.

Canada's approach to dealing with pollution of the Great Lakes is spelled out by J. D. Kingham, the Canadian Co-Chair of the IJC Water Quality Board.

The lessons scientists have learned in their far-flung laboratory—the five lakes—are explained by William Richardson, chief of EPA's Large Lakes Laboratory in Grosse Ile, Mich. A Great Lakes ecological puzzle is discussed by Lee Botts, a planner and long-time participant in the effort to protect the lakes.

The Great Lakes environmental challenge for the 1980s—toxic substances—is described by L. Keith Bulen, U.S. Commissioner of the IJC.

Three journalists present their views on Great Lakes problems and progress. The writers, who report on environmental affairs, are Paul MacClennan, *Buffalo News;* Casey Bukro, *Chicago Tribune;* and Dean Rebuffoni, *Minneapolis Star and Tribune.*

The efforts by EPA Region 5 to make a cleaner future for the Grand Calumet River in the Chicago area are reported by Kathleen Osborne Clute of that region's Office of Public Affairs. This is the sixth in a series in the *Journal* by EPA regional offices.

In other stories, the *Journal* includes excerpts of the statement by EPA Administrator Lee M. Thomas at his confirmation hearings February 6 before the Senate Committee on Environment and Public Works. Also included is an article analyzing the President's proposed budget for EPA in Fiscal Year 1986.

In another article, Senator John H. Chafee, R-R.I., gives his views on the outlook for environmental legislation in the 99th Congress. Chafee is Chairman of the Senate Subcommittee on Environmental Pollution, which oversees EPA-related legislative matters.

The story of how an EPA water quality specialist, Leroy "Bub" Loiselle, Jr., has helped to control pollution from gold placer mining in Alaska is related by Roy Popkin, a writer in the EPA Office of Public Affairs. Loiselle won an agency gold medal for his work on this problem. EPA's steps to safeguard divers in polluted waters are explained by Susan Tejada, Associate Editor of the *Journal*.

Concluding the issue are a book review and the magazine's regular features, Update and *Appointments.* □

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EPA is charged by Congress to protect the nation's land, air, and water systems. Under a mandate of national environmental laws, the agency strives to formulate and implement actions which lead to a compatible balance between human activities and the ability of natural systems to support and nurture life.

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Front cover: Wading into Lake Huron at daybreak, a smelt fisherman tries to net his catch. Every spring the smelt run in the lake near East Tawas City, Mich. Photo by Don Emmerich.

Design Credits: Robert Flanagan; Ron Farrah.

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Restoring the Great Lakes

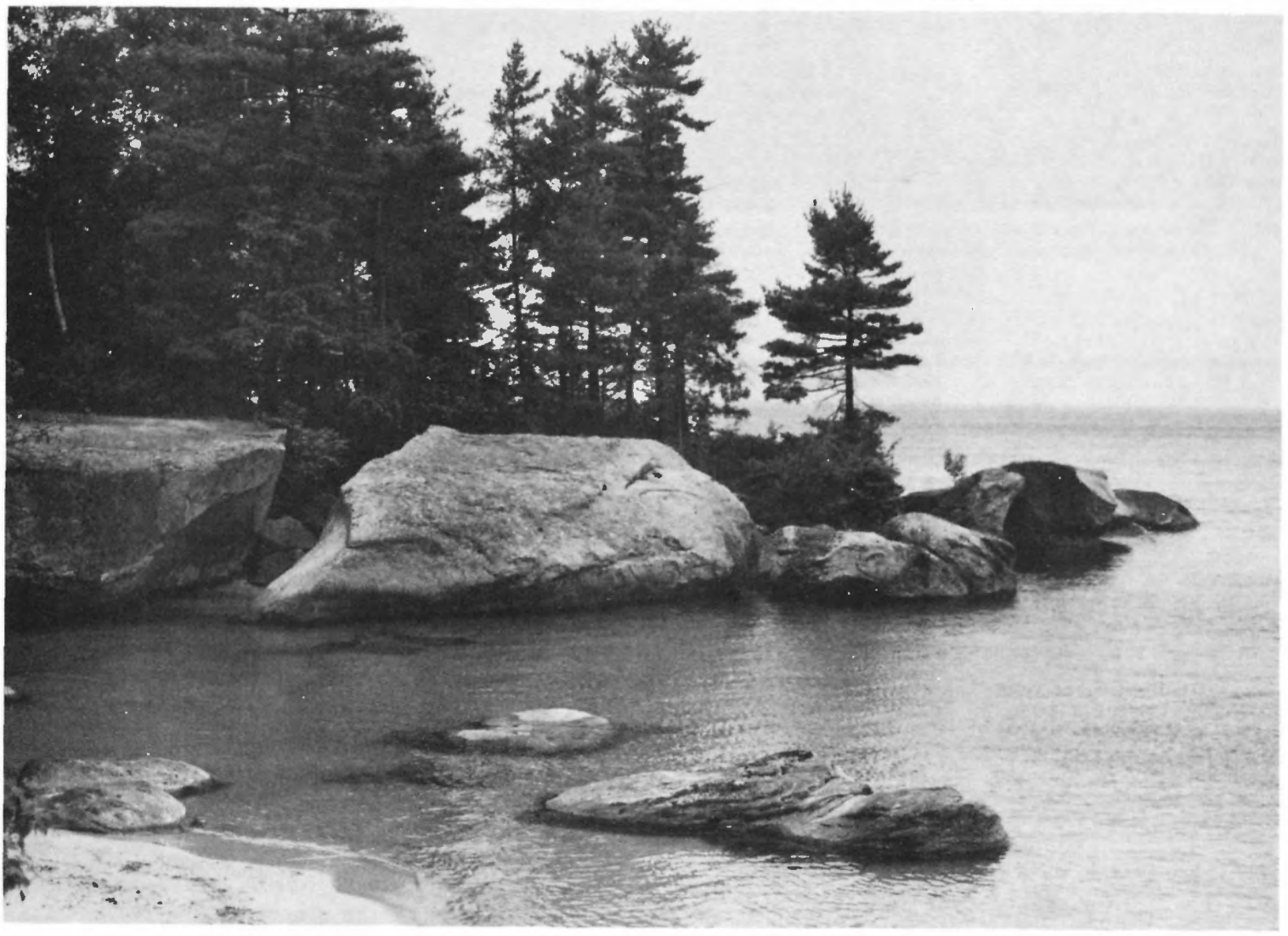
by Valdas Adamkus

I could begin by citing some awe-inspiring statistics about the Great Lakes, but I won't. There are too many, and they're cerebral; it is with our hearts that we consider the lakes.

You are probably aware of the dedicated efforts the U.S. and Canada have made during the last two decades to restore the lakes to their proper state. The widespread, and widely publicized, decline into which they had fallen by the 1960s has been halted. Last summer, all but eight of the lakes' 516 beaches had reopened; water quality is significantly improved. We can say with great assurance that the lakes are no longer in immediate danger.

We are proud of the achievements we've made, but we're not naive enough to believe that these are sufficient. We cannot and must not ignore the problems that loom up before us: toxic chemicals nestled firmly throughout the Great Lakes ecosystem; pressure to divert Great

A scenic view along the shores of Lake Huron.



Michigan Travel Bureau

Lakes water to arid southwestern states; and questions about how to balance appropriately the demands of our economy with the needs of our environment.

The most immediate problem facing us in the 1960s was accelerated eutrophication: the premature aging of the lakes due to the overproduction of microscopic plant life and algae. This plant life was being nourished by raw and partially treated sewage, which contained hefty loads of phosphorus, to the detriment of fish and other aquatic life.

The U.S. and Canada, in 1972, signed a Great Lakes Water Quality Agreement pledging both countries to a series of actions designed to save the lakes. The most significant of these was the specification that both countries would make massive improvements in their sewage treatment plant systems. Both nations, true to their word, have spent a total of $7.6 billion since 1972 to improve or replace 1,079 sewage treatment plants along the shores and tributaries of the Great Lakes.

These improvements, coupled with strict controls on industrial wastewater, have largely freed the lakes from their oppressive nutrient burden and allowed them gradually to return to a much healthier state.

In addition to controlling phosphorus discharges from sewage treatment plants, Canada and several U.S. states and cities essentially banned phosphates in laundry products by limiting the amount that could be present. As a result of the control measures taken to date, the annual input of phosphorus to the lakes from sewage treatment plants has been reduced from a total of about 30,000 metric tons in 1972 to about 4,000 metric tons today.

Even that hasn't been enough. In a 1983 addendum to the Great Lakes Water Quality Agreement, the U.S. and Canada made commitments to further improvements in controlling the flow of phosphorus into Saginaw Bay (Lake Huron) and into lakes Erie and Ontario, the two lakes which still do not meet U.S.-Canada phosphorus targets. These controls will include efforts to control phosphorus washing off of farmland into the lakes and their tributaries.

EPA's Chicago-based Great Lakes National Program Office (GLNPO) has worked for several years with the U.S. Department of Agriculture and the states of Ohio, Michigan, and Indiana on conservation farming programs designed to reduce the amount of fertilizer-laden topsoil washing into Lake Erie. A major feature of that program has been the use of farming methods which leave crop residues on the surface of fields after they have been harvested. These residues keep the soil bound together and help trap topsoil during rainstorms. The Lake Erie project, which operates in the 31 counties thought to be contributing the most phosphorus to Lake Erie, has shown that conservation farming can cut soil losses 75 to 90 percent.

EPA's Great Lakes efforts are anchored in GLNPO. This office, with an annual research and operating budget of $4 million, coordinates federal water quality research concerning the Great Lakes, gives research grants, and works with Canadian environmental professionals on problems of concern to both countries.

When we look at the efforts we are making in the Great Lakes and the results we're getting, we realize that it's more than the mere prodding of our environmental consciences causing us to act—economics is involved.

The fisheries alone are valued at roughly $1.6 billion a year. Industry needs the lakes to forge steel, mine minerals, generate power, and ship goods to the rest of the country and the world. The midwest's economy, and indeed the nation's, is heavily dependent upon these five magnificent waterways.

The fisheries in the lakes have been seriously affected by pollution, overfishing, and the parasitic sea lamprey. Despite all this, the State of Michigan has calculated the worth of its Great Lakes sports fisheries at $350 million a year, while its 100,000 acres of coastal wetlands generate more than $500 per acre each year from hunters, trappers, and wildlife photographers. The State of Wisconsin has reported that sports fishing and related services pumped $49 million into its economy in 1980.

It is obvious from the range of uses I have just mentioned that there are competing interests using our lakes. But I believe that, with proper management, the lakes will be preserved and protected for everyone who needs them.

It is important that we continue to view and to manage the lakes as a total resource having many easily affected components. EPA, agricultural interests, health agencies, and various other governmental agencies are all involved in what was once the province of the sanitary engineer. The shift from the traditional water pollution control framework to integrated resource management was pioneered for the Great Lakes by the International Joint Commission (IJC), a six-member board established by the U.S. and Canada in 1909 to protect the waters shared by both countries.

The IJC, through the Water Quality Board I co-chair, is concerned with maintaining and improving the quality of the Great Lakes ecosystem. This will happen as we move steadily forward in our efforts to identify and to control toxic pollutants and to preserve the wetlands that are so vital to the growth and health of the 92 fish species that exist in our lakes.

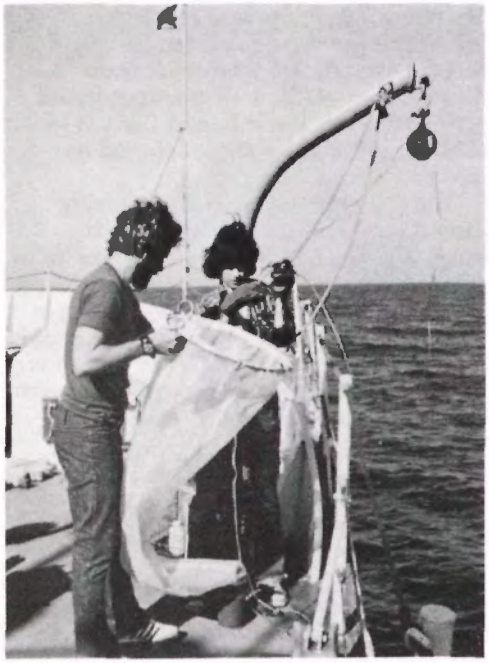
It is unacceptable to me, as I'm sure it is to most of you as well, that people in eight near-shore areas of the Great Lakes are advised by health authorities not to eat certain kinds of fish and to limit their consumption of others. It is unacceptable to me that chubs cannot be caught or sold by commercial fishermen in Lake Michigan because of high PCB and pesticide content; that lake trout still cannot reproduce naturally in the lakes and exist only because the federal government and the states spend millions each year on stocking programs.

We have identified more than 800 toxic chemicals in the Great Lakes ecosystem, so it is no surprise that many of our fish are inedible. These toxics usually are organics and usually are found in trace amounts. We're not exactly sure what that means, but we're certain we'd all be better off if those chemicals weren't in our food chain.

Experts at GLNPO, EPA labs, and universities are looking closely at the toxic chemical problem. We're testing fish, taking sediment samples, and cruising the lakes in our research vessel to learn more about the problems we have and how we can best solve them.

We're looking at the connection between the contaminated sediments of so many of our harbors and the compounds found in fish. We're also working, in cooperation with the IJC, to clean up the 27 U.S. toxic hot spots identified by the IJC as the reason water quality is so poor in certain areas of the Great Lakes. EPA's recent master plan for one such spot, Northwest Indiana's Indiana Harbor and Grand Calumet River, may eventually become a blueprint for

(Adamkus is Administrator of EPA Region 5 and Co-Chair of the International Joint Commission's Water Quality Board.)



B.A. Bulota

Aboard EPA's Great Lakes research vessel crew members carry out pollution surveillance and limnology studies on the lakes.

action in other areas. (See related story on page 21).

While we're out cruising the lakes in our 122-foot research vessel, the *Roger R. Simons*, mighty lake and ocean-going ships are out there too. Stretching more than 2,200 miles from the mouth of the St. Lawrence River, in Canada, to the head of Lake Superior, the lakes and their connecting channels allow previously landlocked ports to engage in international trade. Cleveland, Chicago, Milwaukee, Duluth, and Toledo are among the Midwest's port cities.

The Lake Carrier Association, a trade group representing the operators of Great Lakes bulk cargo ships, says 149.6 million tons of cargo were shipped on the lakes last year. Shipping, of course, carries with it environmental problems, as we saw by the invasion of the sea lamprey which reached disasterous levels after the St. Lawrence Seaway was christened. Other dangers include oil and chemical spills. The U.S. Army Corps of Engineers has been studying the possibility of extending the winter navigation season from mid-December until late January, a move that would involve some ice breaking and possible shoreline erosion and damage, along with possible disruption of the normal winter habitat of Great Lakes fish.

I think I've touched on the major ways the lakes affect our lives. These will not change, but what will change are the kinds of issues we as a nation must face in connection with the lakes.

Perhaps the most emotionally charged of these issues is that of diverting Great Lakes water to areas of the U.S. where limited existing water supplies are being depleted. Diversion is not new. It began in 1829, when the original Welland Canal was opened to provide a navigational link between lakes Erie and Ontario. The two other diversions occur at Chicago, where the Chicago Sanitary and Ship Canal funnels water from Lake Michigan to the Mississippi via the Illinois Waterway; and in Canada, where the Long Lac and Ogoki rivers flow into Lake Superior.

None of these, however, begins to approach the scale of diversion that would occur if we were to pipe Great Lakes water across part of our continent. The cost of such a move, very preliminary analyses show, could be in the billions of dollars, but the impact on our lakes could be even greater.

Large-scale diversion could lower the water level, to the benefit of coastal zone interests which would gain shoreline and to the detriment of those who depend on existing water levels for navigation and power generation. Diversion also would reduce the amount of water available to dilute pollutants and maintain water quality. One study has calculated the loss of economic benefits from all this at upward of $74 million a year.

Complicating the whole thing is the international nature of the water resource. A 1909 treaty prohibits large-scale diversions from any U.S.-Canada boundary water without the consent of the IJC or both governments. The treaty also provides for redress if either government diverts lakes (such as Michigan) or streams which flow into boundary waters.

Because of this, the question of diversion can only get bigger and more contentious as the water crisis worsens in certain parts of the United States. The Midwestern resolve on this issue was recently demonstrated when eight states and two Canadian provinces formed a compact to review any proposed diversions.

Of more short-term concern is the extent to which Great Lakes water is withdrawn for uses such as irrigation and industrial cooling and never put back. In 1975, such uses accounted for 4,950 cubic feet per second (cfs). In the year 2000, the figure is expected to rise to 8,420 cfs, and in 2035, these uses could account for 16,000 to 37,000 cfs, largely because of expected increases in thermal power plant cooling needs. For comparative purposes, let me mention that 238,000 cfs flow out the St. Lawrence into the Atlantic Ocean.

Consumption and diversion make a significant impact on fisheries. The lower water levels reduce the marshes and littoral waters so vital to fish spawning and growth. Half of the wetlands bordering Lake Erie, for example, depend on the water levels in that lake for their existence. Also, consumption kills fish as they are sucked into water intakes, and diversion sends them off somewhere else, probably equally lethal.

Economic, environmental, and political interests will always be colliding over the Great Lakes, and that is as it should be. Our concern here at EPA is that the environmental interests be defended. Our "cluster of inland seas" are too valuable for us to have it any other way. □

Helping the Cleanup

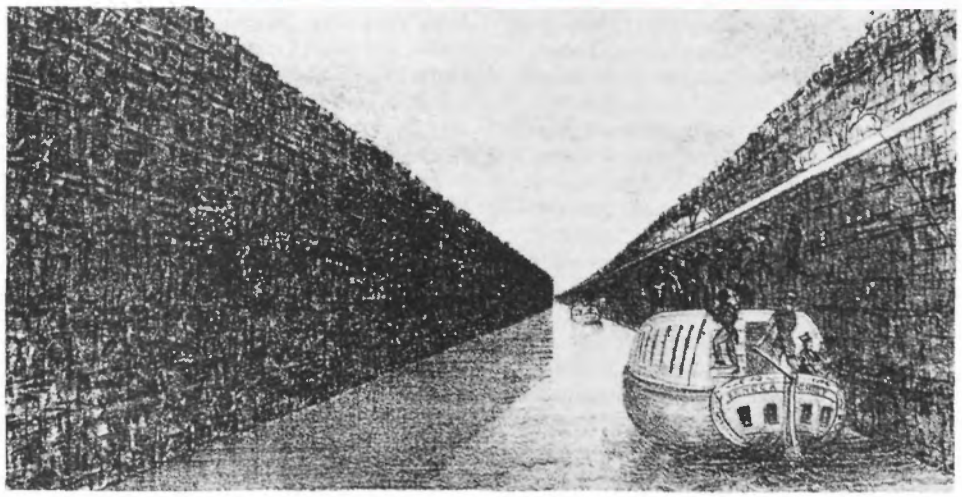
EPA's Great Lakes National Program Office (GLNPO), located in Chicago, monitors the lakes and United States performance under the terms of the U.S.-Canada Great Lakes Water Quality Agreement. The GLNPO reports to the Regional Administrator of Region 5 in his role as the agency's national program manager for the Great Lakes.

The Water Quality Agreement and GLNPO address the lakes as a total system affected by contamination from water, land, and air sources. The lakes serve as traps for pollutants carried by rivers from watersheds containing approximately 20 percent of our nation's industry and population. Also, toxic contaminants concentrate by factors of hundreds of thousands to one as they move through the food chain from water into fish eaten by millions of people.

GLNPO monitors water, air deposition, sediments, and fish tissue to identify hot spots and trends, using its research vessel and through cooperation with various states, federal agencies, and universities. Other recent activities include: preparation of phosphorus control plans in cooperation with the states to meet target loads identified in the Agreement; providing funds and technical support for the binational Niagara River Toxics Committee and its report; achieving agreement on uniform fish consumption advisories by the four Lake Michigan states; and initiation of an intensive binational and interagency study of the Upper Great Lakes connecting channels between lakes Superior, Huron, and Erie. □

The Five Sister Lakes: A Profile

by Jack Lewis



Erie Canal Museum

The Erie Canal linked Lake Erie with the Hudson River and New York City. In 1825, the year the canal was completed, George Catlin sketched the Seneca Chief traveling through the deep cut of the canal west of Lockport, N.Y.

Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario: five sister lakes, five "Great Lakes." And the word "great" is not at all inappropriate to describe their size and their importance:

Consider the following facts:

- Together the Great Lakes form the largest surface expanse of fresh water in the world (94,560 square miles);
- All five of the Great Lakes are ranked among the fifteen largest lakes in the world: in terms of surface area, Lake Superior ranks second; Lake Huron, fifth; Lake Michigan, sixth; Lake Erie, eleventh; and Lake Ontario, fourteenth;
- Completion of the St. Lawrence Seaway in 1959 connected the Great Lakes to form the largest freshwater transportation network in the world. This deep waterway stretching 2,200 miles from Duluth, Minn., to the Atlantic Ocean handles over 350 million tons of cargo every year;
- United States and Canadian cities along the shores of the Great Lakes comprise the largest industrial complex in the world. More than 40 million people—15 percent of the U.S. population and 25 percent of the Canadian population—live and work in these communities. Some experts predict that a single Great Lakes megalopolis will one day extend all the way from Milwaukee to Toronto.

The natural processes that formed the Great Lakes began at least 32,000 years ago. Huge masses of ice, known as the Wisconsin glaciation, carved out lake beds as they advanced south over the surface of North America. The glaciers began receding approximately 18,000 years ago. By 5,000 B.C., the Great Lakes had assumed roughly their present form. But even at 7,000 years of age, the Great Lakes are considered "young" compared to lakes in other parts of the world.

The Great Lakes flow eastward down to the sea. Lake Superior and Lake Michigan are 600 feet above sea level, while Lake Ontario—below Niagara Falls—has an elevation of 250 feet. A canal now takes shipping around Niagara Falls between Lake Erie and Lake Ontario, but for centuries the Falls posed a major barrier to navigation of the Great Lakes.

Indian canoe travel was the most ambitious form of shipping the Lakes witnessed for most of their long history. Various tribes contended for control of the region. The powerful Iroquois tribes monopolized Lake Ontario, Lake Erie, and Lake Huron, while the Chippewa dominated Lake Superior. Lake Michigan was home to several tribes: the Winnebago, the Sauk, the Menominee, and the Miami.

Legend has it that another primitive tribe of warriors—the Vikings—reached the Great Lakes during the Middle Ages, but the authenticity of presumed Viking artifacts found in Ontario and Minnesota has been subject to question.

The Westerner generally credited with discovering the Great Lakes is the French explorer, Samuel de Champlain. He stood on the shores of Lake Huron in 1615, but he paid scant attention to the discovery in his journal. Champlain's objective had not been to discover a new lake. Like Columbus before him, he was obsessed by the quest for an ocean route to China.

Champlain's quest for a passage to China was still continuing in 1634 when he ordered Jean Nicolet to explore the "Lake of the Illinois," now known as Lake Michigan. Nicolet carried with him in his birch canoe a robe of Chinese damask. As he neared the shores of Green Bay, he put the damask over his buckskins. Nicolet hoped he would soon be conferring with Chinese merchants. Much to his disappointment, only Indians were on hand to greet him when he stepped ashore!

French exploration of the Great Lakes never led to China, but it did lead to the foundation of a massive new colony known as Canada. Jesuit missionaries, who played a great role in settling the Canadian wilderness, called the Great Lakes "seas of sweet water." At the time, this was not poetic hyperbole. Before the onslaught of the Industrial Revolution, the Great Lakes *were* "seas of sweet water."

The founder of Detroit, Antoine de la Mothe Cadillac, also marvelled at "the sparkling and pellucid water" of the Great Lakes. Cadillac regarded the shores of the Great Lakes, circa 1701, as a latter-day Garden of Eden: "The banks are so many vast meadows where the freshness of these beautiful lakes keeps the grass always green. These same meadows are fringed with long and broad avenues of fruit trees which have never felt the careful hand of the watchful gardener; and fruit trees, young and old, droop under the weight and multitude of their fruit, and bend their branches towards the fertile soil which has produced them."

After another great Frenchman, the Chevalier de La Salle, claimed the Mississippi River for Louis XIV, the French Empire in North America extended all the way from Nova Scotia west to Lake Superior and south to the Gulf of Mexico. French domination of the

(Lewis is Assistant Editor of EPA Journal).

northern half of that empire ended less than a century later when Britain scored a resounding victory in the French and Indian Wars of 1754-1763. As the price of her military defeat, France had to cede both Canada and the Great Lakes to Britain.

The next great historical upheaval in the region was the American Revolution. During the early years of the Revolution, colonial rebels ended British control of the lands between the Great Lakes and the Ohio River. Other raids secured American positions in western New York and northwestern Pennsylvania. The Great Lakes themselves saw only minor naval skirmishes during the Revolution.

American victory deprived the British of their brief hegemony over the Great Lakes. The Treaty of Paris, concluded in 1783, used the Lakes to raise a natural barrier between the fledgling United States and British Canada. The treaty gave the rebels exclusive control of Lake Michigan and divided the other four Great Lakes right down the middle.

The War of 1812 unleashed the last outbursts of violence along the boundary separating the United States from Canada. In September 1813 American and British forces clashed in a major naval battle on Lake Erie. The Americans, led by Commodore Oliver Hazard Perry, emerged the clearcut victors. For the first time in their history, the British were forced to surrender an entire naval squadron. "We have met the enemy, and they are ours," Commodore Perry reported in words destined to become as famous as his victory.

The recipient of Perry's immortal dispatch was General William Henry Harrison, already famous for his 1811 victory over the Shawnee chieftain, Tecumseh, at Tippecanoe Creek, Ind. Together Harrison and Perry proceeded to drive the British from Detroit. In October 1813 they subjected the enemy to a final defeat on the Thames River in Ontario. In 1840 "Tippecanoe" Harrison was elected President of the United States. But a chill he caught at his inauguration was to make Harrison's tenure in office the briefest in American history.

Since 1813, the relationship between the United States and Canada has been extraordinarily peaceful. The Rush-Bagot agreement of 1817 and the Boundary Waters Treaty of 1909 laid a solid groundwork for U.S.-Canadian harmony. Both countries take pride in the fact that no armaments have been deployed along their common border in nearly a century.

U.S.-Canadian cooperation was to reach its peak in the 1950s. Planning and construction of the monolithic St. Lawrence Seaway drew the two countries together in an uncommon mission: completion of the largest freshwater transportation network in the world. When it opened in 1959, the Seaway was acclaimed as one of the wonders of modern engineering.

The century and a half between the War of 1812 and the opening of the St. Lawrence Seaway in 1959 was a period of stupendous commercial and industrial development in the Great Lakes region. The Erie Canal, completed in 1825, connected Lake Erie with the Hudson River and the major Atlantic seaport of New York City. Starting in 1829, freight traffic between Lake Erie and Lake Ontario was able to skirt Niagara Falls via the Welland Canal. The year 1848 marked another transportation milestone: Lake Michigan was joined to the Mississippi River through the completion of the Illinois Waterway.

An equally vital breakthrough occurred in 1854 when an all-rail network at last connected New York to the Great Lakes trading town of Chicago. That tiny frontier outpost was to mushroom into a metropolis over the next century, its population increasing 150-fold. Railroads also hastened the development of other communities near the Lakes. Almost overnight, trains supplanted ships as the preferred mode of passenger travel. Many an ill-fated vessel had met its ruin on the tempestuous and unpredictable waters of the Great Lakes.

Freight traffic on the Lakes, however, continued to grow by leaps and bounds. Mineral riches, such as copper and iron ore, moved in increasing quantities from the more rustic northern Great Lakes to the urban manufacturing centers of Illinois, Indiana, Michigan, Ohio, Pennsylvania, and New York. To accommodate this growing volume of raw materials and finished products, heavier steamboats began crowding out the sailing ships that had once reigned supreme on the Lakes.

A curious aberration in the history of the Great Lakes occurred between 1849 and 1856 when a devout Mormon named James J. Strang claimed that heavenly voices had instructed him to take possession of Beaver Island in Lake Michigan. There he was to reign for six years over a thriving society of polygamists as the first and only "King" in the history of the American republic. Finally, in the summer of 1856, Mormon assassins and mainland invaders brought a bloody end to Strang's strange dreams of royal splendor.

Technology and progress were "king" elsewhere in the Great Lakes. Duluth, Chicago, Detroit, Toledo, Rochester, and Buffalo all prospered as the nineteenth century gave way to the twentieth. One of the greatest industrial centers in the world—Gary, Ind.—did not even exist when the twentieth century began; all of its phenomenal growth has occurred since 1905! Today the American and Canadian cities bordering the Great Lakes comprise the largest industrial complex in the world.

Once-thriving Great Lakes industries such as lumbering and fishing have declined in importance as the natural riches on which they depend have undergone depletion and deterioration. However, a great deal has been done since World War II to arrest and, in some cases, even to reverse these patterns of decline. In this effort, environmentalists have been aided by the recent slowing of population increases and economic growth in the Great Lakes region.

These stabilizing forces are helping to preserve the natural beauties of the Great Lakes, which have been drawing visitors for over a century. Lake Ontario's Niagara Falls—long the mecca of honeymooners—remains by far the greatest natural attraction in the entire region. Lake Huron's Mackinac Island, with its fabled Grand Hotel, ranks a distant second. Birdwatchers are drawn like the flocks of birds they observe to temperate Lake Erie, with its abundance of aquatic plants. Spectacular sand dunes ornament the Indiana and Michigan shores of Lake Michigan, which has receded considerably from its original boundaries.

Less frequented by tourists is Lake Superior, which is protected from overcrowding by its remote northern location. Superior is by far the most magnificent of the Great Lakes—and still the purest. With its 3,000 miles of rocky coastline, it ranks as the largest freshwater lake in the world. In legend, Lake Superior was the home of the Indian gods, America's answer to Mt. Olympus. These Indian spirits are still said to haunt Superior's Apostle Islands, which were immortalized by Henry Wadsworth Longfellow in "The Song of Hiawatha."

Nature rules the world of Great Lakes tourists, but the everyday life of Great Lakes residents is, for good or ill, in human hands. Decades of urbanization and industrialization have taken their toll, as has the increased volume of shipping on the St. Lawrence Seaway. Lakes Erie and Ontario, plus the southern end of Lake Michigan, have suffered the most noticeable damage.

Fortunately, the nearly pure waters of Lake Superior flow into all the other Great Lakes, so the potential for restored water quality—however slow—does still exist. But it will take years of concerted effort on the part of all the states and provinces bordering the Lakes to save them for future generations. If the Great Lakes are to remain "Great," nothing less will do. □

The Benefits of a Cleaner Lake Erie

by Henry J. Nowak

(Congressman Nowak, D-N.Y., represents the Buffalo area, and is a member of the House Committee on Public Works and Transportation, and Chairman of its Subcommittee on Economic Development. The full committee has jurisdiction over the Clean Water Act.)

The fortunes of Lake Erie and Buffalo, New York, are inseparable.

Just as the lake was the key to nineteenth century Buffalo's growth and development into the "Queen City of the Lakes," today it is again being viewed as the key to the city's revitalization. While the lake and the city suffered through bleak times—the lake from environmental damage, Buffalo from economic deterioration—today Lake Erie and Buffalo together look forward to a brighter future. Ironically, the combination of the decline in heavy industry along the Buffalo area waterfront and the improved quality of Lake Erie water has led to a rediscovery of the lake as a reservoir of vast potential for improving the quality of life.

Two decades ago, people were describing the lake as dead or dying. But, to borrow from Mark Twain, the reports of its death were greatly exaggerated.

Lake Erie—the "dying lake," as it was termed in the late '60s—has been cleaned up and revitalized as a "swimmable and fishable" freshwater resource. Since 1972, more than $14 billion has been invested in the restoration of the Great Lakes, due to an unprecedented bilateral commitment by the U.S. and Canadian governments at federal and state/provincial levels. Although there is much more that needs to be done, we have made measurable progress in restoring the quality of one of the world's major sources of fresh water.

During this period, many cities on Lake Erie experienced a change in their economies. Smokestack industries, such as steel and automobile plants, have closed or relocated. For some localities—like Buffalo—this has brought about a major restructuring of the economic base. The emphasis now is on seeking to diversify the economy and looking for sustainable and viable commercial and recreational growth. Clean water plays an important role in this process.

With the de-emphasis on steel and heavy industrial uses for the Buffalo waterfront, for example, its economic and recreational potential has been rediscovered. Residents now look toward the waterfront and see what they haven't been able to recognize in 20 years—a clean lake and shoreline. The emphasis is on redeveloping this underutilized waterfront property and taking advantage of the tremendous federal investment in improving water quality.

Baltimore, Boston, and Toronto are a few cities that have already developed their ports into commercial, residential, and recreational attractions. The Port of Buffalo is making marked progress in this direction. The Erie Basin Marina and the Buffalo Naval and Servicemen's Park are recent developments that have helped stimulate construction of residential condominiums and restaurants along the downtown waterfront, with a Marina Marketplace retail entertainment complex awaiting the start of construction.

These are just a few of the recent developments along Buffalo's five-mile lake front. Because of the tremendous potential for this newest frontier, the city has commissioned a Waterfront Planning Board to study the many proposals submitted for the waterfront and to make recommendations for a 30-year master plan. One of the planning board's tasks will be to link Buffalo's new light rail rapid transit system, a downtown pedestrian mall (under construction), and a planned baseball stadium with the waterfront.

Much of my effort in the past few years in Congress has been to foster this goal. I have been seeking federal and state funds for a variety of projects to act as a magnet to attract broader private investment. These projects include a Gateway Bridge linking downtown to the waterfront, an expanded and modernized roadway for easier pedestrian and vehicular access, a reconstructed small boat harbor, additional boat launching sites, a safe fishing pier for shoreline fishing, and an artificial fishing reef to act as a fish habitat and spawning ground.

One added attraction to the Buffalo lakefront has been improved sport fishing in the Golden Triangle: the region in the

The Buffalo News

Against the Buffalo skyline, boaters prepare for a day of summer sailing in Lake Erie.

eastern basin bounded by Buffalo, Point Abino, and Sturgeon Point. Smallmouth bass, walleye, trout, and salmon have all begun to increase in population and attract fishermen-tourists to our area. Because of increasing interest among fishermen and recreational boaters, I will continue to pursue assistance for water resource access and infrastructure improvement on the Lake Erie waterfront. Federal support for maintaining the Great Lakes water quality is an essential ingredient in the success of this effort.

One does not have to look far to see the economic benefits gained from the sport fishing industry. In Lake Erie's western basin, the walleye population has made such a remarkable recovery since 1975 that it now supports a $350 million industry just from sport fishing, marinas, and retail development along the Sandusky, Ohio, waterfront.

While the transition from a heavy industrialized waterfront to a commercial-residential-recreational waterfront is underway in Buffalo, a great deal of planning and research still needs to be done. Fortunately, this too is taking place. In addition to the efforts of the Waterfront Planning Board, other studies are being conducted to determine if the Port of Buffalo should be moved down to the abandoned Bethlehem Steel property where the space and facilities may be better utilized—making additional space available for harborfront activity, including a public beach.

Just this past summer in Buffalo we witnessed the tremendous display of interest that exists in the lake as a multi-purpose resource. Three Lake Erie conferences were held with wide participation by public officials, private interests, and concerned citizens.

One of the conference sponsors, the Great Lakes Laboratory of Buffalo State College, has, with my support, been conducting research on the population dynamics of the sport fish species in the eastern basin. The Corps of Engineers has lent the lab a research vessel at my suggestion.

Because of the revived interest in the waterfront, and a sense of momentum toward the achievement of a renewed sustainable economic base, I am working closely with New York's Governor Mario Cuomo to provide funds in the upcoming state budget for improved access, increased fish stocking, and the initiation of the artificial reef project.

While this economic transition is a priority among the many waterfront initiatives, the commitment toward a clean and safe Lake Erie environment is even greater. With the recent discovery of ground-water toxics contaminating many sources of drinking water throughout the country, protecting fresh water remains a critically important issue. We must continue our efforts to further curb point source and nonpoint source pollution of our watersheds.

Because of the complex nature of pollution and waste treatment, the federal government is often the only recourse for dealing with the devastating environmental atrocities we have witnessed. Therefore, Congress must insist on effective implementation of federal legislation such as the Clean Water Act, the Resource Conservation and Recovery Act, and Superfund.

However, while the increased role of the federal government is debated in Congress, the states must also be prepared to play a broader role in environmental protection.

Here in New York, our own state Department of Environmental Conservation has just concluded a three-year Niagara River Toxic Study to determine the sites and extent of the toxic dumps in and around the Niagara River. As a result of this study, additional research will be conducted to determine how best to clean up these sites. The Governor has announced he will provide additional funding for hazardous waste site cleanup, expand the definition of hazardous waste, and provide for stricter enforcement of pollution control laws.

We must devise ways to improve U.S. and Canadian government and Great Lakes provincial/state cooperation in maintaining and addressing common environmental concerns. With a sincere, coordinated bilateral commitment from the federal and state governments we could ensure an even cleaner and healthier Great Lakes environment for the decades ahead.

For Buffalo and other Great Lakes cities, the investments in environmental protection will continue to pay incalculable dividends in terms of economic growth and urban revitalization. □

How Canada Controls Great Lakes Pollution

by J. D. Kingham

(Dr. Kingham is Regional Director General of Environment Canada in the Ontario Region, and is Co-Chair of the Water Quality Board of the International Joint Commission. Environment Canada is that country's environmental protection agency.)

The Great Lakes constitute one of the most important natural resources in North America. They have had a tremendous impact on Canadian history and economic development. Their water and fish have been and will continue to be important in our overall economic activity, and they constitute a medium for human transportation unique in the world. But more than just support for our physical survival, the refreshing breezes and inspiring panorama of the Great Lakes create a singularly significant resource for the spirit.

Simply stated, the major threats to the Great Lakes are changes in their water levels, eutrophication, and toxic chemical contamination. These problems were clearly recognized by the International Joint Commission, and the latter two problems were meant to be dealt with in the 1972 and 1978 versions of the U.S.-Canadian Great Lakes Water Quality Agreement.

Progress with respect to lake water levels has demonstrated dramatically the extent of cooperation that exists between Canada and the United States. Similarly, attempts to control the eutrophication problem (essentially the over-feeding with nutrients of plant life in lakes as a result of human activity) have also been very encouraging. The toxic chemical problem has proven very difficult to solve. It is not intractable, however, and the technology and capability to deal with it exist now.

Canada and Ontario Work Together

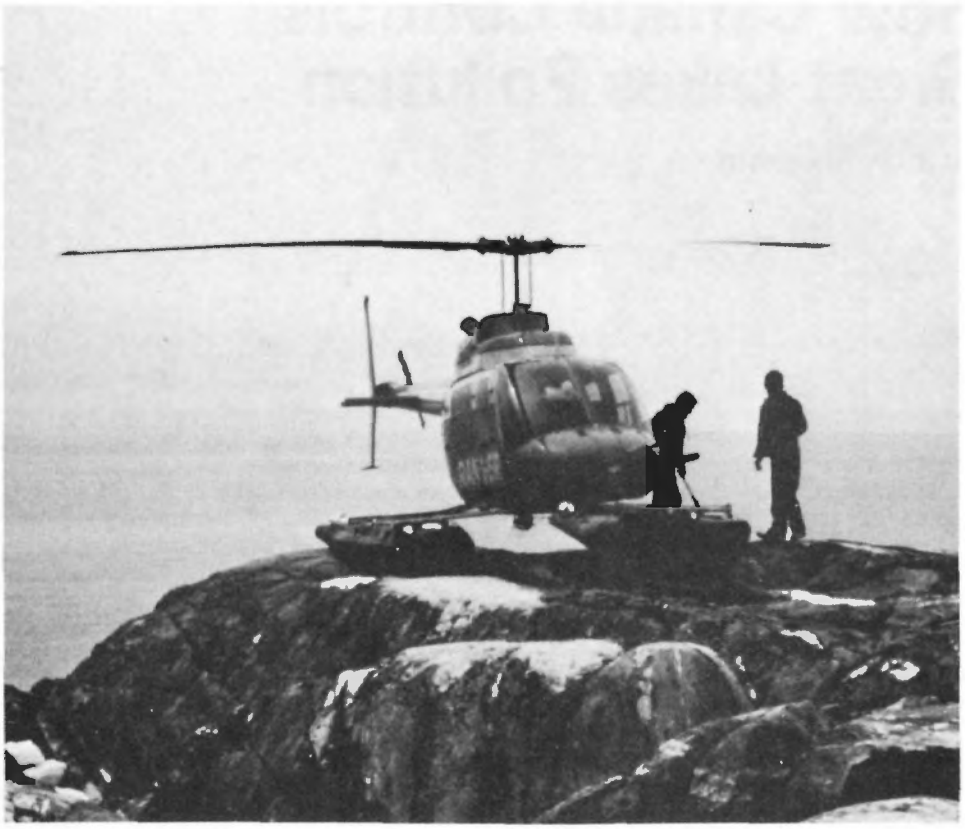
The Federal Government of Canada concluded an "Agreement Respecting Great Lakes Water Quality" with the Province of Ontario in 1971. This agreement, in anticipation of the 1972 U.S.-Canadian Great Lakes Water Quality Agreement, established the basis for a cooperative federal and provincial program to control phosphorus from domestic waste. An extensive research program was conducted, and a cooperative technology development and demonstration program yielded information on the feasibility of the required reduction and the associated costs.

Since the early 1970s, Canada and Ontario together have spent over $1.8 billion to build and upgrade sewage treatment facilities to meet the objectives of the 1972 and 1978 Water Quality Agreements. The single most dramatic act, however, for the reduction of phosphorus in the Great Lakes was that of the Canadian federal government in its regulation of phosphorus in household laundry detergents under the Canada Water Act of 1972.

The results have been clear. There has been a reduction in algal blooms (which result from the excess nutrients) and the associated fouling of beaches. A significant comeback in valuable fish species, as a consequence of cleaner water, has also been observed. Open lake and near-shore phosphorus levels have decreased in many areas. A growing interest in urban waterfront developments and parks has been another positive result.

But we cannot stop here. There is still a need to get control over the diffuse sources of phosphorus in the Great Lakes basin, in particular runoff of nutrients from land, arising from the application of fertilizers containing phosphorus to agricultural fields in the basin. Here again, the Canadian federal government and the Province of Ontario have worked cooperatively to develop a phosphorus management plan which should become a key component in the renewed Canada-Ontario Agreement.

Progress in the toxic chemicals area has been much more difficult. Some definite steps have already been taken. In 1977, for instance, Canada passed an Environmental Contaminants Act. This act has been used to ban or control toxic chemicals such as PCBs and mirex—chemicals which were contaminating the waters of the Great Lakes. The water quality objectives of the 1978 Great Lakes Water Quality Agreement have been adopted by the



Canadian Wildlife Service

As part of a herring gull egg monitoring program, members of the Canadian Wildlife Service collect eggs to test for trace elements of toxic chemicals.

Province of Ontario and are incorporated in effluent limitation control measures in that province.

Toxic Chemicals: The Biggest Problem

We are faced with the problem of what to do about the introduction of new and potentially dangerous chemicals into the Great Lakes, while at the same time trying to make progress on the cleanup of existing problems. These problems are wide-ranging, including atmospheric deposition, contaminated sediments, discharges from industry, and the leaching of toxic chemicals from waste dump sites in the Great Lakes basin.

For its part, the Province of Ontario has established a "Blueprint for Waste Management" that applies to waste materials of clearly defined toxicity. Ontario's programs and initiatives are supplemented by a federal Toxic Chemicals Management Program which promotes a cradle-to-grave approach to chemicals of concern. Canada is also in the forefront of international measures to identify, characterize, and register new chemicals as they come on the market.

One of the more innovative approaches which Canadians adopted for the detection of low levels of toxic chemicals in the Great Lakes was a program which used living species, in their natural setting, as indicators of the health of the Great Lakes ecosystem. One particular program which yielded very good results was the herring gull egg monitoring program.

Because herring gulls feed on Great Lakes fish, and because those fish have already concentrated toxics through their feeding on lower organisms in the food chain, we expected that the herring gull population would be the most sensitive indicator of the effects of toxic chemicals in the Great Lakes. This proved to be the case. The herring gull monitoring program, a joint program of the Canadian Wildlife Service and the U.S. Fish and Wildlife Service, produced compelling evidence for controls in Ontario and in the U.S. states bordering the Great Lakes.

Unfinished Business

It would be misleading to paint a rosy picture of the health of the Great Lakes with respect to toxic chemicals. The reality is that the lakes are contaminated with hundreds of them, many of which are of direct concern to the ecosystem and human health. For many of these chemicals, there are inadequate guidelines and a consequent lack of substantive control programs. No wonder the public is concerned.

But there is a great deal that can be done—and can be done in the short term. A new approach to the work of the Great Lakes Water Quality Board and the implementation of the findings of that Board on both sides of the border is possible. In particular, the Water Quality Board has proposed a new, more rigorous approach to the scheduled cleanup of toxic chemicals in specific geographical areas of concern.

Another new approach which is being investigated on both sides of the border has to do with a more rapid response to already identified problems. By singling out the most serious known chemical contaminants in the Great Lakes (the "dirty dozen," for instance), we can recommend to the eight U.S. states, the Province of Ontario, and the two federal governments control measures to deal with those pollutants.

The Canadian Fisheries Act has the potential to be one of the most powerful pollution prevention tools in the world. Under this act it is an offense for anyone to put any quantity of a substance which might be harmful to fish in any waters which are frequented by fish. The application of this act, however, reflects the reality of human existence: that we produce by-products as a consequence of our daily life and must therefore temper our authority to prohibit pollution with the reality that humans as well as other species have to live on this planet. Although the actual application of Canadian legislation, both federal and provincial, results in standards which achieve similar ends to those used in the United States, the potential for the most stringent control possible clearly exists in the Fisheries Act.

Canadian methods for control of pollutants in the Great Lakes basin may be different from those in the United States, but in conjunction with control measures south of the border, we have already made some significant strides towards improving the health of this particular ecosystem. Continued cooperation between the Canadian federal and provincial governments will lead to improved water quality in the Great Lakes. When this cooperation is coupled with the international cooperation between our two countries, the prospect for even greater improvements is encouraging.

We have the tools, the knowledge, and the capability to deal with the pollution problems of the Great Lakes. It remains to be seen whether we, collectively, have the will to act. □

B.A. King

Learning in the Great Lakes "Lab"

by William L. Richardson

Environmental scientists take great pains in planning and executing their laboratory experiments. EPA and other water pollution scientists meticulously design experimental chambers, called *microcosms,* to simulate the reactions, fate, and effect of chemicals in aquatic systems. They mimic nature as they carefully control temperature, light, and, finally, the addition of chemicals,

Richardson is chief of EPA's Large Lakes Research Station in Grosse Ile, Mich.)

observing which organisms thrive, which ones die, how fast they grow, what abnormalities occur, and how the chemicals are distributed between sediment, water, and animal and plant life. The information gained in this tiny world helps develop scientific understanding of chemical interaction with nature.

Nature, by contrast, provides the real world *macrocosm*; roughly 15,000 years ago she created her own experimental laboratory on the North American continent, and in doing so provided today's scientists a larger laboratory in which to study and predict the impact of chemical pollutants on our waters and the life within them, and on the food chain and water supply that ultimately sustain human life.

This experiment began with immense sheets of ice, miles thick, slowly carving enormous aquaria from the earth as they advanced southward. After centuries of grinding and gnawing, these glaciers retreated, leaving in their wake five magnificent shining emeralds, the Laurentian Great Lakes.

This vast "macro-laboratory" covers the five main lakes, the connecting channels and hundreds of feeder tributaries, embayments, and thousands of miles of shoreline. It provides the setting for man and nature's collaborative experiment in physics, biology, geology, chemistry, limnology, and toxicology, and also in political science, economics, sociology, and law. The experimental design includes man first as the perturber of the natural environment, then as one of the perturbed species, and, finally, as the scientist and manager.

Nature stocked the Great Lakes with thousands of organisms, from microscopic bacteria and plankton to lake trout and huge sturgeon. This ecosystem maintained its natural equilibrium for centuries, first supporting sparse human populations of native Americans and early European settlers. What human wastes entered the lakes over a century ago were rapidly purified by natural processes. But when the forests were harvested to supply wood to eastern and southern cities, the feeder streams and rivers were choked with pulp and sediments that destroyed important spawning areas. This was man's first serious interference (or "perturbation") with the region's ecosystems.

Few scientific observations were made until typhoid struck many Great Lakes towns in the early 1900s. The

typhoid-related studies resulted from the 1909 U.S.-Canada Boundary Waters Treaty and the establishment of the International Joint Commission (IJC), a binational body that negotiates international concerns about the Great Lakes and other common water systems.

These earliest studies, from 1913 to 1916, focused on the connecting channels—the Niagara River, Detroit River, St. Clair River, and Lake St. Clair—rather than the main lakes. The research centered on bacterial contamination from domestic sewage and found, for example, that the connecting channels flowing from Detroit into Lake Huron reversed their direction from time to time, bringing the raw sewage back into the drinking water intakes. As a result of the research and its recommended solutions, drinking waters were treated and disinfected and the sewers relocated. Later, primary wastewater treatment was instituted.

Since the early 1900s, pollutants have flowed into the Great Lakes from growing industrial centers on or near their shores. Other pollutants have fallen from the atmosphere over the lakes' vast surfaces or come from pleasure boats and ore and grain ships carrying their cargoes from as far west as Duluth to the St. Lawrence Seaway. Nuclear power plants discharge cooling waters into the lakes. At one point in the 1960s, Lake Erie was declared dead or dying.

As all these elements were introduced into the Great Lakes "laboratory," the extent of American and Canadian research grew and became much more sophisticated. The first Conference on Great Lakes Research in July 1953, sponsored by the University of Michigan's Great Lakes Research Division, led to organization of the International Association for Great Lakes Research, which today has over 1,000 members.

Larger research and monitoring programs followed in the wake of new and more serious environmental and public health concerns. When wildlife was destroyed in the 1950s by continuous oil slicks in the Detroit River, enraged duck hunters and early environmentalists carried the oil-soaked carcasses to the steps of state capitols and lobbied furiously in Washington. The general public was alarmed when beaches were closed to swimming, when windrows of dead fish lined the Chicago beaches, and when the Cuyahoga and Rouge Rivers actually caught fire.

With the survival of the Great Lakes ecosystem clearly at stake, the public demanded action. Under Public Law 660, anti-pollution enforcement and comprehensive studies were initiated. Scientific data were collected and used as evidence in federal/state enforcement actions. The Great Lakes Illinois River Basin Project (GLIRBP) provided the first comprehensive water quality information for the lakes and it was used in a landmark decision on diversions through the Chicago Ship Canal.

At first, there was little need for sophisticated science in dealing with problems of gross pollution, i.e., grease, raw sewage, bacteria, dissolved solids, and the like. Judges and enforcement panels were usually convinced by the photographic evidence and data summaries showing blatant violations of water quality norms. But as we became more aware of the many chemicals involved and their potential impact not only on the ecology but also on human health, the 1970s saw the growth of research and surveillance efforts. Coordinated binational, interagency programs collected data and developed mathematical models to help predict the future consequences of man's impact on the lakes and provide insights into optimal control strategies.

As oil slicks were diminished by better waste treatment and controls, new studies revealed a more ominous problem that had been overshadowed by previous, more obvious concerns. Eutrophication had accelerated proliferation of plant life in the lakes. The bottom waters of Lake Erie were void of oxygen for much of the summer. Shoreline residents complained of massive weed mats and floating green scum. Water treatment plant operators complained of clogged intake filters, and citizens objected to the musty taste and odors of drinking water.

Researchers using deep-water vessels were able to get water, sediment, and plant and other samples from all parts of Lake Erie. They found that the combination of waste contaminants pouring into its waters was stimulating plant growth to the point where decaying vegetation was depleting the oxygen needed by fish and other helpful organisms. They were also able to relate the problem to the seasons of the year.

The end result? Mathematical predictions that correctly forecasted quality improvements that could be achieved if the input of phosphorus was reduced. This research led to a billion dollar cleanup program and vast improvements in Lake Erie.

The research also led to initiation of new studies of toxic substances. As a result, DDT was banned when researchers confirmed its impact on Lake Michigan wildlife feeding on Great Lakes fish (fish are amazing collectors of pollutants in the waters in which they live). In 1969, mercury was found in fish in Lake St. Clair and the Detroit River. It was discovered that mink reproduction fell off as a result of PCB-contaminated salmon used as food.

Asbestos became the issue in Lake Superior when scientists found it to be a dangerous component in the taconite tailings dumped into the lake by the Reserve Mining Company plant. Those findings contributed to a major court decision. And, most recently, toxaphene, a pesticide used primarily in the southern United States, was banned after it was found in fish in a lake on Isle Royale in the middle of Lake Superior.

Today, over 800 chemicals have been identified by research scientists studying Great Lakes fish samples. Health advisories remain in effect in many parts of the lakes.

As minute as some of the loadings of chemicals are, biomagnification may concentrate them up to a millionfold at the top of the food chain. It is not yet clear what real impact or risks many of these chemicals may present, either alone or in combination. There is some evidence that toxic substances may be preventing lake trout reproduction in Lake Michigan and may be retarding other ecosystem functions. The presence of tumorous fish and deformed fish larvae may also indicate contaminant effects.

Because it is impossible to study all the chemicals in every area of the lakes at one time, researchers have chosen to study thoroughly a few chemicals at a small number of locations. Now under study are radionuclides and PCBs in Lake Michigan; heavy metals and PCB-like compounds in Monroe Harbor, Mich.; PCB mixtures and metals in Saginaw Bay, Mich.; and aromatic hydrocarbons in the near-shore waters of Lake Michigan.

Chemical pollution involving compounds like DDT and mercury, and other concerns in the Great Lakes coincided with increased national awareness of environmental degradation, the establishment of EPA in 1970, the signing of the U.S.-Canadian Great Lakes Water Quality Agreement in 1972, and passage of the Federal Water Pollution Control Act. In 1971, EPA established its research program on the Great Lakes at Grosse Ile, Mich., and in 1978 created the Great Lakes National Program Office in Chicago. Much of EPA's Great Lakes research and surveillance is supported through the agency's Region 5 office in Chicago.

Most recently, a coordinated study has been started to investigate the Upper Great Lakes connecting channels. This study is continuing nature's experiment, as scientists working in microlabs and the Great Lakes macrolab carry on man's urgent efforts to keep his fresh waters clean and the food chain safe. □

Thinking Ecologically in Lakes Protection

by Lee Botts

Dead alewives float on the Chicago shoreline. In "the great alewife dieoff" of 1967, Lake Michigan beaches were unusable for a summer and drinking water intakes were clogged for weeks.

A dozen years ago, Canada and the United States agreed to clean up the Great Lakes, and much progress was made. But....

While most beaches are now open to swimming, more fish have tumors than before.

Algae are less abundant since the amount of phosphorus coming into the lakes has been reduced, but evidence is piling up that growing toxic contamination threatens the health of the Great Lakes ecosystem and its inhabitants.

Moreover, solutions to some Great Lakes problems may have made others worse. Environmental managers still face many dilemmas.

For example, direct discharges of industrial wastes are largely controlled under the permit system of the Clean Water Act, yet toxic chemicals and heavy metals are still entering the lakes from the atmosphere. Research fostered by the Great Lakes agreement with Canada has shown that atmospheric deposition must be the only source of many toxic contaminants to the Upper Great Lakes (Lake Superior, Lake Huron, and northern Lake Michigan). Studies indicate that even in the case of Lake Michigan, with many industrial sources at the southern end, half the total load of toxic contaminants and heavy metals may now be entering the lake from the air. How these contaminants got into the air is not fully understood. The routes are believed to include evaporation from agricultural spraying and landfills, vaporization in industrial treatment systems, and incomplete combustion.

Could it be that prevention of direct discharges of industrial wastes into waterways has displaced more toxic chemicals into the atmosphere?

The diversion of industrial wastes into publicly owned treatment plants creates another dilemma when the result is concentration of toxic chemicals in the sewage effluent. The St. Louis River is the largest tributary flowing into Lake Superior. Since Duluth built its huge new sewage treatment plant, the river is so much cleaner insofar as conventional pollutants are concerned that the walleye have returned and fishing is better than it has been for years. Nonetheless, a recent study found that the sewage treatment plant is now a large source of toxic chemicals going into the St. Louis River and Lake Superior.

Since the cleanup of the conventional pollutants from the river, the sea lamprey has also begun to spawn there. This means that the sea lamprey is now spreading throughout the Great Lakes

(Botts founded the Lake Michigan Federation, a citizens group concerned with Great Lakes cleanup. She is also the former Chair of the Great Lakes Basin Commission, a water planning agency, and is now research associate at the Center for Urban Affairs and Policy Research of Northwestern University.)

system. The lamprey is the parasitic invader from the ocean that first entered the Great Lakes through the St. Lawrence Seaway and earlier manmade canals. By attaching itself to large fish, the sea lamprey kills them. It had almost destroyed the lake trout in Lake Michian by the 1940s.

That removal of lake trout as Lake Michigan's leading predator was followed by explosive growth of the lake's alewife population. The alewife is a small Atlantic herring that also entered the Great Lakes through canals but is not well-adapted and tends to die off in the spring. "The great alewife dieoff" in Lake Michigan in 1967 was one of the all-time Great Lakes ecological disasters.

Thousands of tons of decaying alewives clogged drinking water intakes for weeks and made beaches unusable all around the lake all summer. Public fear was intensified when botulism caused a massive dieoff of fish-eating birds. When the State of Michigan introduced coho and chinook salmon from the Pacific northwest into Lake Michigan in the mid-1960s, the chief reason was to provide new predators to reduce the number of alewives. Then the plan was to reestablish the lake trout population.

Now, twenty years later, there are only about a tenth as many alewives, but the lake trout is not yet reproducing well enough to sustain itself naturally. Researchers at the University of Wisconsin have found evidence that something, presumably a toxic chemical that inhibits reproduction, is passed from the adult fish to their eggs. The Fish and Wildlife Service Great Lakes Laboratory at Ann Arbor found that survival of young fish seemed to be related to levels of toxic substances.

To dredge or not to dredge? Another dilemma is how to clean up places where high concentrations of contaminants and metals have settled out into sediments. Most such "toxic hot spots" are in harbors or near the mouths of tributaries. The highest rates of fish tumors found so far have been among bottom-feeding fish like bullheads in the Buffalo River where sediments have high levels of chemical contaminants. The worst accumulations resulted from past direct discharges, like the high levels of PCBs (polychlorinated biphenyls) in Waukegan Harbor, Ill., and the dioxins in Saginaw Bay, Mich. Because physical removal by dredging can cause resuspension of some of the contaminants in the water, it was formerly thought better to leave the sediments undisturbed once the pollutants had settled into them.

With dredging for navigation, the polluted sediments that were removed were placed in secure landfills or diked disposal areas. Now no landfill is thought to be permanently secure and pollutants often escape from diked disposal sites. Biological recycling of organic contaminant sediments back into the water also occurs. In the 1960s, mercury discharges into Lake St. Clair and the Detroit River had to be stopped because bacteria converted the metal into poisonous methylated mercury.

International Joint Commission

Malformations in fish and birds, such as the crossed bill of this Forester's tern chick, have prompted concern about toxic substances in the Great Lakes.

Now it has been shown that gases excreted by bottom-feeding organisms can pass into the atmosphere through the water. In this way, and also by evaporation from the surface, it is conceivable that chemicals that may have entered the water from the air can be recycled back into the atmosphere.

Although hundreds of chemicals have been found in the Great Lakes, in many cases the levels in the water are so low that they can be measured only by sophisticated techniques such as gas chromatography. There is much concern about persistent organic chemicals that concentrate in fatty tissues and bioaccumulate up the food chain, like PCBs.

Because treatment removes many chemicals from drinking water, humans receive the greatest exposure to chemical contaminants from eating fish. Concentrations of PCBs, dieldrin, mirex, or chlordane exceed Food and Drug Administration standards in trout and salmon and are the reason fishing licenses for all the lakes except Superior advise limiting consumption of certain fish. Because of the special vulnerability of the young, several states advise that women of childbearing age and children under five should never eat these fish.

The economic contribution of sport fishing in a region that has been losing its industrial base adds to the dilemma. The coho and chinook salmon introduced to eliminate the alewife are now the most prized sport fish. But epidemiological studies have shown that levels of PCBs in humans are related to the quantity of Great Lakes fish they eat. Stocking fish thus increases human exposure to contaminants if the health warnings are not heeded.

Concern about human exposure has also been intensified by a high rate of genetic defects in fish-eating cormorants that nest on islands in Green Bay. It is suspected that the cormorants now born with crossed bills have been affected by dioxins or dibenzofurans.

The Clean Water Act regulates the quality of effluent in direct discharges from municipal sewage treatment systems and industrial sources. No such discharges flow into Lake Siscowet on Isle Royale (which has been a wilderness national park since 1910). Yet high levels of PCBs were detected in trout from the isolated lake in 1975, and high toxaphene levels were found in 1980. The toxics, obviously, could only have come from the air. Yet chemicals can only be classified as hazardous under the Clean Air Act if they pose a hazard from *direct* exposure. Neither law takes bioaccumulation in the food chain into account, although this is the way human health effects are most likely to be caused by toxic contamination of the Great Lakes. Another Great Lakes environmental management dilemma!

In summary, the experience with the Great Lakes is a lesson in how some solutions to environmental problems may make others worse. The crux of the lesson is that solutions to single problems must be considered in light of their impact on the whole ecosystem. Some of the most serious damage can be caused indirectly. Moreover, degradation that is caused indirectly can be more difficult to reverse. Still, the success in reducing phosphorus loadings to the Great Lakes suggests that, with enough research and determination, an ecosystem approach to management that would prevent continued toxic contamination of the lakes is also possible.

The classic definition of an ecosystem is the complex of physical resources and the living organisms that depend on them. Humans have caused most of the problems in the Great Lakes ecosystem, but they also have a large stake in solving them. □

Toxics: Today's Great Lakes Challenge

by L. Keith Bulen

(Bulen is U S. Commissioner of the International Joint Commission.)

The environmental challenge of this decade, and perhaps the remainder of this century, will be understanding and addressing the problem of toxic contaminants in our environment. Toxic substances problems are of concern in all urbanized, industrial, and agricultural regions of North America and around the world as well, and the Great Lakes are no exception. Toxic substances may be raw materials, finished goods, or by-products of production or consumption of primary products. These substances were developed for a wide variety of industrial, agricultural, and household applications, and are in the Great Lakes Basin because there is public demand for them or for products requiring their use.

There are those who argue that economic growth necessarily conflicts with environmental protection. However, as Robert McNamara stated in an address to the United Nations Conference on the Environment, "The question is not whether there should be continued growth. There must be. Nor is the question whether the impact on the environment must be respected. It has to be. Nor—least of all—is it a question of whether these conditions are interlocked. They are. The solution of the dilemma revolves clearly not about whether, but about how."

Some natural features of the Great Lakes influence their susceptibility to pollution. Differences in surface area, volume, and rate of outflow determine different water residence times, i.e., the time required for a complete change in water volume by the rate of outflow. Once pollutants are allowed to accumulate in the lakes, it may take decades or even generations for the lakes to cleanse themselves.

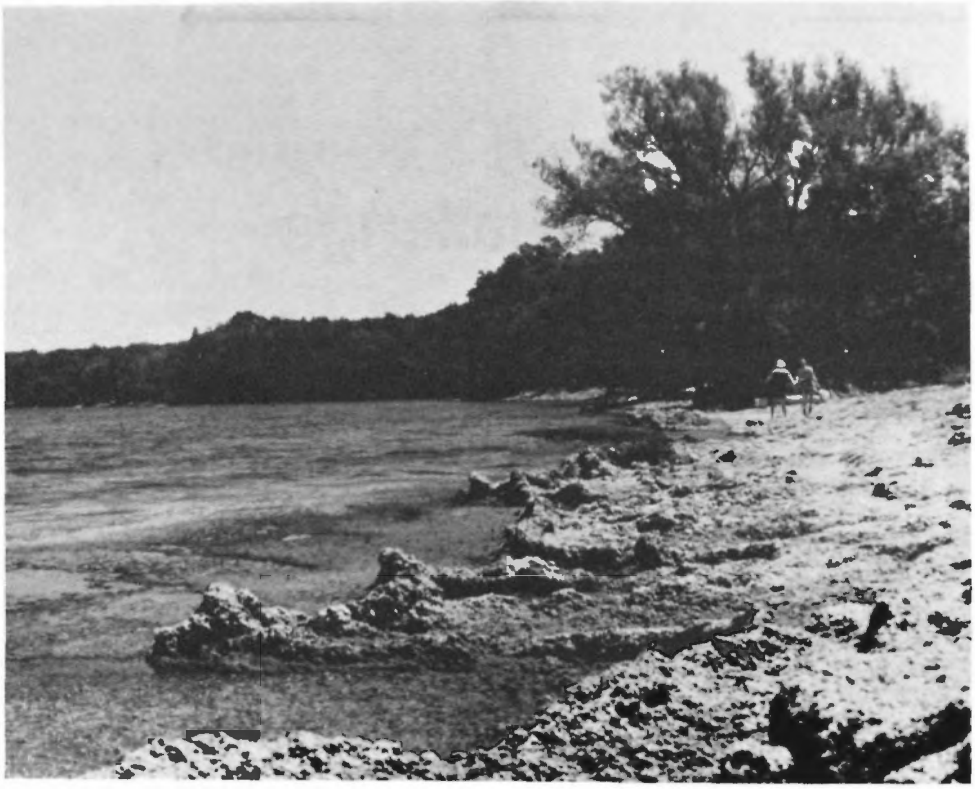
In many respects the Great Lakes have been the victims of historical circumstances. Consider that pestilence and disease plagued Europe for centuries because of the improper disposal of human sewage on land in proximity to habitation. In the mid-1800s, Thomas Crapper perfected an earlier design by Sir John Harrington and invented the modern flush toilet. This device, for which both men are memorialized in the common vernacular, was heralded as a major breakthrough in sanitation and health protection. Cities were now able to dump their sewage into convenient nearby rivers and lakes.

The timing of this invention coincided with the settlement of the Great Lakes by European immigrants. Cities were built adjacent to the shores with economical combined sewer systems that handled both sanitary wastes and storm water. People naively thought the Great Lakes were so large that any pollutants would simply dissipate by dilution.

By the mid-1900s, the population in the Great Lakes basin was not only growing but concentrating in urban areas. Industry, especially after World War II, expanded massively. Not surprisingly, development occurred along the shores because of the advantages of cheap transportation, a seemingly unlimited source of water, and a receptacle for receiving wastes. In addition to directly discharging wastes into the water, a number of industries tapped extensively into the existing sewer systems, and industrial wastewater disposal became largely a municipal responsibility. Countless numbers and quantities of chemicals were discharged into the Great Lakes. They were rarely measured, and their fate and effects were largely unknown. A sewer system originally designed for health protection came to receive a host of manmade, industrial waste materials.

Eutrophication

The initial focus on Great Lakes water quality was not on toxic substances but on much more visible forms of pollution. The overloading of nutrients, especially phosphorus, stimulated obnoxious growths of algae and weeds that fouled waters and beaches and caused other undesirable changes in water quality and fish community composition.



John E. Gannon

Mats of algae rotting on the shores of Lake Ontario, one consequence of a lake overnourished with nutrients, known as eutrophication. The United States and Canada have made major gains in controlling this problem on the Great Lakes. Eutrophication produces much more visible pollution than the toxic substance contamination now challenging the lakes cleanup.

Eutrophication attracted considerable scientific and public concern, and in 1972, the Great Lakes Water Quality Agreement was signed by the U.S. and Canada. The two countries initiated a coordinated international program to restore and maintain the quality of Great Lakes water, and spent billions of dollars to reduce phosphorus loadings from municipal and industrial discharges. Unfortunately, the success story of eutrophication control in the Great Lakes is too often overlooked as attention shifts to the problems of toxic contamination.

The Toxics Challenge

Toxic substances are mostly invisible, but alarming tumorous growths on fishes in polluted rivers and harbors and abnormal development in eggs and chicks of fish-eating birds in the Great Lakes are ominous evidence of their presence. Our awareness of the problem of toxic substances has increased largely through improvements in analytical technology that allow scientists to measure a wider array of compounds at smaller and smaller concentrations.

Even diluted, these hazardous substances may exert adverse biological effects through bioaccumulation in aquatic organisms in the food chain to levels which are eventually toxic. Ironically, the fishery in the Great Lakes has been undergoing a phenomenal recovery in recent years but the levels of toxic contaminants in some species has prompted cautionary health advisories on consumption.

Specific regulatory measures have had an impact on controlling levels of a few toxic substances such as DDT and mercury. Many more, however, remain unregulated because of the lack of information on identification, fate, and effects. Regulation of the myriad of toxic substances on the single chemical-by-chemical assessment approach may not be sufficient to deal with interactions between chemicals.

Nor will local or regional considerations alone suffice; the problems are transboundary. Toxaphene, used as an insecticide in the southern United States, has been detected in the Great Lakes basin, transported by air currents across many political and watershed boundaries. Concerns about toxic substances in the lakes must now extend beyond the Great Lakes basin.

Similarly, pollution cannot be viewed as a single medium problem. For example, industrial solvents buried in landfills leach through the soil and become toxic chemicals in ground water and eventually can pollute nearby rivers and lakes. In many respects, more stringent surface water quality controls enacted in the past several decades have encouraged a shift of pollution from direct surface water discharge to other routes of entry such as the atmosphere and ground water.

Conclusion

The transboundary and multimedia features of the toxic substances problem demand a more holistic, cooperative, integrative, and multidisciplinary approach than heretofore realized. Our understanding of environmental problems is inadequate, and existing legislation and regulatory practices may not fit the task before us. We need to begin developing a comprehensive control strategy for toxic substances.

Additional research is needed on rendering toxic materials harmless before their release into the environment. Pre-treatment technologies for certain industrial wastes received by municipal wastewater treatment plants require further expansion. Residual disposal technologies such as land incineration need additional research. Naive or indiscriminate dumping of toxic wastes over many years is causing harm to the environment now. We must move responsibly into the future with better detoxification mechanisms, controls, and monitoring tools. Better yet, we should generate less toxic waste materials at the outset, promoting effective, not token, recycling efforts, and developing non-toxic substitutes.

Great Lakes water quality problems cannot be addressed adequately without heightened citizen concern and involvement. Toxic contaminants are not nearly as visible as was eutrophication, so citizen concerns must provide some extra impetus for action. Improvements in industrial practices to reduce toxic substances must be encouraged. Consumers must realize that they have had far more impact on the generation of toxic substances than ever imagined. Without active community support, it is probably beyond the reach of any agency or government to achieve the objectives of the Great Lakes Water Quality Agreement. The challenge is, therefore, one to be met not only by governments, industry, the scientific community, or citizens, but by all four.

As President Reagan asked in his second Inaugural Address, "If not us, who? If not now, when?" □

Views from Other Vantage Points

by Paul MacClennan

EPA Journal asked three journalists from different parts of the Great Lakes region to write about the status of the lakes' environment from their vantage points. The writers are Paul MacClennan, Buffalo News; *Casey Bukro,* Chicago Tribune; *and Dean Rebuffoni,* Minneapolis Star and Tribune. *All three regularly write about Great Lakes environmental matters. Their views do not necessarily reflect those of EPA. Here are their comments:*

Let's look at the year 2000.

Will the Great Lakes be restored to the international goal of waters that are fully fishable, swimmable and drinkable?

Two decades ago, alarmed by rivers that burned, beaches closed by bacteria, and waters filled with rotting wastes, the United States and Canada knew they had to act.

The international water quality agreement that followed is a landmark and was the envy of the 140 nations attending the United Nations Conference on the Human Environment in Stockholm. The Great Lakes pact of 1972 is a challenge that set a new world standard for cooperative action on pollution abatement. It gave new hope for millions whose health, welfare, jobs, and recreation depend on pure water.

States, provinces, and the two federal governments set about to rectify the mistakes, misdeeds, and malfeasance of the past, pledging to spend billions on new sewage treatment plants and requiring industry to do the same.

The pace often lagged as commitments waned and communities wavered. One agency started boasting of "success stories." In one such case, the claim was made that a fish had survived the trip from Lake Erie up the contaminated industrial waters of the Buffalo River. The boast was premature.

While not wholly satisfied with progress and noting delays in Chicago, Detroit, Cleveland, Buffalo, and Toronto, the International Joint Commission said that overall, the lakes' water quality was improving and that eutrophication of Lake Erie had stabilized.

But even as the tide began to turn on "conventional pollutants," a new and more sinister threat emerged. The problem of toxic and hazardous wastes had been there all along, but it took Lois Gibbs and a handful of Niagara Falls housewives who lived at Love Canal to rivet international attention on the issue of wastes from a post-war chemical industry run amuck.

Overnight there was a new "Great Lakes crisis," the specter of often invisible, often undetected toxic and hazardous wastes turning up in water samples, bottom sediments, and, more seriously, infiltrating the aquatic and wildlife food chain.

The threat of human wastes contaminating the lakes that dominated the 1970s quickly gave way to the threat of chemical wastes as the challenge of the 1980s.

Scientists had long cautioned that the two nations must deal with the issue of nonpoint pollution. Almost reluctantly, agreement was reached on a pact to limit the discharge of oxygen robbing phosphorus discharges in a mutual effort to curb eutrophication that had despoiled Lake Erie and led some to predict its "death."

Toxic discharges proved more complex, harder to get at, less understood. Some of the environmental fervor of Earth Day was gone. Government funding for research shriveled up. Superfund languished and at best would deal with only a handful of sites threatening the lakes. Cleanup even at Love Canal remains incomplete seven years later.

Beaches are still being closed on the Great Lakes, fish caught in their waters carry health warning labels, and many persons perceive the drinking water as posing long-term threats to health.

Jack Vallentyne, a courageous and outspoken Canadian scientist, warns that until we look at the entire ecosystem,

Some Great Lakes beaches are still closed because of pollution.

International Joint Commission

until we deal with and treat all the forces that comprise the Great Lakes system in its entirety, we will fail in the mission of restoration.

Today our methods for dealing with the hundreds of toxic dump sites that ring the lakes are primitive—analogous to the first flight of Wilbur and Orville Wright at Kitty Hawk in an age of space flight.

Can we meet this latest challenge by 2000?

At the present speed it appears unlikely without major commitments for research, without strong emphasis on high technology applied to existing dumps and disposal of new wastes and without high-level commitment to meeting terms of the Great Lakes Water Quality Agreement. None are in place.

Why the pessimism?

More than a decade ago, the International Joint Commission (IJC), the watchdog over government cleanup efforts, identified 47 U.S. and Canadian problem areas from Thunder Bay on Lake Superior to the Oswego on Lake Ontario. The list and those problems are little changed today.

In 1982 to focus on the most serious situations, the IJC cited 18 "Class A" areas of concern from Saginaw Bay in Michigan to Hamilton Harbor in Ontario. For the most part commission experts say that remedial measures planned or in place will not end contamination.

New York, Ontario, and the two federal governments had an *ad hoc* Niagara River Toxics Committee focus on one of the problem areas, spending four years and $6 million to come up with 24 recommendations. Even if—and it's a big "if"—the money and manpower were allocated, these recommended actions might not achieve results for another generation. And the Niagara River is just one of 18 such areas.

Seven years after Love Canal, not a single major chemical dump site along the Niagara River has been contained, much less cleaned up, nor do we have basic information on the extent of toxic migration or the extent of ground-water contamination and its impact on the river and on Lake Ontario.

However, a Niagara River Toxics Committee reports that 61 dumps of some 164 within three miles of the river "have [been] or are contributing contaminants to the Niagara River." Dioxin-contaminated sludges believed to originate at Love Canal have been found both in tributary creeks and at sewer outfalls in the Niagara River adjacent to Love Canal.

One fails to see the methodical, day-by-day, month-by-month, year-by-year accounting, charting a path out of the toxic wilderness; nor, in the deluge of government paperwork, a box score or tomorrow's lineup telling what's been accomplished and where the players are going.

One would like to be proven wrong, but then one looks at the record of Love Canal—a fiery boil likely to fester through this decade—and wonders if 15 years will begin to erase or even diminish the degradation of one of the world's great freshwater wonders.

Later this year the International Joint Commission will issue its report card on progress under the most recent Great Lakes Water Quality Agreement, formulated in 1978.

The National Academy of Sciences and the Royal Academy of Canada along with the Center for the Great Lakes are already examining the Agreement to determine if changes are necessary to expedite the task of restoring and preserving the lakes.

There are new brooms both at Environment Canada and the Environmental Protection Agency, but both agencies face budget constraints that exacerbate the allocation of limited resources.

There are a multitude of related issues: from diversion of Great Lakes waters to the west and south, to the impact of deposition of airborne contaminants on the pristine upper lakes.

Yet day by day the clock ticks on towards the twenty-first century—a century that could open on a high note of concern for nature as evidenced in clean lakes and pure waters.

Each day we wait, each day we waste, puts a clean environment in the year 2000 further out of reach. And while we look at the year 2000, we must remember that if we fail the Great Lakes, that generation will look back at 1985 and ask why. □

by Casey Bukro

It was back in 1978 when one of Washington's top environment officials happened to see a shimmering blue "ocean" from a downtown skyscraper while visiting Chicago.

"What's all that water out there?" asked the U.S. Environmental Protection Agency official, who was told it was Lake Michigan.

The headline over a story recounting that tale said: "Bureaucrats note: That blue stuff is the Great Lakes."

That gaffe is still remembered in Chicago as evidence of the ignorance or the indifference toward the Great Lakes that often prevails in Washington.

At the time, Dr. Edith Tebo, director of the EPA's Great Lakes program, said: "There is still the sentiment [in her agency] that the Great Lakes are just little puddles across the northern border of the country" and merely a "regional problem."

Seemingly unable to decide what to do with the Great Lakes program, EPA moved the program's headquarters from Chicago, to Washington, and back to Chicago.

More recently, midwesterners have watched with interest as the Reagan administration pledged $10 million in 1985 toward the Chesapeake Bay cleanup, and maybe another $10 million in 1986.

By contrast, the Great Lakes program budget for 1985 is $4.1 million.

Since a number of Washingtonians are known to sail boats on the Chesapeake, that body of water does not suffer from an identity crisis—or a budget crisis.

That is not to say midwesterners begrudge Chesapeake Bay a helping hand. They recognize major waterways as national treasures.

The Great Lakes were described in the late 1960s as dead or dying, although it is popular these days to say such dire predictions proved false. It is important to remember that pollution trends at the time indicated the Great Lakes were in serious trouble, and the worst was predicted if trends continued.

It was not hard to believe something terrible was happening if you stood on the banks of Cleveland's Cuyahoga River, a river that burst into flames occasionally, and saw thick mats of oil and grease ooze past like a gooey glacier.

Or the Indiana Harbor canal that flowed like a melted chocolate bar past the oil refineries and steel mills near Gary, Ind.

Or the Rouge River in Detroit that was as red as some of the fire-engine colored cars that rolled off the assembly lines at Ford Motor Co., which dumped 100,000 gallons of sulfuric acid pickle liquor into the river each day.

It was impossible to look upon such environmental ruin without wondering: "How did this happen?" Only to realize it was the American way in 1967.

These scenes, and the odors that drifted from them, were overpowering.

This was the setting in which the U.S. Environmental Protection Agency was born, along with the so-called environmental crusade.

In those early days, the environmental crusade clearly had a mission that could be seen and sometimes smelled. The record of environmental improvement in the Great Lakes is impressive in many ways.

From 1971 through 1983, the United States spent $6.3 billion to construct municipal sewage treatment plants in the Great Lakes basin alone.

This effort and others led to major reductions in some Great Lakes pollution, such as phosphorus and DDT.

But on the heels of that victory came a tougher battle against toxic chemicals, an environmental foe that cannot be seen or smelled, and could hardly be measured until a short time ago.

The International Joint Commission reports that over 800 chemicals have been detected in the Great Lakes.

EPA is barely addressing the major issues that now confront the Great Lakes. They include:

- Toxic chemical levels in Great Lakes fish, and what those concentrations mean to people eating the fish. Midwesterners are alarmed by a study showing that women eating Lake Michigan fish contaminated with PCBs gave birth to infants with behavioral abnormalities.

- Toxic chemical content of Great Lakes harbor sediments, which could be leaking like slow poison into the water and contaminating aquatic life.

- The extent of atmospheric deposition in polluting the Great Lakes with toxics.

- Industrial pretreatment of toxic chemicals which are flushed into sewer systems that empty into the Great Lakes.

With its $4.1 million budget for 1985, the EPA Great Lakes program is largely confined to meeting its obligations under the 1972 Great Lakes agreement with Canada and monitoring the open waters of the lakes for phosphorus, the indicator for nutrient pollution and eutrophication.

EPA is dwelling on the first generation of Great Lakes pollution, meaning sewage and certain industrial wastes. The Great Lakes research program is geared toward large-lake research.

It needs to focus also on the new generation of Great Lakes pollution, which includes toxics and might even branch out to include likely environmental impact of major Great Lakes water diversion projects that are being discussed these days.

Though difficult, it would be helpful to discover a toxic chemical indicator for the Great Lakes, as phosphorus is a nutrient indicator, to measure toxic pollution trends in the lakes.

Even within EPA's ranks, there is a growing cry for a better understanding in Washington of what the Great Lakes really are—95 per cent of the fresh water in the United States and home to 45 million Americans and Canadians.

There is a call for using the Great Lakes as a national research laboratory, since environmental problems that eventually affect the nation often are recognized for the first time in the Great Lakes. Chemical pollution and atmospheric deposition (later to be known as acid rain) are examples.

Washingtonians who are interested in expanding their understanding of the Great Lakes are welcome to visit any of the eight states that border lakes Huron, Ontario, Michigan, Erie, and Superior.

Bring your boat. Catch some salmon or gamefish, but consult your local conservation department on whether they are safe to eat. □

Heavy industrial development lines the banks of the Cuyahoga River at Collision Bend in Cleveland, Ohio. The oil and grease that used to float in the river actually caught fire in 1969, the year this photo was taken.

by Dean Rebuffoni

It has been five years since a trickle of Reserve Mining Company's taconite wastes flowed down a steel sluice, froze in the chilly air, and formed a long, gray icicle that tapered downward to the steel-gray water of Lake Superior.

That was the last discharge into the lake from Reserve's ore-processing plant at Silver Bay, Minn., 55 miles northeast of Duluth. For almost 25 years the plant had dumped 67,000 tons of wastes into the lake each day.

The halting of the discharge on March 18, 1980, was a milestone in one of the nation's premier environmental disputes, known formally as *United States of America vs. Reserve Mining Company.*

For more than a decade, it had overshadowed other environmental issues along the rim of Lake Superior: the cleanup of the Duluth-Superior Harbor, a proposed all-winter shipping program, the airborne deposition of chemical contaminants in the lake's cold waters, etc.

Starting in 1969, conservationists and a plethora of government agencies, including the EPA, had fought to halt Reserve's discharge. They prevailed when the federal courts ruled that the taconite wastes, which contain microscopic asbestos-type fibers, were creating a potential health hazard. The courts said the discharge had to be halted.

Reserve complied and, as part of a $370 million program, built a 5.6-square-mile disposal basin five miles inland from the lake. In June 1980 it began dumping its ore wastes in the basin. Environmentalists and government agencies turned much of their attention to other matters.

But the Reserve issue has not been completely resolved. The latest twist in the long trail involves a new Reserve discharge, this time into the Beaver River, a tributary of Lake Superior. But this discharge has been at least tentatively approved by the EPA and the Minnesota Pollution Control Agency.

The discharge is necessary because of a complicated series of events that were unforeseen in 1980. At that time, Reserve anticipated using its disposal basin for 40 years, the projected life of its operations in Minnesota.

To build the dams that enclose the basin, Reserve uses coarse taconite wastes, called tailings. They are hauled to the basin by rail from the Silver Bay plant. Fine tailings, about the size of silt particles, are pumped into the basin from the plant through large pipelines.

The fine tailings are carried in a water slurry, and the water comes from runoff and precipitation that collect in the basin. The water also covers the tailings, preventing the asbestos-like fibers from becoming airborne.

What neither Reserve nor government officials had clearly anticipated in 1980 were the severe economic woes now afflicting the taconite industry. Reserve's plant has been either shut down or operating at very low production levels for more than two years.

Because of that, the plant has generated fewer of the coarse tailings needed to continue raising the height of the dams. Compounding the problem has been two years of abundant snow and rain in northern Minnesota and, in turn, more water entering the disposal basin.

The upshot has been that water in the basin is rising faster than the height of the dams, creating a potentially unsafe situation. If the water in the huge basin should wash over the top of the dams, it would carry taconite tailings—and those tiny asbestos-like fibers—into the Beaver River and downstream, to Lake Superior.

To prevent such an occurrence, Reserve has to lower the water level in the basin, and last year it sought state permits to discharge up to 3,500 gallons of water each minute into the small river. The Minnesota Pollution Control Agency approved the permits, but only after requiring Reserve to filter the fibers from its wastewater.

And that resulted in another lawsuit. Although Reserve has built a plant to filter the fibers, it says the limit of one million fibers per liter of wastewater appears too stringent. The company also contends that the state agency modified the permit at the last minute to include that rigid fiber limitation. The Minnesota Court of Appeals has heard the case and has taken it under advisement.

A more reassuring event last year was the preliminary findings of a study done on the huge delta that stretches into Lake Superior from Reserve's plant. The delta, made up of taconite wastes, is similar to those found at the mouths of rivers. It contains millions of tons of the wastes, having been gradually formed during the years when Reserve was discharging directly into the lake.

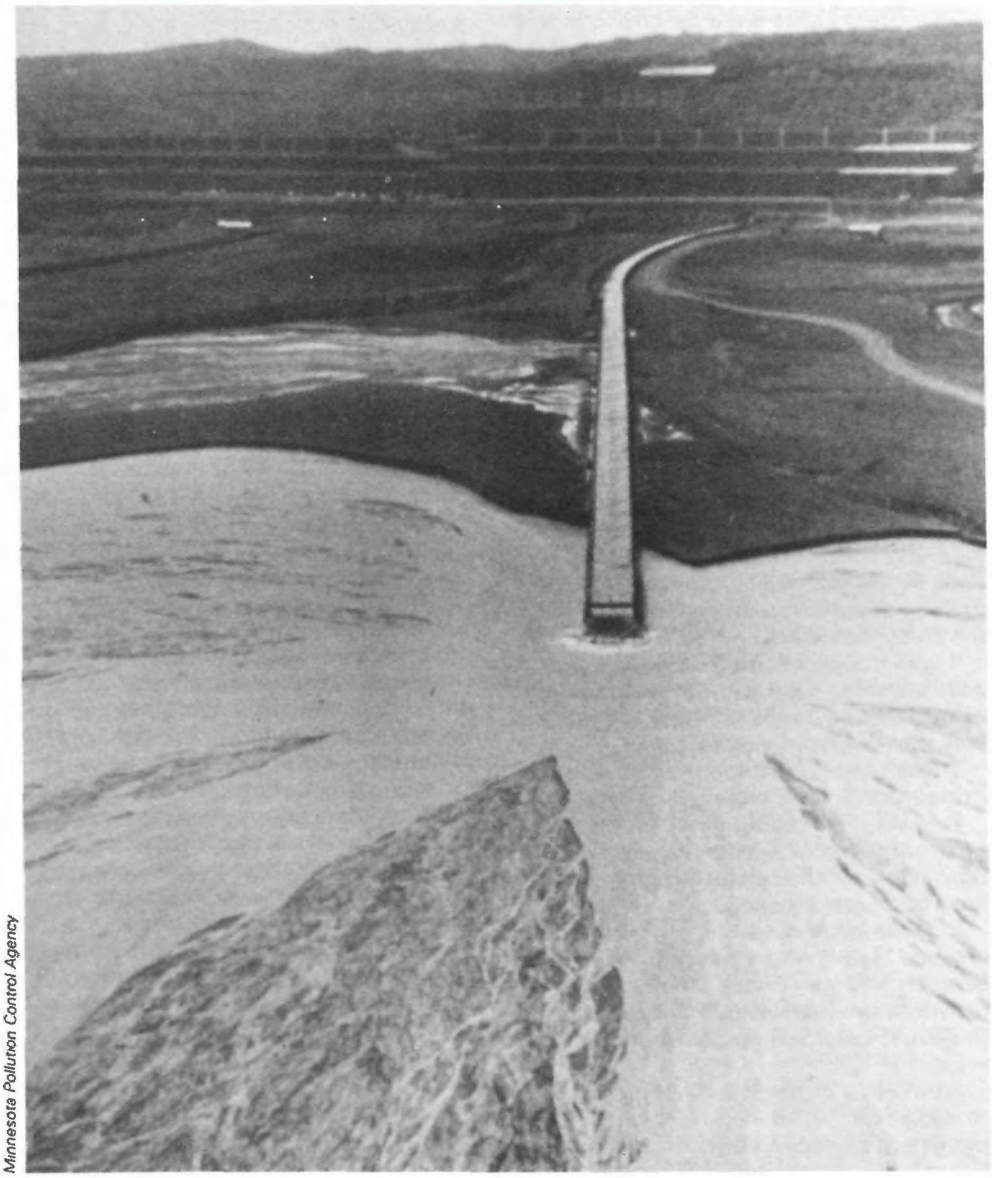
When Reserve halted that discharge, EPA and other agencies raised concerns that the constant wave action along the delta's outer edge would wash the asbestos-like fibers into the lake and resuspend them in its waters. William Busch, an assistant professor of geology at the University of Minnesota, began a study of the matter.

Although not yet complete, Busch's research strongly indicates that the delta is stable, and the huge masses of the fibers are not being washed into the lake.

Another success story was the cleanup of the Duluth-Superior Harbor and St. Louis Bay, which make up the large estuary at the southwestern tip of Lake Superior. For decades the estuary received a steady influx of raw or inadequately treated municipal waste from Duluth, Superior, and several smaller cities in both Minnesota and Wisconsin. Industrial wastes also poured into the estuary from steel plants and paper mills in both states.

Starting in 1971, when the Minnesota Legislature created the Western Lake Superior Sanitary District, more than $115 million has been spent on municipal treatment plants to clean up the effluent of cities around the estuary. The area's industrial firms also have spent considerable amounts to improve treatment of their wastes.

The result has been a remarkable improvement in water quality and sport fishing opportunities. A remaining problem is the persistence of chemical contaminants in silt at the bottom of the harbor and bay. □



Minnesota Pollution Control Agency

Taconite wastes from Reserve Mining Co. near Duluth, Minn., once flowed down a long sluice into Lake Superior, a practice that has since been halted.

Cleaning up the Grand Calumet River

by Kathleen Osborne Clute

This is the sixth in a series of articles by EPA's regional offices concerning major environmental problems they are addressing. The topics of articles have ranged from Puget Sound pollution to the use of EPA's mobile incinerator to burn dioxin-contaminated soil in Missouri. Clute is a writer for the Office of Public Affairs in EPA Region 5.

John Winters was a young sanitarian for the Indiana State Board of Health when he went out to sample the Grand Calumet River for the first time. It was late in the 1950s, and the industries along the northwest Indiana river formed one of the most concentrated steel and chemical complexes in America.

"The upper end of the Grand Calumet by U.S. Steel was red with iron from the steel mill," Winters recalled. "The Indiana Harbor Canal connecting the river to Lake Michigan was heavily covered with oils. By the time we sampled the river, we'd gotten this oil on us—a couple of inches thick in some places—and our clothes were so bad I didn't think there was any possibility of cleaning them up. I just burned them."

That was more than two decades ago. Conditions have improved since then, largely because of EPA's efforts. However, the Grand Calumet/Indiana Harbor Canal area still has serious environmental problems and contributes to the pollution of southern Lake Michigan. It still poses a major cleanup challenge.

Most recently, EPA's Region 5 office in Chicago has developed a master plan to clean up the two waterways. Community groups and a special Grand Calumet Task Force have applauded the effort and hope the plan can become a prototype for action in other Great Lakes trouble spots.

The Grand Calumet is a small river fed largely by industrial discharges as it flows 13 miles westward from modest headwaters in the Marquette Park Lagoon near Gary, Ind. Three miles from the Illinois state line, the river is joined by its west branch and empties into Lake Michigan through the Indiana Harbor Canal.

A trio of steel mills, two chemical companies, three major sewage treatment plants, an oil refinery, and numerous other industries discharge treated wastewater into the Grand Calumet system. In fact, 90 percent of its flow consists of treated municipal and industrial wastewater, industrial cooling and process water, and stormwater runoff. In addition, 38 waste sites are located within the river basin; several of them are right on the river's banks.

Concern over the Calumet River basin crystallized in 1965, when the Secretary of the Department of Health, Education and Welfare convened a conference to define and attempt to solve the problem. At the conference, baseline data were defined and cleanup plans were begun. But evaluations in 1967 and 1968 revealed no significant water quality improvements, even though sewage treatment plants and factories were generally complying with the existing water quality regulations.

It was obvious to a newly appointed Grand Calumet water quality committee that a tougher and broader approach was needed. This began after EPA was created in 1970, and the focus shifted from Calumet-specific actions to broader, more generic, EPA water pollution control programs. Industries were required to install best practicable technology in order to treat their wastewater before discharging it to the river system. The three major sewage treatment plants in the area—Hammond, Gary, and East Chicago—were given EPA construction grants totaling $108 million to upgrade existing facilities and build new ones.

EPA moved aggressively against major polluters in the northwest Indiana area despite legal challenges. U.S. Steel Corp. took the agency to court in a case which affirmed EPA's authority to issue discharge permits and require wastewater treatment. The company ended up paying the largest fine ever levied for wastewater treatment violations—$4.25 million.

These initial efforts led to substantial improvements in the water quality of the river and canal. Levels of conventional pollutants dropped, dissolved oxygen levels increased dramatically by 1982, and 16 species of fish were found in the river system last year. While the fish weren't considered safe to eat, they were able to survive in water which just years before couldn't support any aquatic life. Nevertheless, serious problems remained.

The master plan efforts got underway in 1983, after Region 5 Administrator Valdas Adamkus committed the agency to the project.

To develop the master plan, EPA has worked with the State of Indiana, public interest groups, and a Grand Calumet Task Force made up of representatives from citizen groups, unions, industry, and local municipalities. The plan calls for:

- Modifying discharge permits to minimize toxic and biological contaminants.
- Tough enforcement of existing discharge permits.
- Achieving currently required pollutant load reductions at sewage treatment plants.
- Revising and upgrading water quality standards. The existing standards were adopted in 1978 but have not yet been upgraded.
- Reducing pollutant loads contributed by combined sewer overflows.
- Initiating long-term monitoring to evaluate the effectiveness of control programs and to discover any remaining contaminants.

Released in draft form last fall, the master plan has been well received. Dennis Terry, Chairman of the Grand Calumet Task Force, says it is essential to the future of Lake Michigan. Dave Fogarty, a project manager for the Lake Michigan Federation, said the plan could become an international model for pollution control. Eventually, it is hoped, the combined efforts of EPA and the State of Indiana could result in the removal of the river and harbor from the International Joint Commission's list of pollution hot spots in the Great Lakes area.

In the meantime, EPA will emphasize its existing pollution control programs in the Grand Calumet basin and will design and undertake new ones if necessary. All of the agency's regulatory tools will be marshalled to help solve the area's remaining problems. □

Thomas States Goals for EPA

Lee M. Thomas was confirmed unanimously by the U.S. Senate on February 8 as Administrator of EPA. Here are excerpts from his statement to the Senate Committee on Environment and Public Works at his confirmation hearing:

Steve Delaney

Following his confirmation hearing, EPA Administrator Lee M. Thomas confers with Sen. Strom Thurmond, R-S.C., left, and Sen. Ernest Hollings, D-S.C., who represent Thomas' native state.

It has been a decade and a half since EPA came into being. In those early days, this agency concentrated its energies on the most obvious forms of pollution—smoggy air and rivers so choked with substances that some actually erupted into flame. While we have made substantial progress in these areas during the intervening years, today we must also address much more subtle hazards.

To a certain extent, it is ironic that some of today's environmental problems reflect our successes with earlier priorities. For example, massive air and water cleanup programs implemented during the 1970s created unexpected new challenges involving the safe handling of toxic substances and hazardous wastes.

Our efforts over the past decade also fostered quantum leaps in the technology used to detect and measure pollution. That technology has made us realize just how extensively minute concentrations of many hazardous substances are distributed throughout our environment.

To illustrate this point, we need only look back to the early 1970s, when we could not accurately measure substances beyond the parts-per-million range. Today, we fear that our ground water may contain exotic chemicals in levels of parts per trillion or even parts per quadrillion. I note this to accentuate a point. We do not live in a risk-free environment.

We are an industrialized society, and we will always be faced with risks. It is simply one of the prices we pay for the overall quality of life we enjoy. Thus, we must learn to manage the risks we face.

This has been the thrust of EPA during the past year and a half under Bill Ruckelshaus, and it will continue to be the basis for many of our regulatory decisions.

Some would argue our task is impossible. During a public meeting I attended recently in Boston, a citizen confronted me with a revealing question.

He asked me why I would be willing to take on the job of EPA Administrator when I could not possibly succeed. The laws are complex and unworkable, he insisted. The problems are insurmountable.

Although I agree with him that the challenges before us are demanding, I assured him they are not insurmountable. Our environmental laws are largely on track to address the spectrum of hazards threatening America. It will be a top priority of mine to carry out these laws the way Congress intended. Where we find inadequacies in our statutory foundation, we will work with you to remedy them.

I am a professional manager. Throughout my career, I have managed complex, people-oriented programs. I am dedicated to fulfilling the realistic expectations of the American people. I respect our environmental statutes, and I will carry them out to the best of my ability.

I bring to the job of Administrator experience at every level of government. And I bring a sense of reality with respect to EPA that is the product of two years directing some of this agency's most challenging programs — the hazardous waste regulatory effort under the Resource Conservation and Recovery Act and the cleanup program under Superfund.

I am proud of the results we have achieved under these two statutes since early 1983. As Administrator, I will work to build the same record of progress under all of EPA's basic environmental laws.

I want to share with you several management goals I have set for my term as EPA Administrator.

Firstly, I will emphasize continued implementation of the basic programs EPA is responsible for. EPA will do the best possible job with the statutes given us by Congress. I will manage the agency the same way I managed its hazardous waste programs—for results.

To assist in setting goals and achieving them, we will maintain and enhance the management systems developed in recent years to identify problems, monitor progress, and measure success. Where necessary, we will develop new ones to fill management gaps as we identify them. I will also work with state officials to assist in the development of similar systems at the state level. For I believe that commitment at all levels of government must be to measurable progress in all areas of environmental protection.

A second goal will be to ensure a strong enforcement presence in all agency programs. It is extremely important that our enforcement efforts be fully integrated into each program. Enforcement need not dominate our implementation of environmental laws. But the regulated community must know that we will not accept recalcitrance when it comes to compliance. We will be ready to take aggressive enforcement steps wherever necessary as part of our commitment to protecting human health and the environment.

Thirdly, I believe in decentralizing the management process where it makes sense. Much of my government experience has been at the state and local levels. I have a natural bias toward managing programs close to the source of the problem. In Superfund, I have worked to decentralize decision-making to the regions and the states. That process will continue, and I will explore opportunities to further decentralize other EPA programs.

It is important to recognize that, properly implemented, decentralization does not diminish the federal role. Rather, it enhances that role. Effective decentralization allows for a clear definition of the roles to be played by federal and state authorities. It promotes efficiency and a system of mutual support.

A fourth goal that I will pursue will be to ensure that EPA has the strong scientific and technical base it needs to support program decisions. This is a key component in assessing risks and managing them. A solid technical capability must be at the heart of our judgment. It will be a critical element of all public health decisions we at EPA will make under my administration.

A fifth goal will be public accessibility to EPA through an effective community relations/public involvement program. This agency will continue to operate in a fishbowl. Openness will be a hallmark of our agency as long as I am here. I welcome varied opinions and viewpoints. I see them as useful contributions to the decisions we must make.

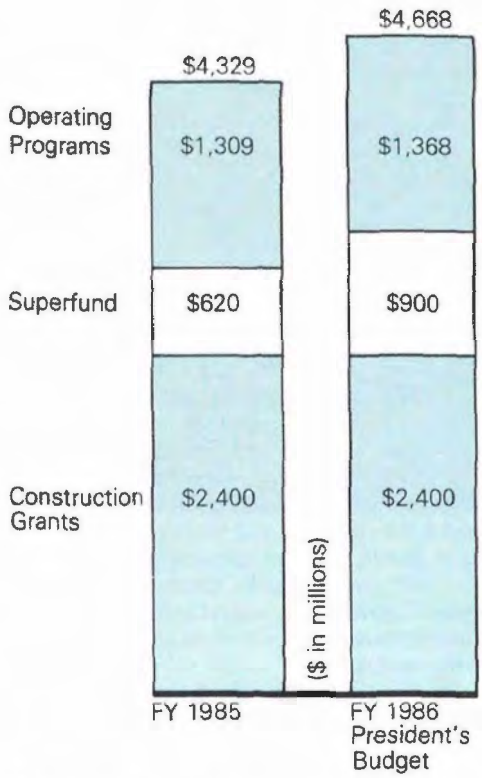
The American people have made it clear they want to be involved in critical environmental debates, especially those that affect their health and their property. The challenge before us is to provide citizens with access to our deliberations and a meaningful role in our decisions. I have found that the community relations program we instituted under Superfund helped people to understand our decisions and helped us to understand their concerns.

Finally, I will work hard to make EPA the kind of agency that attracts and retains quality people. We have a fine professional staff now, and I am committed to maintaining it.

I believe very strongly in government work and government workers. EPA employees are professionals and I respect them. I will do all I can to improve and enhance individual growth and career opportunities for those who serve EPA through commitments to professional development, individual mobility, and opportunities to participate in the decision-making process. □

EPA's Budget: An Analysis

by Jack Lewis



Total resources increase by 8% over the 1985 level

The Environmental Protection Agency has fared well in President Reagan's budget for the 1986 fiscal year. If Congress approves the proposed budget, EPA's overall funding will increase eight percent during the coming fiscal year, rising from $4.3 billion in fiscal 1985 to nearly $4.7 billion in fiscal 1986.

Highlights of the fiscal 1986 budget include:

- Substantial increases in EPA's programs for hazardous waste: Superfund, up 45 percent; and RCRA, up 26 percent.
- Significant increases in EPA's funding for enforcement, up 21 percent; and extramural research and development, up 12 percent.

Of EPA's programs, Superfund will benefit the most dramatically in the President's new budget. Funding for this hazardous waste cleanup program is slated to rise from $620 million to $900 million.

Most of Superfund's added funding—$250 million of the $280 million total—will be used to increase the number of Superfund sites at which remedial design or construction actions will begin in fiscal 1986. The purpose of these actions is to clean up hazardous waste sites on Superfund's National Priorities List. Actual contracting of Superfund design and construction actions, although EPA-funded, is handled either by the U.S. Army Corps of Engineers or by state governments.

Remedial engineering design work will begin at 89 Superfund sites in fiscal 1986, an increase of 25 over fiscal 1985. Remedial construction actions, the final and most expensive phase in the cleanup process, are expected to start at 56 Superfund sites during fiscal 1986, 31 more than were begun in fiscal 1985. Thus, by the end of fiscal 1986, the number of Superfund sites where the final cleanup phase has begun will be double the present total.

Superfund will also continue to strengthen its emergency response capabilities in fiscal 1986. Through Superfund, EPA performs aggressive removal actions to address immediate threats to public health and the environment. Additional resources are being provided in fiscal 1986 to augment the EPA Environmental Response Team. This will improve the agency's ability to provide timely technical advice to federal, state, and local officials during Superfund removal and remedial actions.

The proposed budget increases Superfund's enforcement funding by $23 million. This is a 48 percent increase over fiscal 1985 enforcement levels. The agency will also have $2 million in additional funds to increase the number of Superfund cases referred for prosecution to the Department of Justice.

EPA construction grants to the states for improvements in wastewater treatment will remain at the same level as last year—$2.4 billion. However, plans have been announced to phase out these construction grants gradually over the next four years.

Under the President's budget proposal, funding for all components of EPA's budget other than Superfund and construction grants will increase 4 percent in fiscal 1986. Net gains will offset net losses by $59 million.

Agency programs slated to receive the most significant increases in funding are:

RCRA: A $54 million increase will give EPA 26 percent more funds in fiscal 1986 for implementation of the Resource Conservation and Recovery Act. RCRA was amended and reauthorized by Congress late last year.

Under the new RCRA law, EPA has received added responsibility for banning hazardous wastes, developing alternative treatment technologies, and regulating small quantity generators and underground storage tanks. The agency will hire 146 new RCRA staffers to handle this increased workload.

Also, to address the new RCRA requirements in a timely manner, the agency has redistributed resources within the fiscal 1985 budget. An additional $22 million has been allocated to RCRA in the current fiscal year. When factored in with the increases planned for fiscal 1986, this money would nearly double RCRA resources over fiscal 1984 funding levels.

The fiscal 1986 increases for the RCRA program include $25 million for new regulations and implementation guidance to meet the requirements of the amended RCRA law. A $3 million funding increase will enable EPA to carry out the special compliance monitoring and enforcement requirements of the new RCRA law. A $9 million increase will support the salaries and related expenses of the 146 additional employees RCRA will have in fiscal 1986. The President's budget also raises funding of RCRA-related research by $9 million.

Under the proposed budget, EPA will increase RCRA grant assistance to state and local governments by $8 million. This increase in grant funds will support the states in development of regulatory programs for underground storage tanks and small-quantity generators as well as continued implementation of the National Permits Strategy.

Acid Rain Program: EPA will have $23 million more to spend on its acid rain program in fiscal 1986. This is a 61 percent increase over the current fiscal year and brings EPA's total fiscal 1986 budget for acid rain to $60.5 million. The agency will use the additional money to emphasize research into the effects of acid rain on aquatic resources and forests, and to accelerate the installation of an acid rain monitoring network.

Toxics and Pesticides Research: In fiscal 1986 EPA will have $14 million in increased funding for toxics and pesticides research. The agency plans to use this money to improve the quality and the range of its health and environmental risk assessments for various toxic substances. Part of the increase will be used to step up the agency's research into biotechnology.

Other EPA programs that will benefit from funding increases in fiscal 1986 include: water quality compliance, with a $3 million increase, as well as pesticides generic chemical review and existing chemical review, which will each have $2 million in increased funding.

The most significant funding cuts in the fiscal 1986 budget will occur in the following areas:

Administrative Costs: EPA's funding for administrative costs will go down a total of $25 million in fiscal 1986. A large part of this decrease—$16 million—will come from cutting the salaries of EPA employees by 5 percent. All federal employees will share in this pay cut, which the President has recommended as a special austerity measure.

Unlike many federal agencies, however, EPA will be hiring during fiscal 1986. Increased staffing will be concentrated in two priority areas: Superfund will have 359 new employees in the coming fiscal year, while RCRA will have 146.

The remainder of administrative budget cuts—$9 million—will come in areas such as contracts, travel, printing, and equipment. Expenditures for these items will be trimmed 10 percent from fiscal 1985 levels as part of a government-wide proposal for reducing administrative costs.

Limestone Injection Multistage Burner (LIMB) Technology: A large-scale, one-time demonstration of this burner was funded in fiscal 1985. EPA plans to cut funding for LIMB by $12 million in fiscal 1986, but $4.6 million will remain in the budget to complete efforts at improving LIMB technology.

Other budget items slated for cuts in fiscal 1986 include: exploratory research, and buildings and facilities, each earmarked for a $7 million decrease; also, indoor air research and radiation/health effects, which will be eliminated in fiscal 1986 at a total savings of $3 million.

EPA's fiscal 1986 budget continues the upward trend in agency spending that began in fiscal 1984 and proceeded at a more rapid rate in fiscal 1985. EPA Administrator Lee Thomas has expressed confidence that the latest increases in EPA funding will enable the agency to continue meeting its old responsibilities while at the same time taking on new ones in the area of hazardous waste.

"This budget not only builds upon the foundation laid in the last two years," Thomas remarked at a press briefing on February 4, "it also represents a significant expansion in areas where our responsibilities must be met with increased resources. EPA's 1986 budget gives us the resources we need to continue our momentum and to effectively address the challenges in every environmental medium." □

Environmental Outlook in the New Congress

by John H. Chafee

Sen. John H. Chafee (R-R.I.)

The EPA Journal *asked U.S. Senator John H. Chafee, R-R.I., for his views on the outlook for environmental policy issues in this Congress. Senator Chafee is Chairman of the Subcommittee on Environmental Pollution, which oversees EPA-related legislative matters.*

Senator Chafee has been chairman of the environmental subcommittee, which is part of the Senate Environment and Public Works Committee, since 1981. He is also a member of the Senate Finance Committee and is Chairman of the Senate Republican Conference.

Chafee has been representing Rhode Island in the U.S. Senate since 1977. Prior to his election to the Senate, Chafee was Secretary of the Navy in the Nixon Administration. He was Governor of Rhode Island from 1962 to 1968. Earlier, he served six years in the Rhode Island House of Representatives.

The Rhode Island Senator is a graduate of Yale University and the Harvard Law School. He left Yale during World War II to enlist in the Marine Corps. In 1951, he was recalled to active duty to serve in Korea.

Born in Providence, R.I., Chafee is married and the father of five children.

As we begin the 99th Congress, the list of environmental issues facing us evokes a sense of *déjà vu*. During the 98th Congress, the Senate Environment and Public Works Committee grappled with legislation to reauthorize Superfund, the Clean Air Act, the regulatory portion of the Clean Water Act, the Resource Conservation and Recovery Act (RCRA), and the Safe Drinking Water Act. We tackled issues such as acid rain, nonpoint sources of water pollution, ground-water protection, and wetlands preservation. We also dealt with budget recommendations and two rounds of Presidential appointments regarding EPA's leadership.

With the exception of our bill to amend RCRA, all the environmental issues that were unresolved at the end of the 98th Congress—and a few new matters as well—will be with the Committee again in this Congress. The new items include reauthorization of that portion of the Clean Water Act relating to grants for sewage treatment plant construction, the Endangered Species Act, the Toxic Substances Control Act, and ocean dumping. Another issue that might come up is the possible regulation of genetic engineering.

Can the committee and Congress deal with such a full agenda in the next two years? Perhaps not, but we will certainly try.

Although Congress originally expected that major environmental laws would be reviewed and, if necessary, modified every three to five years, experience has taught us that the process of revising existing laws often takes an additional three years or more. This is not a new phenomenon. The 1977 Clean Air amendments, for example, took three years of debate; the Hazardous and Solid Waste Amendments of 1984, modifying RCRA, required a similar amount of time.

Enactment of the 1984 RCRA amendments—which constitute one of the toughest environmental laws passed in years—demonstrates that Congress considers protection of human health and the environment a national priority of the highest order and that such protection will not be sacrificed for the sake of saving a few dollars or relieving the "burden" of regulation.

The need to strengthen environmental legislation, rather than to weaken existing law, will continue to cause sharp debate within Congress, but I am convinced that better and stronger laws will result from our deliberations, no matter how long they may take.

Let me go through some of the issues we face in the 99th Congress, beginning with Superfund.

Although Superfund was originally funded in 1980 at a level of $1.6 billion over five years, it was recognized then that this figure was too low, given the scope of the problem. That level of funding was set as part of a compromise to get the program underway, even though it now appears the United States will ultimately be forced to spend tens of billions of dollars over the course of many years to clean up the hazardous waste that has been strewn across the landscape of America.

Similarly, the need to respond to spills and the release of hazardous substances of all types will be with us forever. For example, the recent disaster at Bhopal, India, where 2,000 persons lost their lives after a leak of poisonous gas in a chemical plant, has raised the question of whether new controls might be needed in the United States to prevent the release of substances posing an immediate threat to life.

In dealing with Superfund, there are two major issues that must be addressed: first, how much money can EPA productively and effectively spend on the problem each year; and second, where will the money come from to pay for an expanded program.

To demonstrate the priority attached to these issues, the Senate Environment and Public Works Committee has agreed to consider extension of Superfund at the full committee level, bypassing subcommittee consideration. On January 3, the chairman of the committee, Senator Robert Stafford—with my

support and that of others—introduced legislation similar to a bill approved by the committee last year.

Although the bill envisions a spending level of $7.5 billion over the next five years, the details of how to raise such funds must be decided by the Senate Finance Committee, which will spark a new round of debate. Furthermore, while there seems to be a good deal of support for a Senate bill setting a funding level of $7.5 million over five years, there will undoubtedly be other Superfund reauthorization bills put forward, some of them calling for more money and others for less.

Our objective on the Environment and Public Works Committee is to expedite the bill. We hope to have our hearings completed and a reauthorization bill approved by the committee no later than mid-March, which will give the Finance Committee time to consider the funding aspects of the program so that a completed Superfund package can reach the Senate itself well before the present program expires September 30.

Another legislative issue which will be handled at the full committee level will be reauthorization of the Clean Air Act. As in years past, reauthorization of this bill will turn on the debate over an acid rain control program. In both the 97th and 98th Congress, the Senate Environment and Public Works Committee approved legislation containing strong provisions to curb acid rain, only to see the issue blocked by regional dissension. This year, the full committee will again be addressing the issue, once we have dealt with Superfund. Undoubtedly, the debate will be just as controversial this year as it has been in the past.

While the full committee will be considering Superfund and the Clean Air Act, a top priority of the Environmental Pollution Subcommittee, which I chair, is the reauthorization of the Clean Water Act. We must consider not only the regulatory side of the law, but also the reauthorization of wastewater treatment construction grants.

The Subcommittee's starting point will be the Clean Water amendments approved by the full committee last year. That legislation, which died in the rush to adjournment last October, calls for increased control of toxic pollutants, stricter enforcement and increased penalties for polluters, and a new program to control nonpoint sources of pollution. I suspect that we will generally follow last year's bill and that the major debate this year will be reauthorization of the construction grants program.

Since Congress enacted the Clean Water Act in 1972, the federal government has spent over $40 *billion* to construct wastewater treatment facilities in communities large and small across America. With the burgeoning budget deficit, however, it is doubtful whether we can afford to continue spending at the current annual rate of $2.4 billion.

Many federal, state, and local officials recognize that the federal government cannot—and should not—subsidize construction of these facilities on a perpetual basis. During our deliberations, we will be exploring ways to increase state and local responsibility for funding these plants.

One suggestion which merits consideration is a revolving loan fund. Under this approach, the federal government would gradually reduce straight categorical grants for wastewater projects and, in their place, provide money for states to establish a loan fund. Using this federal "seed money," the states could then make low-interest loans available to communities for construction of treatment plants.

In developing any proposal to phase out direct federal involvement in financing such facilities, we must ensure that construction of necessary plants moves ahead unhindered. A smooth transition is essential if we are to continue the impressive gains in water quality that have taken place in the past 13 years.

I would mention three other issues which are high on the priority list for the Environmental Pollution Subcommittee in the 99th Congress:

Ocean dumping: The Marine Protection Research and Sanctuaries Act which regulates the disposal of municipal and industrial waste in ocean waters is scheduled for reauthorization. In view of the increasing desire of some coastal cities and industries to expand ocean dumping practices, a review of this law is timely and necessary.

Endangered species: In 1982, Congress strengthened this important law, which prohibits buying, selling, possessing, exporting, or jeopardizing endangered or threatened species. I expect that once again, we will face a debate on conflicts between protection of endangered or threatened species and the desire to develop water and other natural resources. Nevertheless, I believe we will ultimately extend and enhance the law.

Wetlands: There is a concern on the part of many that the Corps of Engineers is systematically dismantling the nation's basic wetlands protection law, Section 404 of the 1972 Clean Water Act, which regulates dredging and filling. Wetlands are disappearing at an alarming rate. The Subcommittee has taken a strong interest in this program, and I hope to hold oversight hearings on its management by the Corps. On a separate track, I expect the Subcommittee to move forward with legislation authorizing a wetlands acquisition and preservation program.

Clearly, both the full Environment and Public Works Committee and the Subcommittee on Environmental Pollution face a busy agenda in the next two years. Without doubt, many of the issues we face will spark controversy and heated debate. But controversy has always been the hallmark of environmental legislation. It should not prevent us from fulfilling our obligation to protect the health of the American people and to defend and preserve our natural resources. ☐

Safe Diving in Polluted Waters

by Susan Tejada

In the EPA regional office in Seattle, there is a mask. It is a diver's mask, and it is a mess, its rubber seal eaten away. The rubber dissolved when a diver from the Seattle Police Department's harbor patrol unknowingly dove into water polluted with hazardous chemicals.

That mask is a graphic symbol of the dangers that divers face when they enter contaminated waters. Unfortunately, the need for this kind of diving is on the rise because underwater pollution is on the rise. Between 1977 and 1981, more than 64,000 major waterway spills of petroleum products and hazardous materials were reported to the U.S. Coast Guard. The total number of chemical spills into the nation's waterways, both reported and unreported, is estimated to be about 15,000 per year.

A new type of equipment promises to provide greater protection to polluted water divers than they have ever had before. The SUS suit (suit-under-suit), developed cooperatively by EPA and the National Oceanic and Atmospheric Administration (NOAA), safeguards divers in waters highly polluted with chemicals or pathogens. Tests have shown that the SUS suit can protect a diver from up to 90 percent of the toxic chemicals transported on, or found at, underwater dump and spill sites.

Dangers Recognized

As recently as 10 years ago, neither the scientific nor the diving communities had given much thought to the effect of contaminants on divers. It was generally believed, for example, that standard gear offered adequate protection to divers working at ocean dumping sites.

That perception began to change in 1976, when NOAA launched a study of the effects of pathogenic microorganisms on divers in ocean dumping areas. Results showed that "microbial pathogens—bacteria, viruses, and parasites—present in polluted waters clearly pose potential hazards for divers." The results were confirmed by incidents like the one in 1982, when several New York City firefighters and police officers contracted amoebiasis after taking part in diving training exercises off a pier in the Hudson River, a discharge area for raw sewage. It was reported that a city sewage treatment plant worker had died of the same disease a year earlier. Amoebiasis is an infection caused by an intestinal parasite found in polluted water.

The NOAA study was examined at a 1982 workshop hosted by the Undersea Medical Society and sponsored by EPA and NOAA. In an introduction to the proceedings of that workshop, Rita Colwell of the University of Maryland wrote: "The risks [of entering a contaminated aquatic environment] are not known and perhaps not even appreciated...Individual working divers are today, more or less, in the category of 'experimental animal' when they enter polluted waters to work."

EPA Takes the Plunge

Across the country, in regional offices, laboratories, and on board research vessels, about 50 divers work for EPA. The number has remained fairly steady for the past decade. None of them is a full-time diver. One is a mechanic; others are chemists, biologists, and technicians. They go underwater to carry out their scientific missions—diving, for example, to collect water and sediment samples or organisms for toxicology studies and enforcement investigations. More and more, they are also being asked to dive on Superfund investigations, to confirm cleanup results or identify the presence of chemical drums.

The type of diving they do can put them in some pretty murky waters. "People think we do a lot of Cousteau-type diving, in crystal-clear water," says Don Lawhorn of EPA's Athens, Ga., lab. "But it's not true. I'd say that on about 70 to 80 percent of our dives, we have zero to very low visibility."

In 1978, EPA surveyed agency field personnel about their jobs. "We realized," says EPA safety programs manager Tony Brown, "that our divers were doing their own thing. Some had been trained in the Navy or Coast Guard, some by the YMCA. Each had a different set of diving do's and don'ts. The need for an agencywide program was evident."

This need led Brown to NOAA, whose diving program, he says, "was highly accepted in the scientific community. Basically we adopted the NOAA program." EPA now requires its divers to be federally certified, a status obtained by successfully completing a one-week course run by NOAA at the EPA lab in Gulf Breeze, Fla.

The certification program helped ensure diver proficiency, but diver protection remained a serious problem. So in 1982, EPA put more than $500,000 into an interagency agreement (IAG) with NOAA. According to Richard P. Traver, staff engineer at EPA's Releases Control Branch in Edison, N.J., the agreement covers "the assessment, testing, evaluation, and demonstration of modified commercial underwater protective suits, clothing, support equipment, and breathing apparatus in waters contaminated with hazardous substances that may be injurious to a diver's health." Traver, who has been moonlighting as a professional YMCA scuba diving instructor for more than 10 years, was selected as EPA project officer. His counterpart at NOAA was Dr. J. Morgan Wells, Jr., director of that agency's diving program.

Test Dives

"You can't walk into a local dive shop," explains Don Lawhorn, "and buy what you need to work in polluted water." The truth of that statement led workers under the interagency agreement to a three-year series of test dives to modify available equipment.

The tests began at the Naval Surface Weapons Center in White Oak, Md. Seven diving suits and five helmets were evaluated and subsequently modified to eliminate leaks. This first series of tests took nearly a year, from April 1982 through March 1983.

A 50-foot diameter platform within the 100-foot deep water tower at White Oak that could be raised or lowered to vary the diver's depth gave experimenters tight control over dive conditions. "We did dive after dive after dive there," says NOAA diver Paul Pegnato. The work did not always progress smoothly. "We didn't follow a straight and narrow path," Pegnato explains. "It was more like a wide, zigzagging road."

But the work paid off. It led to the development of what is, to date, the ultimate in diver protection from contaminants: the suit-under-suit (SUS) system.

Basically, the SUS suit is a tight, 1/8 inch foam neoprene inner suit and a baggy, heavy-duty, natural rubber outer suit which are clamped together at the neck to form a closed cavity between the suits. Clean, temperature-controlled water from the surface is pumped into the cavity through the diver's umbilical hose at the rate of two gallons a minute to warm or cool the diver, and exits through one-way ankle and shoulder exhaust valves in the outer suit. Wells explains: "Since the entire volume of the suit is filled with water under a pressure slightly greater than the outside water, a puncture or leak in the suit results in clean water leaking out, rather than outside water coming in." The suit, says Wells, "is an innovative solution to two

(Tejada is Associate Editor of EPA Journal.)

problems associated with contaminated water diving—thermo-regulation and leakage."

Next Step

The test divers at White Oak had shown that the SUS suit and certain commercially available equipment that they had modified did function underwater. The next step was to show that the equipment could really keep out contaminants.

In March 1983, Traver and five NOAA divers tested the modified diving systems at EPA's 5,000 gallon chemical dive tank in Leonardo, N.J. Fluorescein dye tracers and a simulated spill chemical—ammonia at 500 parts per million—were added to the water in the tank. Underneath their outer diving dress the divers wore a special, one-piece cotton body suit and carried cotton swabs within the helmet. If contaminants penetrated their gear, the body suit material would adsorb the dye tracer, which would then be revealed under ultra-violet or "black" light, and the cotton would become saturated with ammonia, which could be immediately analyzed in the lab.

Result: None of the systems tested leaked.

During the Leonardo dives, the project crew began considering other issues related to diving in polluted waters. They developed procedures to protect surface support crews who serve as umbilical tenders and decontaminate emerging divers. They also developed methods to communicate with divers underwater via special microphones placed in the helmets.

The heating and cooling range of the SUS suit was the next item on the testing agenda. At the NOAA Diving/Hyperbaric Training Center in Miami, Fla., in December 1983 and February 1984, divers descended into a tank of water that was gradually heated up to 112°F. Each diver's condition was constantly monitored by electrocardiogram and core temperature probes; helmet conditions were monitored by additional temperature probes. At each increase in the water's temperature, the divers were to execute a 20-minute series of exercises.

In the first series of tests, the three volunteers—Wells, Pegnato, and a third NOAA diver from Woods Hole, Mass.—dove without benefit of the SUS suit's cooling system. After performing one 20-minute exercise cycle in 107° water, Wells' heart rate increased from 70 to 180 beats per minute, and his body core temperature jumped from 98.6° to 102°. "It wiped me out," he says. The other two divers experienced similar dramatic effects of heat stress.

The next day, however, wearing a SUS suit with surface-supplied cool water,

Jack Stringer

To test the cooling capacity of the SUS suit, a diver enters a tank of hot water at a Miami, Fla., facility of the National Oceanic and Atmospheric Administration (NOAA).

Wells was able to stay underwater over an hour and complete three 20-minute exercise routines with no evidence of heat stress. What's more, he did so in 112° water, even hotter than the day before, and still emerged "feeling fine."

By this time, the SUS suit and modified versions of two commercially available suits and two helmets had been identified as effective for diving in contaminated waters. In September 1984, at NOAA's Western Regional Center in Seattle, Wash., this equipment was tested under simulated operational conditions. In four-day exercises, divers from NOAA and the U.S. Coast Guard Strike Team who were outfitted in the special gear moved 55 gallon chemical drums underwater, vacuumed up simulated contaminated sediment, used isolation domes, and carried out welding and cutting operations underwater. "It was a pretty big shindig," says Pegnato, "and everything went off without a hitch."

Observing the Seattle demonstration were test engineers from the U.S. Navy's Experimental Diving Unit, which develops and tests the latest diving dress and equipment used by the military. After witnessing the performance of the modified helmets, diving dress, and especially the SUS suit, the engineers commented that the work done by EPA and NOAA under the interagency agreement had catapulted diving technology 10 years into the future.

EPA, NOAA, and the Coast Guard are now looking for a "spill of opportunity" to test the SUS suit under actual field conditions. A lower level of diving dress protection was used last December, when the three agencies cooperated in a search for leaking drums of toxic wastes at Big Gorilla, an abandoned, open pit coal quarry near McAdoo, Pennsylvania.

Other Uses

The SUS suit has potentially important applications beyond its use in polluted water diving. For example, the water in the cooling pools that surround nuclear reactors and in the canals at nuclear generating facilities that are used for cooling process waters is extremely hot, between 110° and 120°. Commercial divers in cold water SUS suits could perform underwater repairs in this superheated water, eliminating the need to drain the facilities first. Interested in this possible use, the Department of Energy supplemented the interagency agreement with an additional $25,000.

SUS suits could be used for dives in extremely cold as well as extremely hot water. For example, rescue workers in warm water SUS suits could stay in icy water for extended periods of time if necessary. In fact, says Wells, the SUS suit will have a working range of 100 degrees: it will warm divers in below freezing water as cold as 30° and water as hot as 130°.

Based on their work under the interagency agreement, EPA and NOAA will publish a manual of practice on operations in contaminated water, hopefully by the end of the year.

Industry has picked up on some of the innovations pioneered by EPA and NOAA. Four manufacturers are now offering polluted water diving suits and helmets. Modifications of other equipment are available if custom ordered.

Don Lawhorn echoes the views of many divers when he talks about the development of protective equipment. "A lot of times you don't know what is being put out upstream," he says, "and you can't find out. When you don't know the conditions, you need maximum protection." ☐

Fighting Waste from Gold Mining

by Roy Popkin

Matthew Jarrett

At a placer mine outside Circle, Alaska, an operator mixes muddy recycled water with soil that is being mined for gold. The water forces the dirt through a sluice into a settling pond.

Using methods that date back to the days when grizzled sourdough prospectors first found gold in the Yukon almost a century ago, Alaska's placer mining operations have long been the number one polluter of that state's rivers and streams. For decades, their heavily silt-laden wastewater discharges have seriously affected fishery resources, native village drinking water supplies, and recreational activities.

But now that is changing. The way Alaska's gold is found still conjures up memories of Jack London's *Call of the Wild* and Robert W. Service's poetry, but the impact on Alaska's environment is being significantly lessened.

Much of the credit for this achievement goes to Leroy "Bub" Loiselle, Jr., a 38-year-old scientist from EPA's Region 10 in Seattle. In recognition of his success as coordinator of EPA's placer mining compliance activities in Alaska, Bub last year received an agency gold medal award.

The coordination was no easy job. Loiselle spent the summer of 1984 meeting with the miners and with state, local, and EPA officials, in locations ranging from up near the Arctic Circle to deep in the interior of Alaska, selling the virtues of cooperation and environmental protection. He had to gentle down deep-seated animosities directed at "government interference."

Unlike the complex, high-tech industries towards which much of EPA's anti-pollution enforcement effort is directed, placer mining is relatively simple. In most operations, soil and gravel are dumped into 40-foot-long sluices where water carries them over a series of riffles that shake the gold nuggets so they can be picked out by the miners. The water, and everything else in it, is discharged into the nearest available river or stream. "Everything else" may include arsenic and may also create a level of silt-laden turbidity that harms the salmon, whitefish, and other species and fouls the streams from which the hundreds of tiny native villages take their water for cooking and drinking.

Since 1966, when the effort to clean up Alaska's rivers began, EPA and its predecessors have had what the papers accompanying Loiselle's gold medal nomination describe as an "adversary" relationship with Alaska's mining industry. Efforts by the federal and state governments to improve mining processes by establishing standards and requiring permits ran into continuing resistance.

Most of Alaska's placer miners are not large commercial operators. The ventures usually involve three to four people using one or two old bulldozers and a sluice box. Of the 700 permit applications last year, only two to three hundred are considered by EPA to be for outfits of commercial size. Federal permits are required for those that move 20 cubic yards of soil and gravel—the equivalent of two dump truck loads—a day.

Some of the small-scale placer mines are run by people who for one reason or another come to Alaska from down below each summer to try their luck at finding gold. In contrast, the "regulars" may stretch out the time, fighting bitter cold and the rugged Alaska terrain in the hunt for gold. Many see government regulation as an assault on their constitutional rights.

Faced with the continuing struggle to decrease pollution of rivers and streams by the mining operations, Region 10 assigned Loiselle to temporary duty in Fairbanks for the summer of 1984. Although he graduated from college with a degree in biology, Loiselle had become an expert first in water quality problems, then in mining and its impact on such pollution. Prior to the Fairbanks assignment, he had been heavily involved with the environmental problems created by big mining operations in Idaho and other northwestern states.

Loiselle had also been a general laborer for the Alaskan Railroad and worked part-time for a bush pilot in the state. He "knew the language," the people, and the free spirit Alaskan psychology.

To carry out his mining cleanup task, Loiselle travelled hundreds of miles to district miners' meetings, by car in the few areas where there were roads, and by helicopter into remote places far from his headquarters in Fairbanks, Alaska's second largest city. He coordinated the assignment of EPA staff from the headquarters Effluent Guidelines Division, the Denver National Enforcement and Investigation Center (sent there because of public threats against government agents), and Region 10 compliance inspection and permit data gathering teams. He also met with the miners to explain, wheedle, and stand firm for environmental protection.

What he was telling the miners they needed to do was to dig settling ponds where the sluice water would flow instead of into the rivers, and to take the waste treatment steps necessary to meet National Pollutant Discharge Elimination System permit conditions. For some, this would be quite expensive when related to the potential income from a small mining operation, but Loiselle was successful. As one letter received by Region 10 said of his efforts, "he struck just the right balance between friendliness, respect and firmness and has earned their respect."

This hard-won respect is mentioned in the citation that accompanied Loiselle's gold medal, for "outstanding achievement in the reduction of pollutant discharges from gold placer mining activities resulting in improvement in the water quality of Alaskan streams and rivers."

Loiselle hopes to return to Alaska next summer and expects to find that the miners are continuing to comply with the EPA and state regulations.

"Alaska miners have a little bit of Missouri in them," Loiselle said. "They've got a 'show-me' attitude, and if they can be shown the benefits of complying with federal and state regulations, they'll comply." □

(Popkin is a writer for the EPA Office of Public Affairs.)

Update:

A review of recent major EPA activities and developments in the pollution control areas.

AIR

New Lead Phasedown Option

EPA has announced that it is proposing a new method that would give gasoline refiners and importers added flexibility in meeting the agency's standards for allowable lead content in gasoline. EPA proposed the new standards in July 1984.

Under EPA's new proposal, the agency would give refiners the option of reducing their leaded gasoline production over the next year below federal lead standards. Refiners would be allowed to accumulate credits for the difference.

The credits could be applied toward future gasoline production as stricter federal standards go into effect. This banking mechanism would give refiners added flexibility without slowing progress toward EPA's lead reduction goals.

Central Illinois "Bubble" Proposal

EPA has proposed allowing a Central Illinois Public Service (CIPS) power plant to reduce sulfur dioxide emissions from two of its boilers by imposing a tighter than necessary emission limit on one unit to offset a less strict limit on the other, instead of placing the same restrictions on both.

This is the first time EPA has used this "bubble" approach to the new source performance standards (NSPS) of the Clean Air Act. It will reduce the overall sulfur dioxide emissions from the two boilers by 3,100 tons a year while allowing CIPS the flexibility to use less costly fuel.

Fuel Additive Penalties

EPA has proposed civil penalties of over $4 million against three fuel additive manufacturers in Phoenix and Seattle for improperly blending alcohol with gasoline.

Notices of Violation have been issued to United Energy Company of Phoenix, Ariz., proposing a penalty of $1,310,000; UEC, Inc., of Phoenix, proposing a penalty of $880,000; and Sound Energy, Inc., of Seattle, Wash., proposing a penalty of $1,950,000.

EPA said that it began investigating the firms after an anonymous source alleged they were improperly manufacturing and blending alcohol additives for use in unleaded gasoline. A search of company records found evidence to support these allegations.

Methanol Unleaded Gas Blend Approved

EPA has announced that it will grant a conditional waiver to E.I. DuPont de Nemours & Co., Inc., to begin marketing a new blend of unleaded gasoline containing methanol and other cosolvents.

The agency took this action in response to a request from DuPont to waive a Clean Air Act prohibition against certain fuels and fuel additives.

EPA has determined that DuPont's methanol blend is entitled to a waiver because it will not cause or contribute to the failure of any vehicle to meet federal emission control standards.

GM Recall

The General Motors Corporation is voluntarily recalling approximately 225,000 1981 and 1982 vehicles to repair catalytic converters that may be defective. California vehicles are included in the recall.

The recall affects vehicles equipped with 4.1 liter V-6 gasoline engines. Models included are the 1981 and 1982 Buick Electra, LeSabre, and Riviera; Cadillac DeVille, Fleetwood Brougham, Eldorado, and Seville; and the Oldsmobile Ninety-Eight and Toronado. Also included are the 1982 Buick Regal and Regal Estate Wagon; and the Pontiac Bonneville, Bonneville Wagon, and Grand Prix.

HAZARDOUS WASTE

Largest Superfund Cleanup Approved

EPA has approved the largest cleanup yet undertaken under EPA's Superfund program. Estimated to cost more than $55 million, the project is designed to eliminate the threat to public health and the environment posed by the Bridgeport Oil and Rental Services site in Logan Township, Gloucester County, N.J.

The Bridgeport site, which ranks 35th on the National Priorities List of Superfund sites, is a former waste oil reclamation operation on a 30-acre plot once used for sand and gravel excavation. It includes about 90 tanks and process vessels, drums, tank trucks, and a 12.7-acre waste oil and wastewater lagoon. Contaminants from the lagoon have been found in local wells and ground water.

Accelerated Superfund Cleanups

EPA has proposed to help improve and accelerate private and government responses to hazardous waste contamination by amending the national guidelines for cleaning up waste sites or spills of hazardous substances.

The guidelines, known as the National Contingency Plan (NCP), set down the procedures private companies and federal and state agencies must follow in any cleanup operations under the Superfund law.

EPA would revise the National Contingency Plan procedures for Superfund actions by such steps as:

- Removing certain restrictions which did not permit quick response at sites in certain situations;
- Removing the prohibition on listing federal facilities on the Superfund's National Priorities List (NPL) and requesting comments on other ways to identify federal facility priorities;
- Requiring EPA to use applicable and relevant federal public health standards when determining the appropriate remedy for hazardous waste cleanups; and
- Clarifying when and how private parties responsible for hazardous waste problems must clean up these sites or pay for Superfund cleanup actions.

New Waste Recycling Regulations

EPA has issued new regulations controlling a number of hazardous waste recycling practices not now covered by the agency's hazardous waste management regulations.

The new rule gives EPA the authority to control the management of waste burned as fuel, waste spread on land as a dust suppressant, accumulated waste that no one expects to recycle, and certain wastes that are reclaimed.

EPA estimates that the new rule will bring 2,600 companies which generate hazardous waste into line with the more stringent waste management requirements of the amended RCRA law.

Ban on Contaminated Used Oil

EPA has proposed a new regulation to prohibit the burning of contaminated used oils in residential, institutional, and commercial boilers. It has also taken action to prohibit the burning of hazardous wastes in these boilers.

EPA's prohibition against the use of contaminated used oil would affect all residential, institutional, and commercial boiler operators across the country who purchase used oil for fuel, as well as collectors, blenders, and sellers of the used oil fuel.

Dioxin Disposal Regulation

EPA has announced that it will regulate the management of dioxin-containing wastes. The dioxin wastes will be added to the list of wastes subject to the hazardous waste management standards of the Resource Conservation and Recovery Act (RCRA).

This regulation is a key part of EPA's dioxin strategy, which is designed to prevent mismanagement of dioxin-contaminated wastes. By listing these wastes under RCRA, EPA is taking broader control over the disposal of dioxins than it has previously exercised under the provisions of the Toxic Substances Control Act (TSCA).

PESTICIDES

EPA Actions on Five Pesticides

EPA has announced separate actions for five pesticides: dibromochloropropane (DBCP), alachlor, triphenyltin hydroxide (TPTH), captafol, and dinocap.

Four of the actions involve the initiation of special reviews; the other action cancels the remaining registration of DBCP. This latter action results from the completion of the special review of DBCP and applies to DBCP only.

Continued to next page

Temporary EDB Tolerance Level for Imported Mangoes

EPA is setting a temporary tolerance level of 30 parts per billion (ppb) for the pesticide ethylene dibromide (EDB) on imported mangoes.

This is the last remaining use of EDB on foods destined for U.S. consumers. EPA's action sharply curtails the use of EDB on mangoes destined for U.S. consumption in the near future.

The 30 ppb EDB maximum residue level will be effective until September 1, 1985. After that date, no mangoes with any detectable EDB residues will allowed into the United States.

AGENCYWIDE

Engineering and Technology Office Reorganized

EPA has announced the reorganization of its Office of Environmental Engineering and Technology (OEET). The change will affect the agency's Washington headquarters office as well as laboratories in Cincinnati and Research Triangle Park, N.C.

EPA's research activities in the areas of air, water, Superfund, toxics, and hazardous waste control technology will be realigned into three laboratories under the direction of Carl R. Gerber.

These laboratories are responsible for developing pollution abatement technology in support of EPA policies and regulations. The research is conducted both in-house and through contracts and cooperative agreements. □

Appointments at EPA

John Stanton

Peter Cook

John J. Stanton, whose appointment as Director of the Emergency Response Division of EPA's Office of Solid Waste and Emergency Response (OSWER) was reported in the September 1984 issue of the *Journal,* has recently been named Director of the Superfund Enforcement Division. Stanton held the former position from June 1984 until February 1985 when he took on his new responsibilities within OSWER.

Peter L. Cook has been appointed Deputy Director of Waste Programs Enforcement in OSWER. Cook has returned to EPA after five and a half years as Deputy Federal Inspector in the Office of the Federal Inspector for the Alaska Natural Gas Transportation System, an independent agency responsible for overseeing construction of the Alaska Natural Gas Pipeline, one of the largest and most expensive construction projects ever undertaken.

Cook worked at EPA between 1971 and 1979. From 1971 to 1975 he was an Environmental Protection Specialist in the Office of Federal Activities. From 1975 to 1979 he served as Assistant Director of the same office.

Prior to joining EPA, Cook worked for three years as an aerospace engineer at the National Oceanic and Atmospheric Administration (NOAA). Between 1966 and 1968 he served as an officer in the Commissioned Corps of NOAA.

Cook studied engineering at the Clarkson College of Technology in Potsdam, N.Y. He received his B.S. in Electrical Engineering in 1966. Cook earned an M.B.A. at American University in 1971.

Book Review

From time to time, EPA Journal *will include brief reviews of current books of popular environmental interest. Suggested books are welcome. Here is a review by Jack Lewis of the* Journal *staff:*

Anne W. Simon, *Neptune's Revenge: The Ocean of Tomorrow* (N. Y.: Franklin Watts, 1984; $15.95)

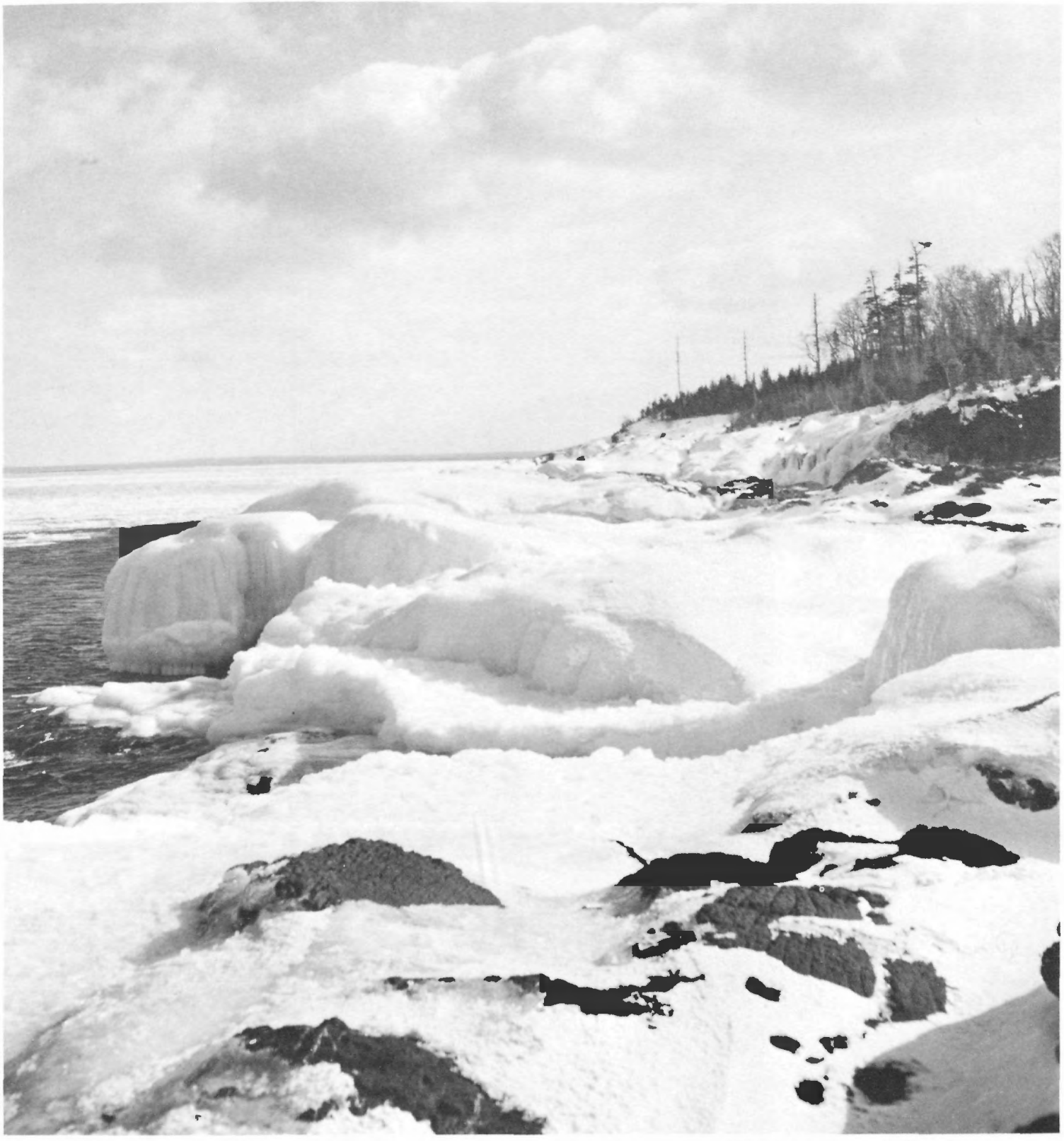
Neptune's Revenge offers a pessimistic prognosis for the future health of the world's oceans. Unless present patterns are reversed, Anne Simon foresees environmental disaster on the high seas. In fact, she deploys a wide array of evidence to support the idea that disaster of various types is already upon us.

Simon is both a skillful scientific popularizer and an idealistic environmental purist. Her writing is less eloquent and coherent than Rachel Carson's, but she shares many of Carson's concerns. Three decades have passed since Rachel Carson's last book about the world's oceans, so—despite its flaws—Anne Simon's updated analysis does fill a real and present need in environmental literature written for popular consumption.

Simon is particularly eloquent in describing the perils of oil spills and ocean disposal of radioactive wastes. However, she also devotes careful attention to the hazards posed by ocean dumping of toxic chemicals and sewage sludge as well as indiscriminate salmon fishing and whale hunting. Perhaps her most fascinating chapter, "The Sea Also Rises," describes how the "Greenhouse Effect" could lead to flooding problems on a scale never before encountered in recorded history.

Neptune's Revenge ends with a disillusioning survey of political and legal issues bearing on the future of the world's oceans. She describes the modern land rush for underwater drilling rights as a bizarre form of imperialism that can only lead to further ecological degradation. Simon's warnings are so dire that her depiction of Antarctica as "the one almost pure place left on earth" takes on desperate rather than hopeful undertones.

Many experts will dispute the practicality of Simon's premise that only "zero" degradation can prevent "unreasonable" risk to ocean ecology. However, few would question Simon's insistence on the importance of healthy oceans to the survival of the planet and the urgency of the problems confronting our oceans today. "A killing sea," Simon warns, "will be Neptune's revenge for our misuse of his domain—unless we act with determination, fast." □



Michigan Travel Bureau

Winter comes to Lake Superior.

Back cover: Flowers bloom along the shoreline of Lake Michigan, in Leelanau County, Mich. Photo courtesy Michigan Travel Bureau.

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