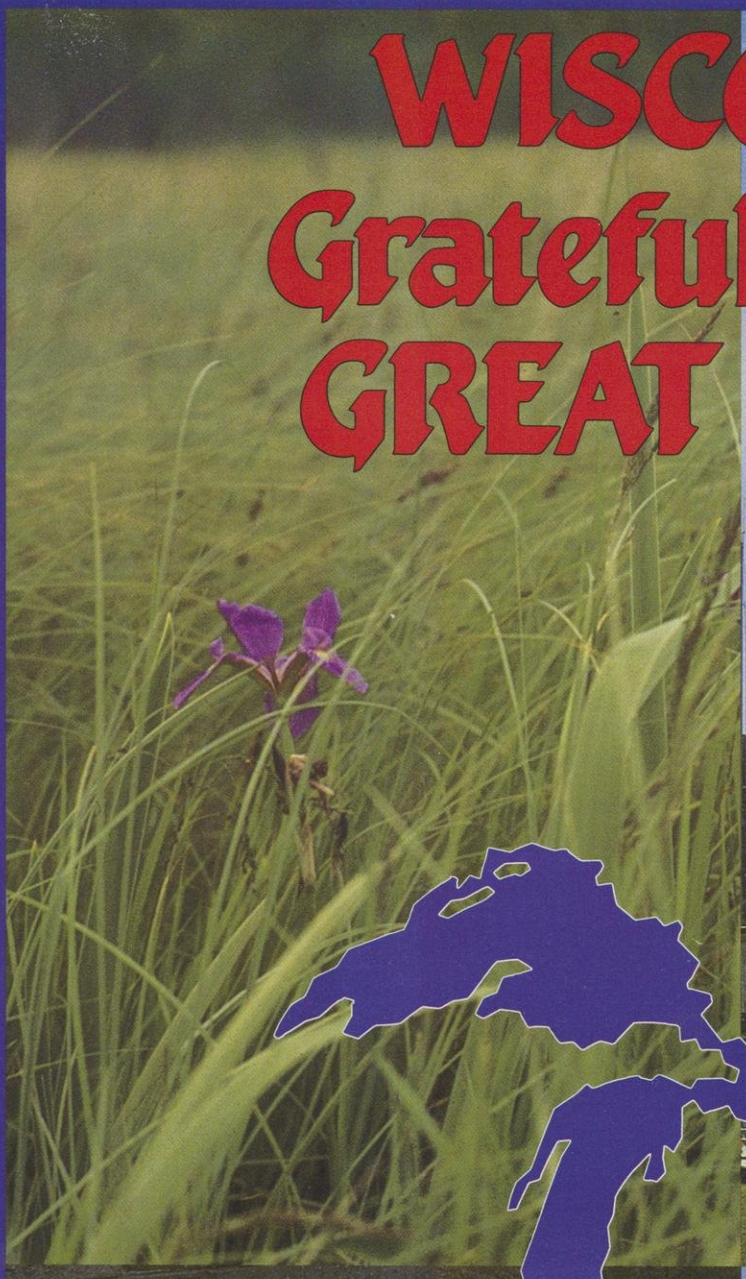
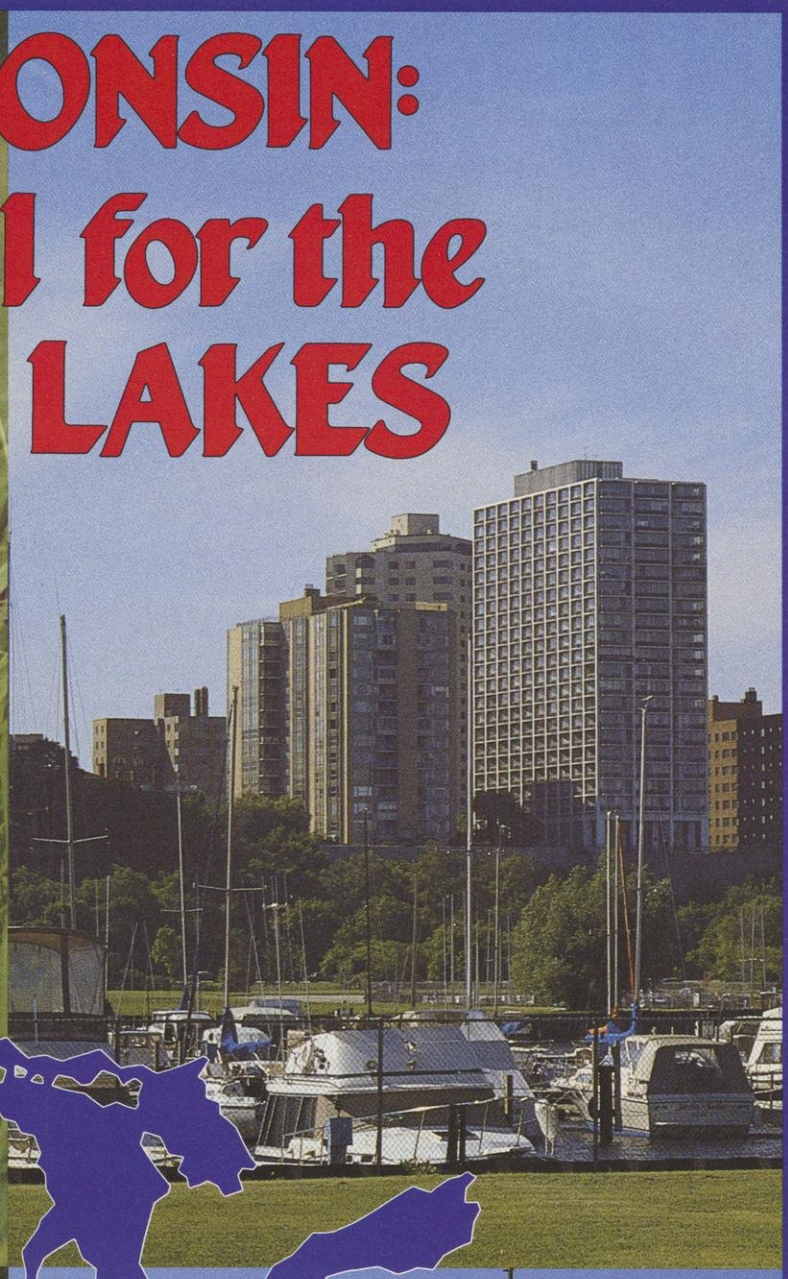
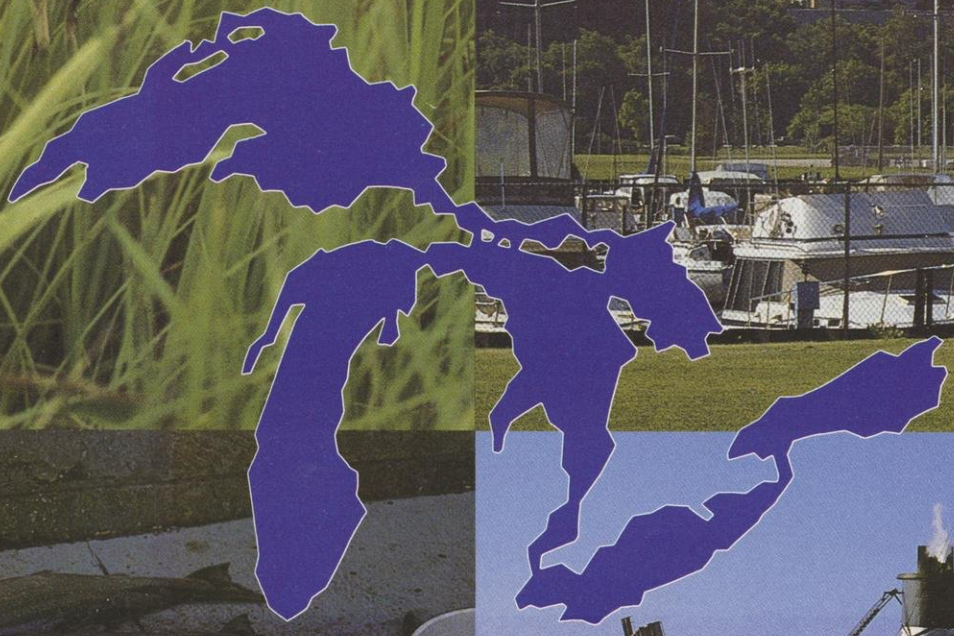
Wisconsin: grateful for the Great Lakes. Special report, [Vol. 11, No. 1] [January/February 1987]

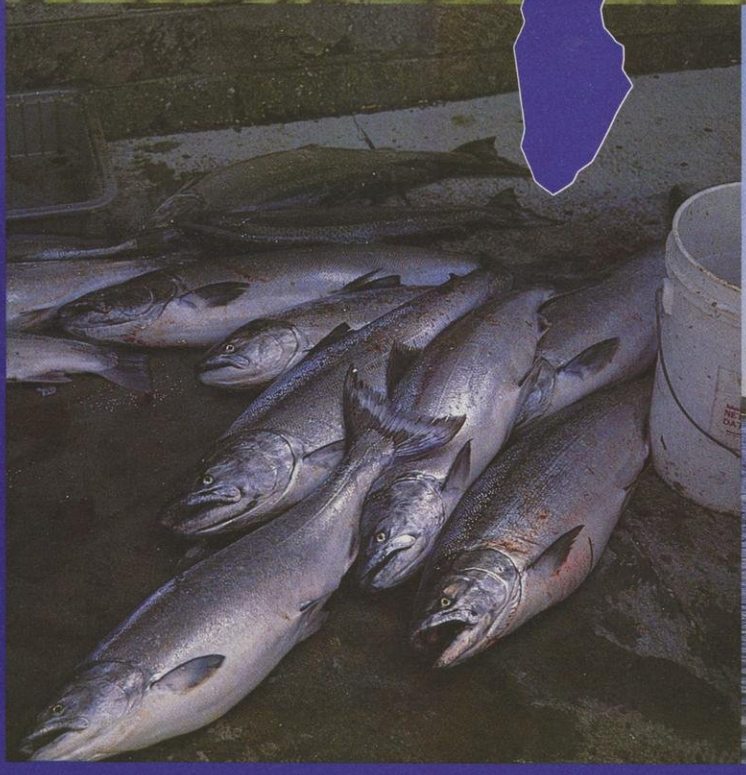
[Madison, Wisconsin]: [Wisconsin Department of Natural Resources], [January/February 1987]

WISCONSIN: Grateful for the GREAT LAKES









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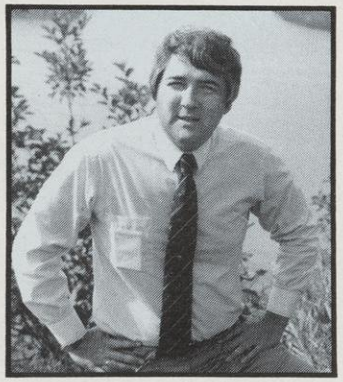
Coordinators for production of this publication were Jayson Chung of the Wisconsin Coastal Management Program, Department of Administration and Michael T. Llewelyn, chief of DNR's Water Resources Planning and Policy Section.



Tom Klein

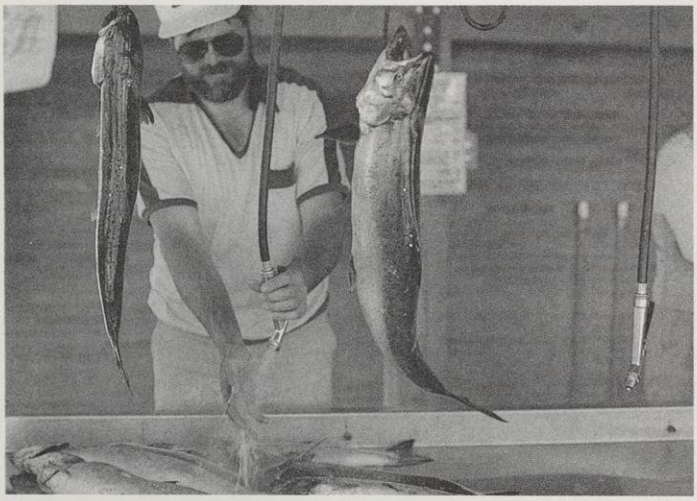
As chairman of the Wisconsin Coastal Management Council, comprised of state agencies, local governments, citizens and legislators with a common interest in protecting the resources of the Great Lakes, I have seen first hand how our state has become a leader in translating a regional management philosophy into meaningful action. I have also seen how citizen participation can highlight Great Lakes issues and help improve management decisions. It is citizen help like yours that sparks Wisconsin leadership in Great Lakes management.

The articles in this special report are intended to give readers the dynamic flavor and complex nature of Great Lakes issues. They illustrate the Wisconsin Coastal Management Program's effort to make sure management of the Lakes keeps apace of evolving demand. The articles are aimed at the Lakes' important challenges—commercial and recreational fishing equity, adapting ports and harbors to new economic conditions, stopping multiple sources of water pollution, developing a framework to discourage interbasin diversion and managing local consumptive uses before a crisis arises. Strengthening regional institutions so that they can better make and implement Great Lakes policy is also a challenge. If we do these things, we will be better equipped than ever to anticipate change and deal with the complex consequences of our activities. The work we are now engaged in shows we are becoming more understanding and responsible users, protectors and members of our Great Lakes ecosystem. This publication tells how.

Tom Klein, Chairman,
Wisconsin Coastal Management Council,
Department of Administration

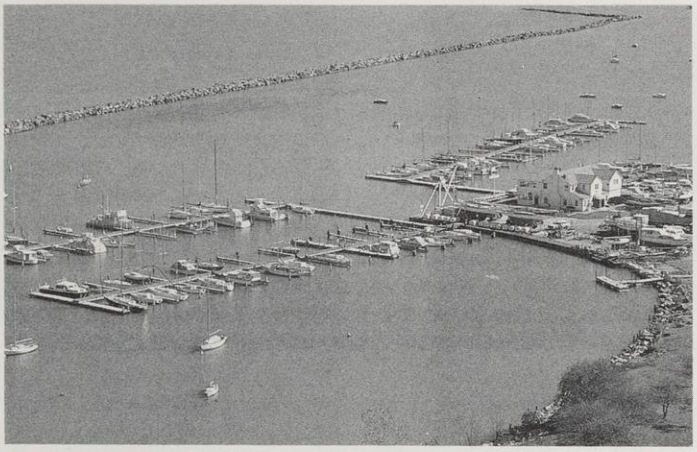
THE REGIONAL CHALLENGE OF THE GREAT LAKES
MANAGING CHANGE

Tom Klein, Chairman,
Wisconsin Coastal Management Council, Department of Administration

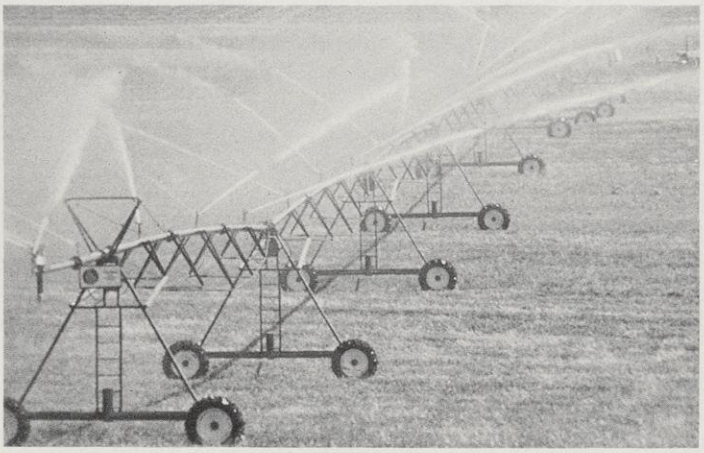


Port Washington fish cleaning station.

Duluth-Superior Harbor.



The South Shore Yacht Club at Milwaukee.



Irrigation in the Southwest.

The Great Lakes' basic strengths will play a prominent role in regional resurgence. Managing the lakes as one ecosystem can help protect against toxic contamination and prevent water diversion for uses like irrigation in the Southwest. It will also enhance local economic development in shipping, fishing, boating and related commerce and recreation.

The Great Lakes are geologically young and still in the formative stage. They assumed their present configurations and levels only about 2000 years ago. Land along the northern edge of lakes Superior and Huron is still rebounding from the weight of the glaciers, rising a foot every hundred years. And, as it has for centuries, wave action continues to re-shape the shorelines, with obvious results during periods of high water such as we have now.

Largely unaware of the powerful forces shaping our surroundings on a geologic time scale, we have altered the Great Lakes basin with amazing speed. We've surrounded them with railroads and highways, channeled their rivers and dredged their harbors. Our homes, cities, and industries crowd the shoreline and lake vessels, motorboats, and sailboats fill the harbors. We've drawn upon their waters for our sustenance and to enrich our lives.

Because we are so dependent upon the Great Lakes, we have a duty to manage them with responsibility and sensitivity. But sometimes, our actions precede understanding. And managing this big ecosystem is further complicated by recent deep-rooted changes in the region's political, economic, and natural environment over which its citizens and policy makers have no control.

Lately, federal funds for major environmental protection, resource management, and economic development programs in Great Lakes communities have dropped off. This hampers consolidating initial gains made on these fronts and stymies tackling new environmental improvement. Reductions in federal urban and economic development programs have also been harmful. Upshot of these cutbacks is that additional responsibilities now fall to the states. This hurts because Great Lakes states are already sad-

dled with trying to rejuvenate an aging and dislocated industrial base. Except for a couple places still thriving, a telling sign of these misfortunes is the decline in activity at most Great Lakes ports and shipyards. And these are fundamental to the health of local economies in many coastal cities.

All the recent problems, however, have forced Great Lakes policy makers to carefully assess the region's basic strengths—a large population, capable labor force, solid energy and transportation networks, a rich natural resource base, and strong educational and research institutions. Building on these, the region has begun to rebound.

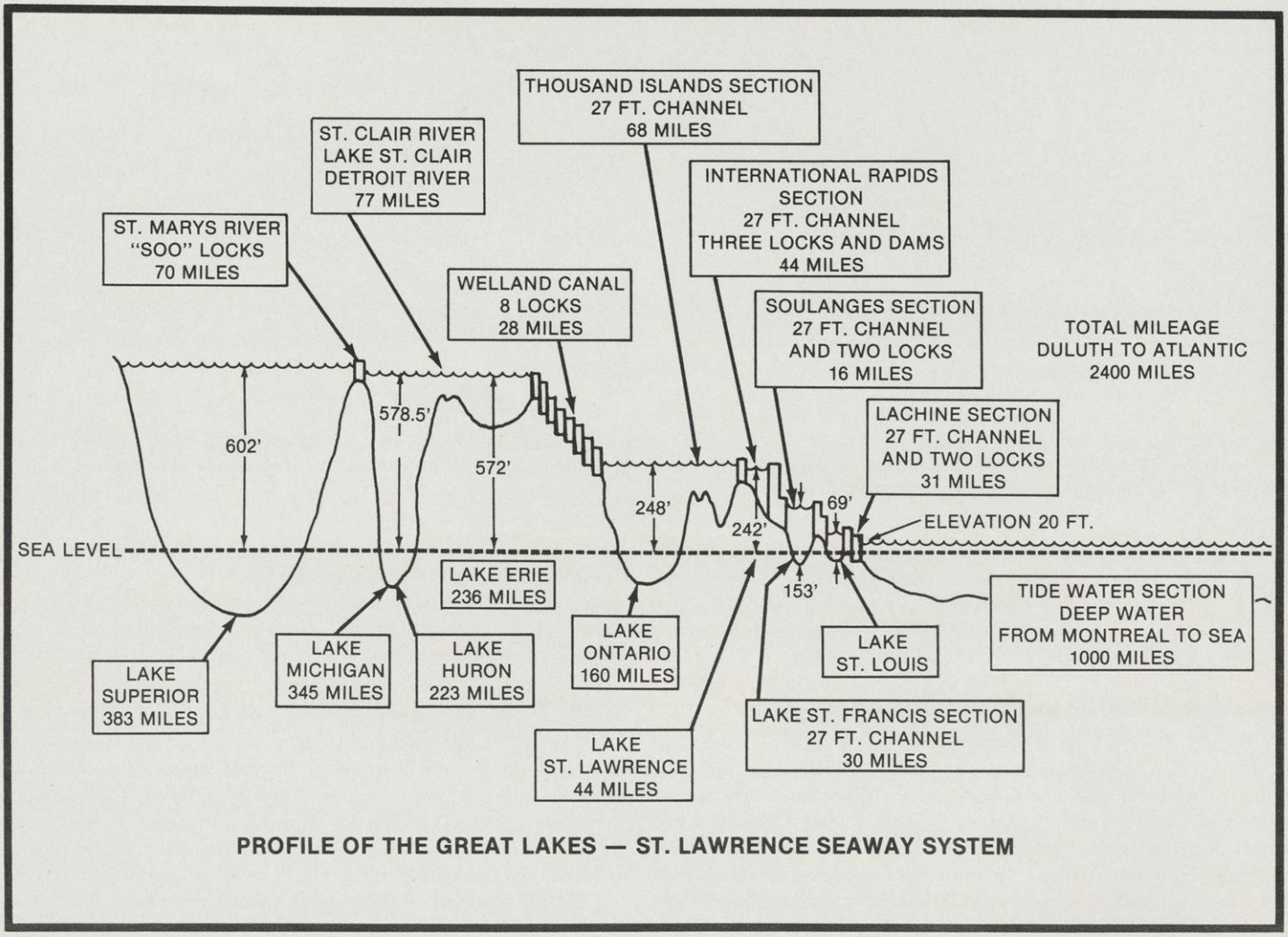
One of the most notable outcomes of this self-evaluation has been a renewed appreciation of the importance of the Great Lakes to the region's economy and to the health and well-being of its citizens. Once taken for granted, the Great Lakes are now clearly recognized as a unique asset that, if properly cared for, will play a key role in the region's resurgence.

This fresh recognition has engendered a new emphasis on cooperative action in both the US and Canada to protect and manage the lakes as an ecosystem. It's an old idea, but until now, turning multiple jurisdictional recommendations into hard action hasn't fared well. The Great Lakes Charter and the Great Lakes Toxic Substances Control Agreement are visible signs of a reinvigorated regionalism that will get things done.

This resurgent cooperation is heartening. It is a sign that the conservation, protection, and wise use of Great Lakes resources again have a chance of becoming a reality—all the way from from Superior, Milwaukee and Chicago to the mouth of the St. Lawrence River. It is something we have to keep working at.

GEOLOGICAL HISTORY OF THE GREAT LAKES

YEARS AGO	
PRESENT	
2,000	The Great Lakes assume approximately their present configurations and levels.
3,500	Continuing retreat of the Wisconsin glacier permits Lakes Duluth and Algonquin to combine, forming Lake Nipissing where Lakes Superior, Michigan, and Huron now lie.
10,000	Minor advances and retreats of the Wisconsin glacier, coupled with gradual uplifting of the region, form a complex series of lakes and levels. At one point Lake Duluth occupies present western Lake Superior; Lake Algonquin fills present Lakes Michigan and Huron; Early Lake Erie occupies the present Lake Erie basin; and Lake Iroquois occupies present Lake Ontario.
15,000	Gradual retreat of the Wisconsin glacier results in formation of the first Great Lakes: Early Lake Chicago at the south end of present Lake Michigan, and Lake Maumee at the western end of present Lake Erie.
1,000,000	Beginning of Pleistocene Epoch: four great glacial ages scour out future lake basins; the Great Lakes region is in turn covered by Nebraskan, Kansan, Illinoian, and Wisconsin glaciers, with long warm periods between.
70,000,000	The Great Lakes region remains above sea level; gradual erosion takes place.
225,000,000	Slow downsinking of portions of the Great Lakes region forms ancient seas with alternately advancing and retreating shorelines; thick layers of sediments are laid down before seas finally withdraw.
550,000,000	Volcanic action forms Canadian shield; buildup of lava, ash, and sediments alternates with wearing down of the Great Lakes region by erosion.



PROFILE OF THE GREAT LAKES — ST. LAWRENCE SEAWAY SYSTEM

GREAT LAKES INSTITUTIONS

To achieve effective management of the Great Lakes as a total ecosystem will require cooordinated action by a multitude of agencies. It's beginning to occur.

William Brah, Wisconsin Coastal Management Program, Department of Administration

Eight states and two Canadian provinces border the Great Lakes. Well over a dozen federal agencies — on both sides of the border — have an interest in some aspect of the lakes. Hundreds of other government entities have limited resource management responsibility. There is also a constellation of research institutions and citizens' groups that want to exert influence.

This complex management structure presents policymakers with a challenge: To get existing institutions to work together on water issues facing the entire Great Lakes region. How is the challenge being met? Can the present system be improved?

THE WISCONSIN COASTAL MANAGEMENT COUNCIL

The effort to deal comprehensively with Great Lakes issues goes back at least 15 years in Wisconsin. At that time, the many state and local government programs were uncoordinated. But in 1977, the Wisconsin Coastal Management Council was created to view the lakes system as a whole including its environmental, economic and social attributes. The Council, staffed by the Coastal Management Program in the Department of Administration, coordinates the many state policies and programs that affect Great Lakes management and advises the Governor on various issues. Wisconsin's was a first among Great Lakes states.

The Council has 14 members representing the Departments of Natural Resources, Transportation, Administration, the UW-Sea Grant Program, citizens, state legislators and local and tribal governments. All are committed to working together on long-term resource management problems. For example, the Council laid the groundwork for the historic Great Lakes Charter, which in turn inspired the Great Lakes Toxic Substances Control Agreement. The Council is the kind of coordinative mechanism some would like to see for the entire Great Lakes region.

THE COUNCIL OF GREAT LAKES GOVERNORS

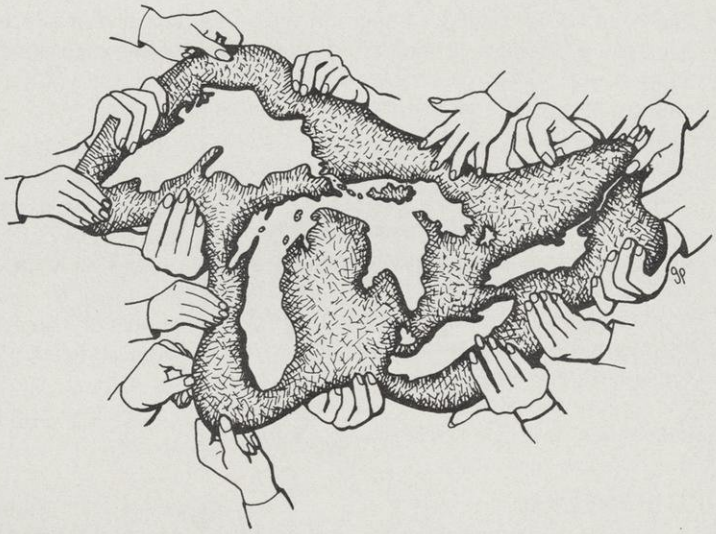
This need for better coordination was one of the forces behind formation of the bipartisan Council of Great Lakes Governors in 1982. The governors take up economic and environmental policy issues common to the six member states — Illinois, Indiana, Michigan, Minnesota, Ohio and Wisconsin. When dealing with Great Lakes water problems, they also confer with New York, Pennsylvania, Ontario and Quebec. Unique among Great Lakes organizations, the Council can generate consensus among chief executives and speak forcefully when national policy changes will affect the future of the region. The 1985 Great Lakes Charter setting-up a regional water resource management strategy was one of its important accomplishments. While the Council exerts strong pressures and stimulates cooperation among various institutions, its influence is limited because it does not speak for all lake state governors.

THE GREAT LAKES COMMISSION

The Great Lakes Commission (GLC) is the only interstate organization with a statutory mandate to represent the collective views of all Great Lakes states. It was established by the eight governors in 1955 and granted congressional approval in 1968. Its charge is to promote the orderly use and conservation of water resources in the Great Lakes basin. The GLC distributes information to member states, coordinates their positions on various issues and advocates these positions in Washington.

While the GLC and Council of Governors resemble one another and pursue similar activities, the Council focuses on policy while the Commission emphasizes data collection and information sharing. The Commission, however, has broader membership than the Council and more legal authority.

The Commission's effectiveness has been limited at times by members' lack of strong commitment to the institution and by the fact that its activities tend to be diffuse and generalized. A change that should help GLC activities become more focused and relevant was made in 1986 when key staff of the Governor's Council were assigned to sit on the Great Lakes Commission.



Hundreds of agencies, federal, state, provincial and local on both sides of the border have a hand in Great Lakes management. But the lakes are a single ecosystem and institutions are needed that supersede piecemeal approaches. Some agencies are beginning to realize this and loosen their grip.

THE GREAT LAKES FISHERY COMMISSION

The Great Lakes Fishery Commission (GLFC) was established by the US and Canada in 1955. It does not deal with comprehensive Great Lakes management, but determines ways to better manage fish stocks of common concern to the two nations and performs research in support of this. The GLFC has both Canadian and US sections, each served by four commissioners appointed by their respective governments. The Commission operates through committees made up of the academic community and representatives of agencies with fish management and other natural resources mandates.

A recent major GLFC initiative has been writing and implementing the Joint Strategic Plan for Management of the Great Lakes Fisheries. Also, the Commission has played a major role in coordinating fisheries research and management among all agencies on both sides of the border.

THE INTERNATIONAL JOINT COMMISSION (IJC)

Over the years, the IJC has evolved from an institution that had as its main function the processing of applications for

water diversion permits, to one that must deal with increasingly complex and politically sensitive transboundary environmental problems. Through the US-Canadian Water Quality Agreement, the IJC has played a pivotal role in developing an international response to the basin's serious pollution problems. It is now starting a new study that deals with high water conditions on the Great Lakes.

It is difficult to overstate the significance of the IJC's role in Great Lakes management, or the positive effect it has had on US-Canadian relations. The IJC is the only formally sanctioned, binational body with authority to address water quantity and quality concerns of the federal governments. Certain changes would greatly improve the Commission's effectiveness.

Increased interest in the IJC on the part of the federal governments, especially the US, is needed. Changes in the IJC's rules of procedure would encourage the Commission to act on its own in reviewing water diversion proposals, instead of waiting for an application to come through the federal governments, which may not refer the matter to the IJC.

More emphasis needs to be placed on state and provincial participation in the IJC's investigative boards and study groups. Now, there is no formal path for this involvement. With respect to the Water Quality Agreement, the states must be given a greater role in renegotiation discussions because they have the responsibility for implementing the agreement.

THE FUTURE

Although significant institutional resistance to coordination still exists, a cooperative spirit is growing and several historic steps toward removing that resistance have been taken. Regional water resources agreements have been reached and various agencies are working more closely together. It will be important to maintain this momentum. Fulfilling the promise of a basin-wide water resource protection strategy will rest on the personal commitment and initiative of the governors, premiers and other leaders in the region. Mutual cooperation and good faith will continue to be essential.

But citizens and organizations outside of government are perhaps the most important Great Lakes institutions. They play a pivotal role in continuing to raise Great Lakes water issues and ask questions about progress toward a basin-wide water resource management program. Their continued enthusiasm and resolve is essential if this giant task is to be accomplished.

COASTAL LAND USE

Michael D. Dresen,
DNR Shoreland/Wetland Specialist

Better zoning and greater setbacks are needed.

The Great Lakes coastal zone is always changing. Storm driven winds, waves and ice erode the bluffs beneath homes, businesses and recreational developments. Uplands, marshes, beaches and near-shore waters, home to fish and wildlife, are threatened. Erosion contributes to littoral drift, the north to south movement of sediment along the coast. Some is deposited in the lee of groins, jetties, or natural obstructions to form new land by accretion. Rising lake levels make the natural hazards of flood and erosion even worse.

Despite these hazards, shoreline development continues. A lake view, boating, swimming and fishing are powerful magnets to homeowners and vacationers. Commercial fishing, marinas, port facilities, power plants and certain industries are either directly dependent on Great Lakes water or need it for transportation, cooling or manufacturing. Similarly, the near-shore environment and tributary streams are required by certain fish for spawning or nursery areas. Waterfowl and other birds follow the coast like a road map during seasonal migrations or ride the thermals along the land/water interface. Many fish and wildlife are year-round residents.

All these economic and environmental values competing for a limited amount of Great Lakes shoreline mean that choices will have to be made allocating various uses. The choices are wide-ranging and difficult to assess: heavy industry, homes, restaurants, parks, campgrounds, natural areas, wildlife refuges? Or what? How much fish and wildlife habitat will sustain populations or support a commercial fishery? Is it reasonable to allow private development, knowing the owners will eventually request public assistance to insure their property or construct protective works when coastal flooding or erosion threaten? Should funds be expended to construct public facilities exposed to flood and storm damage? Should we allow landfills in the coastal zone, knowing that sometime in the future their contents will be exposed by coastal erosion? Is it a violation of personal property rights to set aside shoreline for uses which require a waterfront location? What legacy will we leave on the shores of the Great Lakes?

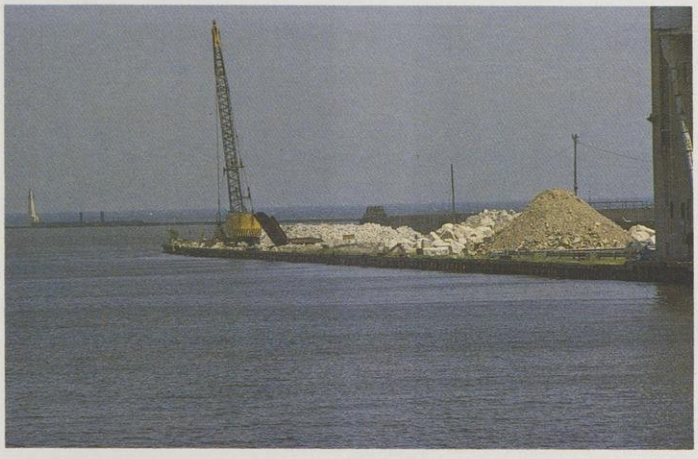
These questions are unlikely to be answered by technological advance. Engineering solutions to coastal flooding and erosion already exist. But dollar and environmental costs of such things as flood-proofing, lowering Great Lakes water levels or protecting shorelines are prohibitively expensive. In some critical areas such as the Town of Pleasant Prairie in Kenosha County, a special tax district of threatened properties was proposed, but was rejected by taxpayers. It would have provided a mechanism for amortizing the cost of shoreline protection and floodproofing.

Also needed for the shoreline is a comprehensive plan to guide future development, especially development that is not water-dependent. Areas susceptible to coastal erosion or flooding and those with special natural resource values such as coastal wetlands should remain undeveloped. In addition, Wisconsin law as it applies to wetland and floodplain zoning along the Great Lakes shore needs to be strengthened. Currently, the same development standards apply on the Great Lakes as on more sedate inland waters. Inland setback requirements and flood zone restrictions are not well tailored to the extreme natural hazards along the coast.

Technical information upon which to base regulations and zoning already exists. Ways to identify coastal areas with accelerated erosion rates as well as standards for increased setbacks were developed by UW-Extension in the mid-1970s. At present, however, only a few counties have adopted zoning based on this information. Racine County is an example of one that has. Combinations of public acquisition and restrictive zoning in the City of Sheboygan and in the Chiwaukee Prairie-Carol Beach area of Kenosha County represent a different strategy aimed at protecting valued resources and minimizing the effects of natural hazards.

Hopefully, a crisis precipitated by an additional rise in Great Lakes water levels will not be necessary to encourage further zoning regulations. Unfortunately, ill-planned commercial and residential development occurs little by little over a long period of time and is well entrenched before a crisis becomes evident. The facts are all in on the harm and expense a failure to act can incur. Now it's up to the policy makers.

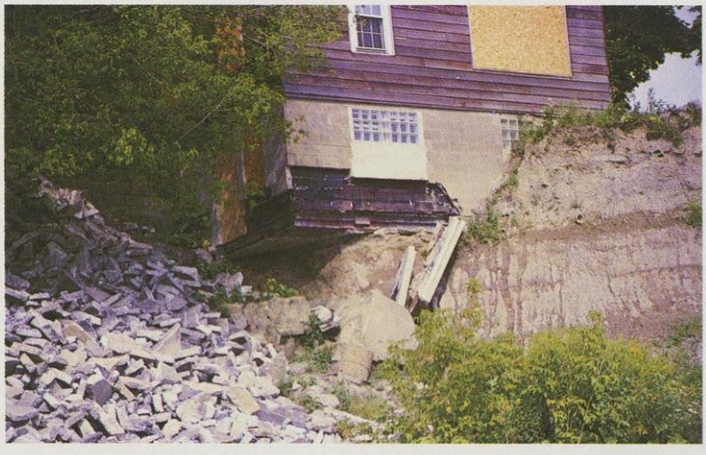
Carol Beach at Chiwaukee Prairie in Kenosha County. Preservation of distinctive natural areas combined with recreation is a good lakeshore land use. Even these need protection from high water.



Big rocks can stave off erosion, but not forever. Setbacks and zoning save property with less cost and trauma when lake levels rise.

Protected from development by a private conservation organization, the Mink River estuary in Door County will never require expenditure of public money to fight high water.

High cost shoreline protection south of Manitowoc.



Sensible setbacks could have saved this house. Such scenes will become more common if Great Lakes water levels continue to rise.

Zoning laws should prohibit construction of buildings and installation of public utilities on shoreline like this subject to erosion.

LAKE LEVELS: RELENTLESSLY RISING

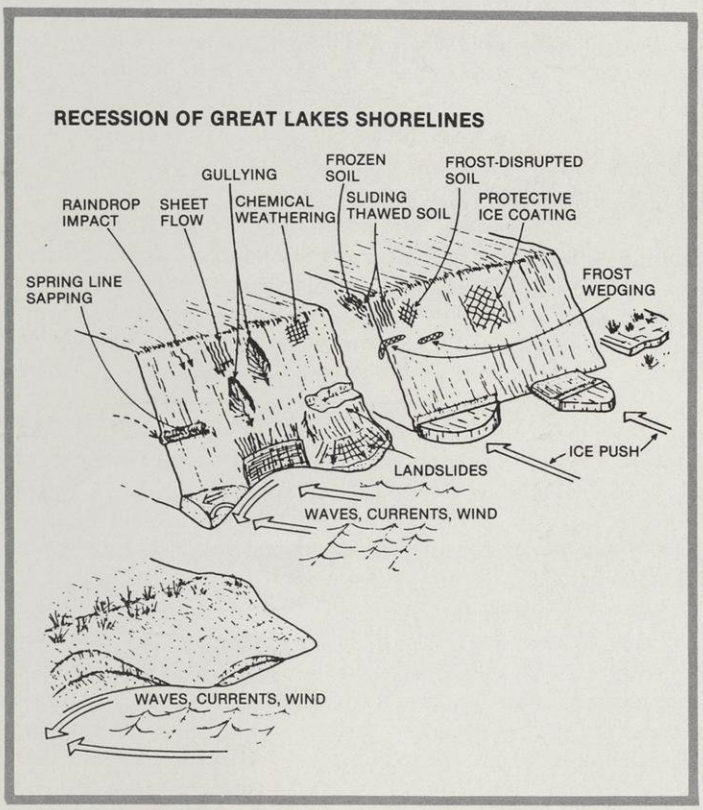
Robert W. Sonntag,
Environmental Engineer

Property damage is in the millions and will go higher unless something is done.

The highest elevation ever recorded for Lake Michigan just occurred. It was in early October, 1986, when the water level reached 581.8 feet above sea level. This was over a foot higher than October of 1985; more than three feet above "normal"; and nearly six-and-one-half feet higher than the historical low established in 1964.

Above average precipitation is the culprit. For the last 15 years, the annual average has been nearly five inches higher than from 1900 to 1970. This turn of events has raised a question about what is really normal. Precipitation records go back only about 150 years, which is not very far. Research has found that Lake Michigan has been as high as 585 feet above sea level at various times in the past 1,500 years. It's possible the lake could rise up to another 1 1/2 feet if above-average precipitation continues.

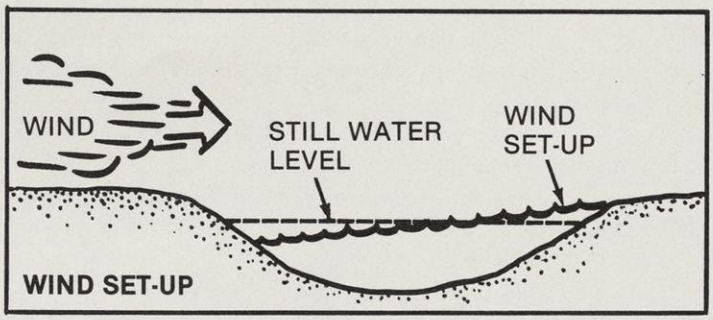
The current high water is causing literally millions of dollars in property damage, which makes it difficult to imagine the amount another 1 1/2 feet could cause. Most current shoreline development took place during the 1930s, when water levels were much lower. Over the last hundred years or so, Lake Michigan has washed away more than 1200 feet of upland from parts of Kenosha County. The average loss over that period has been two to three feet per year. Over the life of a 30-year mortgage, that could amount to 60 to 90 feet of property. Homes, commercial developments, parks and recreational areas, sewer and water treatment facilities, roads and many other facilities are all threatened.



To minimize future damage costs, both land use regulations and construction of control devices will be necessary. Protective structures include bulkheads built of steel or aluminum sheetpiling, treated timber or other materials; reinforced concrete seawalls; stone revetments; riprap and rock groins. Such devices are expensive and can easily cost more than $100 per foot, depending on the shoreline to be protected. Often it's cheaper to relocate a building than to structurally protect the shoreline. Many structural devices built 15 or 20 years ago were thought to be sufficient to last a lifetime, but they've now been either destroyed or rendered ineffective by the current high water.

Appropriate zoning and land use regulations can hold down future losses by discouraging development in erosion-prone areas. Where erosion hazards are high, ordinances generally prohibit most construction and installation of public utilities such as sewers, water and highways. Near-shore lands are usually restricted to open space uses such as parks and recreation areas or to temporary or mobile structures which can be easily relocated.

Regulations and mapping prepared for Wisconsin's Coastal Management program by the University of Wisconsin Extension in 1980 identify coastal erosion hazard areas and provide standards for setting back structures from the Great Lakes shoreline. These are based on historically established shoreline recession rates and relate also to the height and stability of lakeshore bluffs and beaches. Wisconsin municipalities can enlist the aid of state agencies, university experts and regional planning agencies in developing zoning tailored to the particular coastal erosion problems which confront them. Unfortunately, only a few counties and even fewer communities have adopted any land use controls.



Wind alone can cause high water, without regard to precipitation. When the two combine the result can be devastating.

The cycle of high water levels on Lake Michigan may be much longer than we previously supposed, perhaps as long as 300 or 400 years. If this is the case, controls on future development and more stringent (and more costly) standards must be applied to the design and construction of structural shore protection devices. Only through proper application of structural and non-structural controls can future shoreline erosion damage on Lake Michigan be minimized.

GREAT LAKES WATERFRONT REDEVELOPMENT

Tanace Matthiesen,
Wisconsin Coastal Management Program,
Department of Administration

The old wharves, docks and warehouses are being polished up and rebuilt for everybody to use. It's good, but not without cost or problems.

A transformation is happening along Wisconsin's Great Lakes waterfronts. Up and down the two Great Lakes coasts community after community is planning, constructing or enjoying redeveloped waterfronts. They have learned that these are exciting places to play, eat and live—assets that attract tourists, businesses and residents. New marinas have appeared at Superior, Manitowoc and Washburn. Improvements to public access are occurring up and down the coast. At Racine a face-lift of the entire waterfront will feature a 922-slip marina. Kenosha, Sheboygan, Two Rivers, Kewaunee, Green Bay, Ashland and Milwaukee all have redevelopment plans going.

Historically, protected harbors were sought and chosen as the first settlement sites and the waterfront became the focus of the community. But railroads drastically reduced the dependence on shipping. Wharves, docks and other facilities became obsolete. Waterfronts grew unsightly and even dangerous. Wisconsin communities wanted a change and planning funds from the state Coastal Management Program plus successful examples from the east coast helped point the way. Here are some examples of what's been accomplished or is being planned on Wisconsin waterfronts:

Racine—a 922-slip marina and festival grounds, public boat launch, park, fishing pier and extensive joint waterfront/downtown redevelopment.

Sheboygan—waterfront/downtown redevelopment with a German theme to highlight ethnic heritage, a marina and walkway.

Manitowoc—a 20-unit apartment complex, 109-room hotel, a walkway/bikeway along the river and lakefront and a maritime museum.

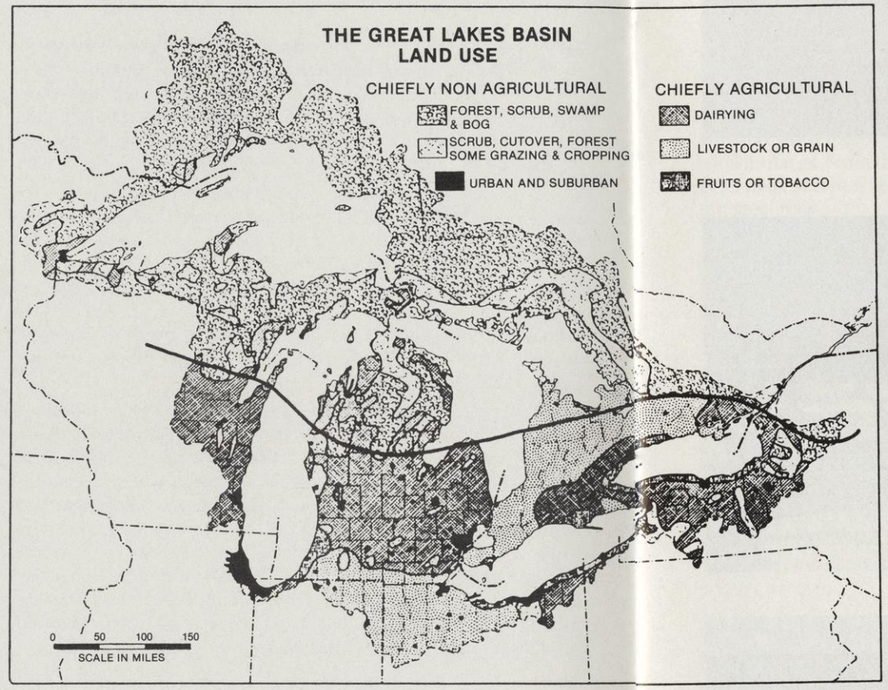
Milwaukee—a 20,000 seat amphitheater plus the "Historic Milwaukee Landing" which will include restaurants, a Milwaukee riverfront walkway, an aquarium, maritime museum and a Great Lakes ship.

Ashland—a new 10-acre lakefront park with a public fishing dock and waterfront trails.

Green Bay—a two level downtown indoor shopping mall, 223-room hotel, a conference center, office space, a housing complex, park and county museum.

These changes have been sparked by the big investment in Great Lakes water cleanup as well as the burgeoning interest in outdoor recreation, especially pleasure boating. Marinas have become a major component of most Wisconsin waterfront redevelopment projects. Many are linked to community-wide economic revitalization efforts. A Michigan study several years ago found that a typical 100-boat marina generated $660,000 annually in direct spending. A UW-Milwaukee economic impact analysis of Racine's planned 922-slip facility shows it will create 403 jobs, pump $29.5 million a year into the local economy and bring $300 million to the Racine area over the period of amortization.

Revitalization of the Great Lakes sport fishery has been another factor spurring waterfront redevelopment. Stocking of lake trout, chinook and coho salmon has spawned a fleet of 560 charterboats that attract anglers from all over the Midwest. Fishing license sales were up almost 80% between 1970 and 1980.



Recently emphasis has shifted to preserving existing buildings and the uniqueness of each community's waterfront as opposed to clearance-type urban renewal projects.

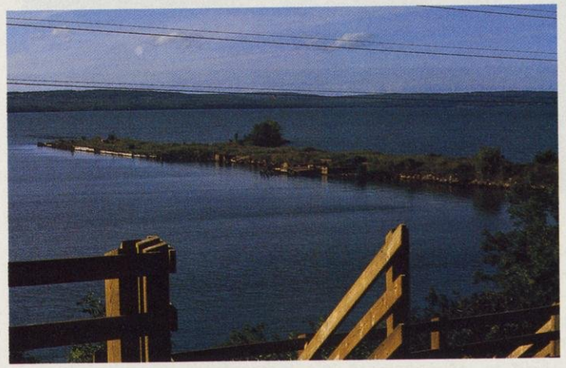
Redevelopment of waterfront areas would not have been possible without a big investment of public dollars. Over the past decade, the Wisconsin Coastal Management Program has made millions available to almost every Wisconsin waterfront community along Lakes Superior and Michigan. The Wisconsin Waterways Commission with a biennial budget of $3.5 million helps pay for recreational boating facilities; Wisconsin's Community Development Block Grant office has approximately $8-million available annually for economic development-type projects; and local park aids of $1.8 million finance fishing, boating and swimming projects. In 1985, the Wisconsin Coastal Management Program funded waterfront construction in Manitowoc, Racine, Ashland and Cornucopia.

While the boom in waterfront redevelopment is welcome, it is not without problems. Too many visitors can cause congestion. Conflicts may arise over public access. Overlapping responsibilities exist in some state funding programs because a number of them fund similar projects. Coordination and clear priorities need to be established for the most efficient use of public dollars. Certain policy questions need to be answered to avoid working at cross-purposes. For example, should waterfront redevelopment be geared toward tourists, residents or both? Does encouragement of recreational waterfront use conflict with commercial navigation? Should state dollars be targeted to high population centers? Are more marinas being built than can be filled?

The new waterfront under construction at Racine. It will include a 922-slip marina, festival grounds, public boat ramp, fishing pier and nearby downtown redevelopment. Similar work is underway on Wisconsin city waterfronts all along Lakes Michigan and Superior. *Photo by Richard T. Vallin*

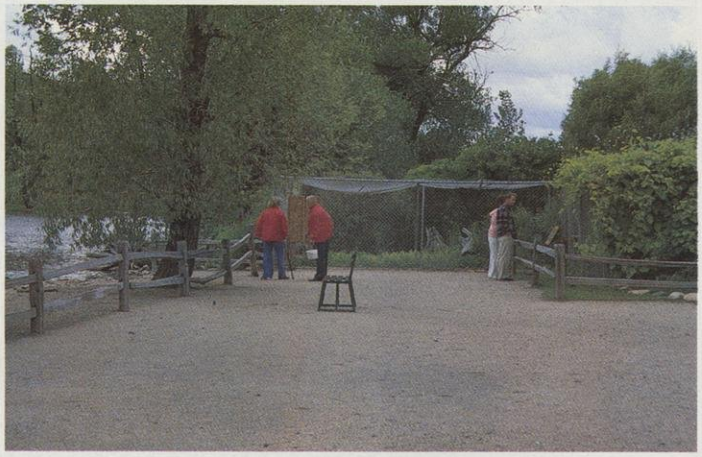
To get at some of these problems, the Wisconsin Coastal Management Program has set up an interagency Waterfront Action Group made up of representatives from the Departments of Natural Resources, Transportation, Development and Administration. The group will try to coordinate waterfront redevelopment and recognize other economic opportunities when they arise.

Waterfront redevelopment of Wisconsin's coasts offers more people an opportunity to enjoy the Great Lakes, holds the promise of improved economies in waterfront communities and attracts much-deserved attention to the unique Great Lakes resource. But it must be done in a way that will maintain a balance—between natural beauty and development of amenities to make the lakes accessible—between traditional uses of the waterfront and new "leisure class" uses. It must also provide adequate free public access. If these opportunities and challenges are met intelligently and with adequate planning and concern for all citizens, Wisconsin communities will never again be forced to turn their backs on our Great Lakes waterfronts.



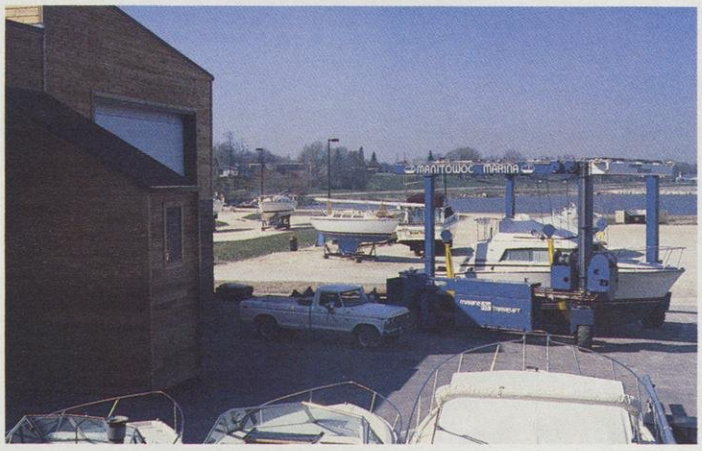
View from new steps to the bandshell—part of a waterfront revitalization project at Ashland.

Summerfest grounds on the Milwaukee lakeshore.

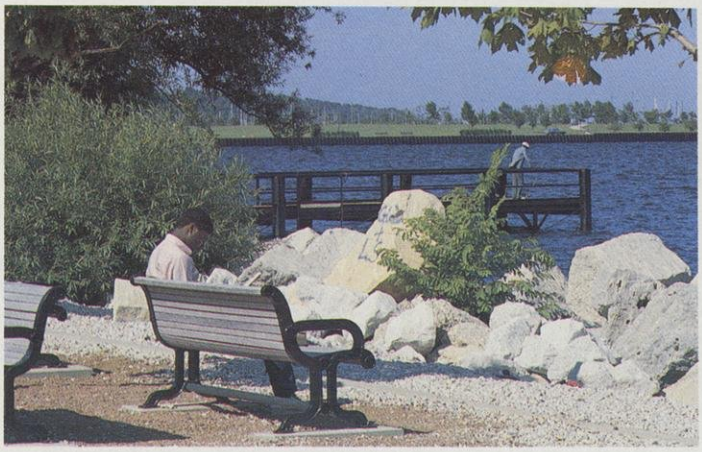


Bay Beach natural area at Green Bay.

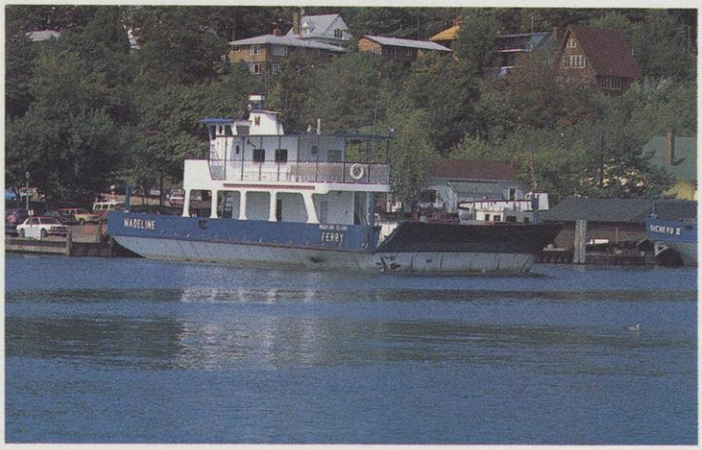
Shipbuilding has come on hard times in Wisconsin but is a legitimate and important waterfront use.



The new Manitowoc Marina.



The Milwaukee waterfront near Juneau Park.



The ferry at Bayfield.

ENERGY FACILITY SITING

Bob Halstead,
Radioactive Waste Review Board

Great Lakes power plants occupy prime sites and have significant and continuing environmental impacts which are carefully regulated.

Energy facilities have historically been located at Great Lakes sites because of many economic advantages. They include waterborne transportation of fuel and construction materials, proximity of ports to major urban markets and the accessibility of transportation linkages to inland markets and energy supply sources. Another big reason is the availability of Great Lakes water for condenser cooling and other industrial uses.

The siting of energy facilities—coal and nuclear electric generating stations, transmission lines, coal transportation and storage facilities, and petroleum and natural gas facilities—can have both good and bad local economic, social, and environmental impacts.

Energy facilities preempt large areas of land, which potentially can reduce lakeshore public access and open space, and create visual and noise pollution. Increased harbor traffic can interfere with recreational uses of harbor waters and coal deliveries by rail can disrupt local traffic patterns. And, of course, coal-fired power plants, coal docks, and petroleum facilities have the potential of degrading air and water quality.

On the other hand, it must be remembered that energy produced by Wisconsin's electric generating plants on the Great Lakes is essential to our well being. In 1980 their turbines spun out 23.5-million kilowatt hours, or 62% of all electricity generated by Wisconsin utilities.

While power plants occupy valuable shoreline, in Wisconsin they generate 62% of all the electricity turned out by state utilities.

To maintain the best of both worlds, the state reviews energy companies' advance plans and requires adherence to the environmental protection act. Local governments have learned to deal with impacts of energy facilities through help from the Coastal Management Program

In sharp contrast to the early 1970s, it does not appear that the next decade will see construction of new facilities along the Great Lakes anywhere. Despite this, existing facilities that want to change or improve can still have significant effects on neighboring communities and regional natural resources. Examples are installation of large-scale pollution control equipment like scrubbers or flue gas desulfurization units, conversion from coal to fluidized bed combustors, or changes in fuel handling systems.

An existing nuclear facility like Kewaunee or Point Beach could be considered for handling and storing low-level radioactive waste pending construction of a regional facility. It may also be necessary for Wisconsin utilities to store more high level radioactive waste from their own plants. This could require new contruction in the 1990s if the US Energy Department's plans for a geologic repository don't progress fast enough.

Regardless of the level of construction activity, energy companies continue to hold significant amounts of unused coastal property pending future development needs. Many of these sites include choice locations for public recreation or open space. The ones that are not needed for energy production should be used for public access and coastal managers are continually on the lookout to accomplish this.

Drinking water is a necessary consumptive use. A new law will keep track of all water losses from the Great Lakes whether for drinking, manufacturing, or electric generating.

WATER, WATER EVERYWHERE, BUT HOW MUCH?

Allen K. Shea,
Water Quantity Planning Analyst

Wisconsin's new Water Resources Conservation and Management Act recognizes that managing water quantity is just as important as managing quality.

The Department of Natural Resources is the 'doctor' and the 'patient' is water. Nothing new, right? DNR has been prescribing cures for water quality problems for years. This 'checkup,' however, is different because the focus is on water quantity.

The Water Resources Conservation and Management Act, known as Act 60, is the first major Wisconsin law to require a comprehensive look at the quantity of water in the state. In addition to focusing on water quantity rather than quality, the Act is unique in other respects. It is the first state law requiring DNR to:

- Examine both ground and surface water together as integral parts of the whole state water picture.
- Include the state's boundary waters — the Mississippi River and Great Lakes — with the more traditionally studied inland lakes and streams.
- Begin collecting and assessing data and information on all harbor water users in the state.
- Conduct a broad analysis of the relationships between water quantity and water quality.

Passage of Act 60 grew out of a series of meetings attended by governors of the eight Great Lakes states and the premiers of Ontario and Quebec. In February 1985, they entered into an historic agreement called The Great Lakes Charter, which responds to the threat of both diversions away from, and consumptive uses within, the Great Lakes basin. The charter establishes a cooperative regional strategy to protect and conserve water resources of the basin. Its specific provisions call for:

- A common data base on water use.
- A regional water resources management committee.
- A regional prior notice and consultation process.
- A basinwide water resource management program.
- Research on flow and lake levels.

To fulfill these tasks, each state and province agreed to enactment of legislation which incorporates provisions of the charter. The Water Resources Conservation and Management Act of 1985 is Wisconsin's fulfillment of that commitment.

The act itself was drafted through a cooperative effort by the Governor's Office, Department of Administration, the Legislative Reference Bureau and the Department of Natural Resources. Additional input was received from the Public Service Commission, the Wisconsin Coastal Management Council, Environment Wisconsin, the Wisconsin Association of Manufacturers and Commerce, the Wisconsin Paper Council, and the Fort Howard Paper Company.

Even though possible diversions from the Mississippi River or the Great Lakes currently receive most media attention, the new law is designed to protect, conserve, and manage all water resources of the state. To the maximum extent possible, it builds on existing water regulations and the permits already authorized under them. Present water users retain the rights they now have. To minimize paperwork, information already collected for other permits will be used to meet requirements of the act. Regulatory controls under it apply to both interbasin diversions and consumptive uses and both are defined as "water loss."

Under the law, all withdrawals averaging more than 100,000 gallons per day in any 30-day period must register with DNR. Existing permits or approvals will fulfill registration requirements whenever possible. New or increased withdrawals that average more than 2,000,000 gallons in water loss per day for a 30-day period must have DNR approval. Those now operational are authorized at their current level of water loss. Fees will be charged for both withdrawals and approvals.

The Act also provides that by August of 1988, DNR must adopt a plan that identifies the state's existing water uses, estimates future trends and sets up a system for allocating water during a shortage or other emergency. The plan will also specify what is required of those applying for a water loss approval.

Cooperation with other Mississippi River and Great Lakes states and provinces is mandated by Act 60. Among other things, the groups have developed a Great Lakes regional prior notice and consultation process.

A Technical Advisory Committee is currently helping write rules for administering the new law. Its 13 members represent a wide range of water users and experts—industry, agriculture, water and electric utilities, electric companies, the University, US Geological Survey, environmental groups, the Public Service Commission and Wisconsin's Native Americans. Among other details, the rules will set up procedures for reviewing water loss approval applications and establish the amount of various fees to be paid. They will also define what portion of a withdrawal constitutes a consumptive use.

When all Act 60 pieces are in place, Wisconsin will be prepared to handle just about any water use conflict, whether it be a large interbasin diversion proposal from outside or an in-state consumptive use on a lesser scale. By monitoring the amount of water now being used, relating quantity to quality and managing and planning for both, the law will make sure that one of Wisconsin's most valuable economic and environmental assets remains just that, in the interest of all citizens.

Interbasin water diversions for irrigation or any other purpose will be regulated under Wisconsin's new Act 60.

THE GREAT LAKES CHARTER

Jayson Chung
Wisconsin Coastal Management Program,
Department of Administration

An historic agreement not only protects against water diversion, but also spurs water management for the entire Great Lakes ecosystem.

In February 1985, the eight governors and two Canadian premiers of the Great Lakes region hailed the signing of the Great Lakes Charter as an historic event. The Charter represented an innovative strategy to resist attempts to divert Great Lakes water to arid regions of the country. The Charter was much, much more than "putting down some homilies about the Great Lakes and signing our names to it," Governor Earl said. "We stand united as a region," Governor Blanchard of Michigan declared. The Charter, proclaimed Governor Cuomo of New York, "will have dividends when none of us are here." Why is the Charter lauded as an unprecedented document in this region's history of resource management? And what is the threat to this grand system of lakes, which now seems quite overfed in terms of water supply?

For the various beneficiaries of Great Lakes water resources, the maintenance of reliable lake flows and levels is a matter of health and survival. Right now there are no definite plans or proposals to divert water out of the Great Lakes basin; the costs are too high. However, in a decade or two this situation could change. Meanwhile, the Great Lakes region has enough water supply problems of its own to warrant improved management.

Wisconsin, for example, has had periodic water supply crises. In 1976, when drought struck statewide, an executive order was invoked allowing emergency withdrawals from streams. A similar order was almost issued in 1985. In southeastern Wisconsin, high groundwater pumping has created an extensive "cone" of depression in the water table that has merged with one underlying the metropolitan Chicago area. In the lower Fox River valley, groundwater levels have been lowered hundreds of feet since municipal and industrial pumping began. These kinds of water quantity problems can impair water quality as well. Lower levels and flows could harm the usefulness, attractiveness, and biological productivity of nearshore lakewaters and tributary streams.

Regionwide, it's estimated that by the year 2000 consumptive use of Great Lakes water will increase by 50 to 100%. This, coupled with booming demand from the thirsty southern and western US, have made prompt, effective Great Lakes water quantity management somewhat urgent. Several factors point to the need.

Heavy federal taxpayer subsidization of immense water projects in the west has led to a tradition there of extravagant use of a scarce resource. The collision of rising demand with dwindling supply is forcing "Parchbelt" states to seek new supplies. Although conservation has become increasingly important in southern and western water plans, the momentum of water demand still necessitates engineering fixes. The price of water in the West may rise to the point where once uneconomic diversions become feasible. Aside from high prices, the ascendancy of the Sunbelt's political clout makes a congressional finding that Great Lakes water diversion is in the national interest a distasteful but real possibility.

◀ *Great Lakes region leaders from Canada and the US who signed the historic Great Lakes Charter in February of 1985. The agreement resists interbasin diversion of water. Shown, left to right, are Frank Wright, Anthony Earl, Mario Cuomo, Bernard Landry, Richard Celeste, James Blanchard, James Thompson, Rudy Perpich, and Adrian Ouellette.*

The Governors and Premiers have realized that the Great Lakes region can most effectively block diversions by demonstrating their own need for the water and managing it in a responsible way. Therefore, in addition to establishing anti-diversion policies, the Great Lakes Charter also provides for control of consumptive losses in the region itself.

These are some of the basic principles established by the Charter:

- The water resources of the Great Lakes basin should be managed as a unified hydrologic system to protect the integrity of the basin ecosystem.
- Regional defense of the Great Lakes water supply depends on the states and provinces having legal authority to manage and regulate interbasin diversions and consumptive uses.
- No Great Lakes state or province will approve any major new or increased interbasin diversion or consumptive use without consulting and seeking concurrence of all affected states and provinces.
- Cooperative programs such as development of a common data base are vital to improving management of the Great Lakes.

Implementation of the Charter began shortly after it was signed. There has been a a wave of activity in legislatures of the region aimed at strengthening water use management capabilities. Wisconsin's new Water Resources Conservation and Management Act was the first to pass and is a good demonstration of how the Charter is changing the face of water rights in this part of the country.

The significance of the cooperation by diverse political jurisdictions that resulted in the Great Lakes Charter cannot be overestimated. The Charter is especially meaningful because it emphasizes a specific implementation program rather than sweeping general policy. Fulfilling its promise will depend on many important intangibles—the diligence of the region's water management agencies, the personal commitment and initiative of the region's political leaders, and the vigilance of citizens and organizations outside of government. But if all goes well, soon a water management program for the entire Great Lakes basin should be a reality.

▼ *Cartoon by Joe Heller dramatizes the threat.*

NO "LIMITED USE" FOR WISCONSIN'S LAKESHORE

Michael T. Llewelyn, Chief,
Water Resources Planing and Policy Section

Jeanne Christie, Planning Analyst

The International Joint Commission, formed by a treaty between the US and Canada, has provided the framework for a "Remedial Action Plan" that will clean up Lower Green Bay and a few other heavily polluted spots along the Great Lakes shoreline in Wisconsin.

On the world scale, freshwater lakes are uncommon, numerous only in areas covered by glaciers of the last ice age. The Great Lakes are even more uncommon because of their size—the largest freshwater lake system on the planet. Not only are they our international boundary with Canada, they are also essentially one large ecosystem. Pollution from one state or province can impact the entire watershed. Therefore, management must be mutually shared and a commitment given by all states and provinces,to protect and rehabilitate this uncommon resource.

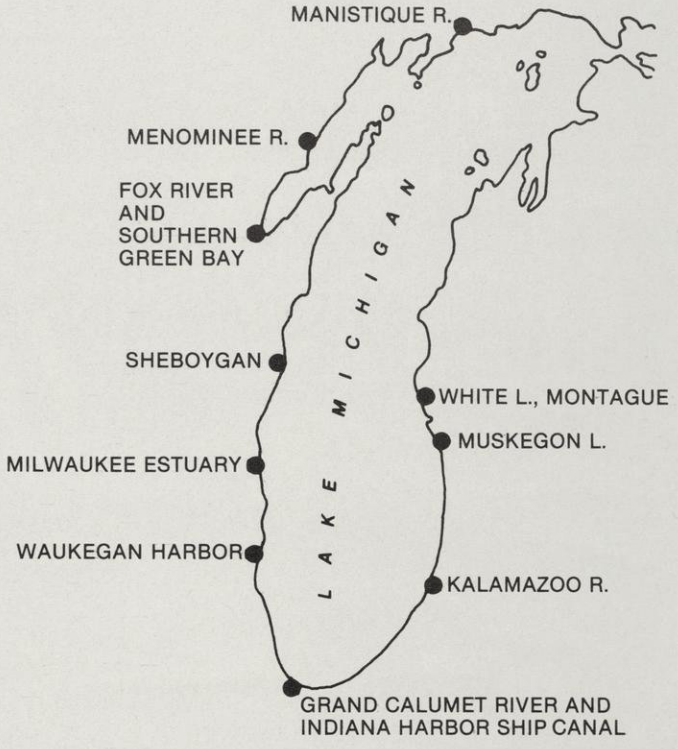
Since the Great Lakes are controlled by Canada and the United States, actions of the two need to be coordinated if water quality is to be protected. Recognizing this, in 1909, they signed a Boundary Waters Treaty which created an International Joint Commission (IJC) to settle boundary water disputes and identify common problems for resolution. Later, in 1972, responding to concern about pollution, the US and Canada went further and entered into a Great Lakes Water Quality Agreement. The state of Wisconsin has certain responsibilities under this agreement. They include reduction of industrial and municipal pollution, programs to prevent toxics from reaching the lakes and reduction of phosphorous discharges to cut down on nuisance algae and overfertilization. Wisconsin is also obligated to control pollution that enters from the air, from nonpoint sources and from inplace sediment. And we have agreed to establish monitoring programs to record water quality changes.

In 1987, the Water Quality Agreement will come up for review by the International Joint Commission. When it does, Wisconsin will continue to support the elimination of toxic discharges to the Great Lakes from all sources. We will also work to wipe out references to the so-called "limited use zones," which are near-shore harbor areas originally thought too severely degraded to ever rehabilitate. Instead, Wisconsin wants to institute "remedial action plans" of the kind used in Green Bay, Milwaukee, Sheboygan, and eventually Marinette. The goal of these plans is to restore degraded near-shore areas to beneficial uses like water supply, swimming, fishing, and wildlife habitat.

At the review, Wisconsin will also oppose allowing any Great Lakes state or Canadian province to lower water quality through lenient discharge requirements designed to attract industry. Wisconsin wants uniform discharge criteria for new industries throughout the system. These positions are largely due to strong public support for the Water Quality Agreement. This agreement was expressed at four public hearings conducted by DNR.

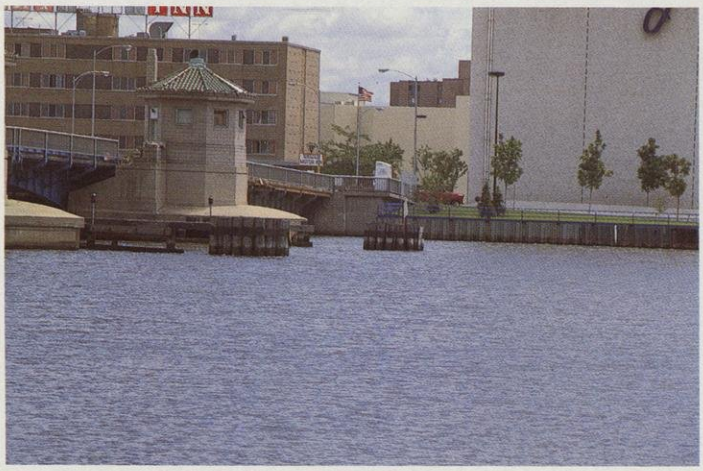
REMEDIAL ACTION PLANS

Over the years, pollution in the Great Lakes has stirred increasing concern at the International Joint Commission (IJC). The most serious problems were generally found at harbors, river mouths, and connecting channels where intensive urbanization, agricultural and industrial use occurred. These spots were first recognized and listed by the IJC's Water Quality Board in 1973. Since then, various sites have been added and subtracted. Many of these so-called Areas of Concern stayed on the list because solving one problem exposed another. Often, reducing conventional pollutants from industrial and municipal sources restored fish and wildlife to once grossly polluted areas only to reveal toxic substances stored in the sediments below. Fish consumption advisories were issued in these areas to prevent humans from eating toxic substances moving through the newly reestablished food chain.



Areas of concern on Lake Michigan threatened by toxics. Proposals to write off these places as limited use areas have been rejected. Cleanup projects are planned or underway.

It became apparent that in some areas of the Great Lakes a cutback in pollution by municipalities and industry didn't solve the problems. Therefore, the Water Quality Board recommended Remedial Action Plans for these locations based on an "ecosystem approach." The basic idea is that an Area of Concern must be viewed "in total" to develop solutions. And any implementation plan has to describe how local, state, and federal government, private industry, nonprofit organizations, and individuals can work together to solve the problems.



A remedial action program is cleaning up Lower Green Bay. Most tangible result so far has been recovery of the walleye fishery. A citizens group, representing nearly every local interest, helps guide the clean water effort.

St. Louis harbor at Duluth-Superior is another area of clean water concern. Dredges like these can stir up toxics from bottom sediment. Minnesota has a remedial action program underway here.

In Wisconsin, there are four Areas of Concern: Lower Green Bay, and the harbors at Milwaukee, Sheboygan, and Marinette. The Green Bay Remedial Action Plan (RAP) will be completed in 1987 and soon after, the ones for Sheboygan and Milwaukee. Marinette will be finished in '88 or '89.

Despite international boundaries, the IJC and other institutions, it takes the citizens of a community working together to make a RAP work.

What's been happening with the Lower Green Bay Remedial Action plan is a case in point. Four technical advisory committees (TACs) have been established there to describe the problems, generate alternatives and recommend the best strategies for solution. These ideas were presented to a local Citizens' Advisory Committee and to DNR for review. The technical committtes deal with management of biota and habitat for fish and wildlife, toxic substances, nutrients and eutrophication; and governmental institutions.

Lower Green Bay's problems, described by the technical advisory committees, include toxic substances which have resulted in fish consumption advisories and reproductive difficulty in birds; large amounts of nutrients from rural and urban areas that create slimy, smelly water in summer; and degraded wetland and aquatic areas inhospitable to birds, other animals, and fish. Wildlife that have managed to survive in Lower Green Bay are literally "slumming it."

But the cleanup effort is producing results as industries and municipalities improve their facilities. Perhaps the most visible and remarkable achievement there has been recovery of the walleye fishery in the Lower Fox River and lower bay.

Lately, attention has centered on the Citizens' Advisory Committee. It is made up of 26 local people representing many different interest groups affected by the Remedial Action Plan. They include local government, industry, sport and commercial fishing, the environment, lakeshore property owners, and others. This citizens' group is responsible for bridging a difficult gap—trying first to comprehend technical problems and solutions and then understand how the solutions would affect water quality and local people. Their job is to endorse, change, or reject strategies proposed by the technical advisory committees. DNR will listen, then use ideas and concerns expressed by the citizen committee to come up with a final plan.

Citizen Advisory Committee Chairman Jake Rose described the process. "It's trying to put all the pieces in one place and see what we have. It's mind boggling for a lot of us, especially me. I don't know all the scientific terms. I think the timetable is a little tough. There is a lot of pressure on us. (However,) the committee is working very well. They're trying."

The Mayor of Green Bay, Sam Halloin, also a CAC member, stated his concerns. "In the long run, we want swimmable and fishable water. Obviously, I'm concerned a compromise is made to retain jobs and retain water quality. I'm sure it will be a long process. It's a matter of making sensible decisions. I'm concerned about how long we are going to continue with studies before making decisions."

However, Halloin was positive about the approach being taken. "I'm the first to admit I've had differences with DNR at times. Under the present Secretary, there is an effort to try to get different entities of the government and DNR together. I think it's showing."

Bruce Robertson, Manager of Environmental Affairs for James River Corporation and an industry representative, especially for the paper companies, agreed. "DNR is getting more public input. They haven't attempted to take on (a project on this scale) before. It's a much better way to do things—looking at the long range rather than short-term goals that might conflict. We're looking at the big picture."

However, putting together a Remedial Action Plan is only the first step. The biggest problem according to Becky Leighton, another citizen member, will be implementation. "We've got to relay information to politicians and the legislature to stress the importance of developing further funding. This is difficult because the issues are so complicated. It's difficult to do in a clear way."

DNR itself is especially dedicated to implementing the plan. Charlie Higgs, DNR Lake Michigan District Director, who is also a member of the Citizens' Advisory Committee says, "I would expect and certainly demand that the items identified in the plan and approved by the Secretary will become a document for us to follow. It's a very important undertaking. I'm looking for a document that not only will guide us, but one we can use when we go to the public to gain support. From a personal aspect I'm interested in seeing clean water and enjoying fishing, boating and swimming. I see these as reasons, both professionally and personally, to do everything I can to try to make the effort successful."

PORTS AND SHIPPING

Oscar Herrera,
Wisconsin Coastal Management Program,
Department of Administration

The story of Wisconsin harbors begins in the late 1650s when French settlers arrived at Chequamegon Bay on Lake Superior. Fur trade was the main economic activity. But in the next century, vast mineral resources were found and by the 1850s, when the first ship lock opened at Sault Ste. Marie, the ports of Superior and Ashland were shipping thousands of tons of iron ore to Pittsburgh steel furnaces. From the mid-1880s to the late 1920s the region was at its peak and iron ore poured out of Wisconsin ports to the eastern steel mills.

The Wisconsin harbors on Lake Michigan began as trading posts. Milwaukee, an Indian term which means "gathering place by the water," was founded during the late 1700s. By the 1860s, commerce and shipping had become the backbone of Milwaukee's economy. Threatened by competition from Chicago, Milwaukee encouraged industrial development and attracted meat packers, brewers and flour mills, but shipping always remained a major economic activity for the city.

Green Bay also first emerged as a trading post, taking advantage of its unique strategic location. It grew as a lumber port when the great pineries were exploited and finally developed a strong industrial base consisting of paper mills, meat packers, cheese factories and other enterprises. Use of the harbor widened as industry expanded and by the early 1900s after the Sturgeon Bay canal opened, Green Bay was handling over a million tons of cargo a year.

▲ ***Commercial shipping is an important economic asset in every port city. For example, at Milwaukee, which is shown here, a study eight years ago found that port activities generated jobs for about 6,000 people and an annual payroll of $112-million.***

◀ ***The Detroit Harbor light near Washington Island in Door County helps guide commercial fishermen, ferries and recreational boaters. Similar navigational aids guide shipping at other locations.***

The ports at Kenosha and Racine were started to provide goods and services for fast-growing Chicago and Milwaukee. But by the mid-1860s, they had developed an efficient water transportation system of their own and solid economic growth began to attract new industry. From 1890 to 1920, the cities' population increased by the thousands. Kenosha and Racine's efficient commercial water transportation system always supported their economic growth.

Today, Wisconsin's 12 commercial ports provide on-site work for hundreds of people, with employment opportunities and benefits that go far beyond Lakes Michigan or Superior. For example, an economic impact study performed by the port of Milwaukee in 1979 showed that 5,825 people were employed directly and indirectly in port activities with payrolls of about $112.6-million. An estimate of similar or greater economic impact can be drawn for Superior, Green Bay and Kenosha.

Farming, the processing industries, the service sector and other parts of the state's economy all feed off the ports. Lately, however, the hard times that have befallen the St. Lawrence Seaway threaten Wisconsin ports. To thrive, they need a new commercial strategy and strong state support in both policy and action.

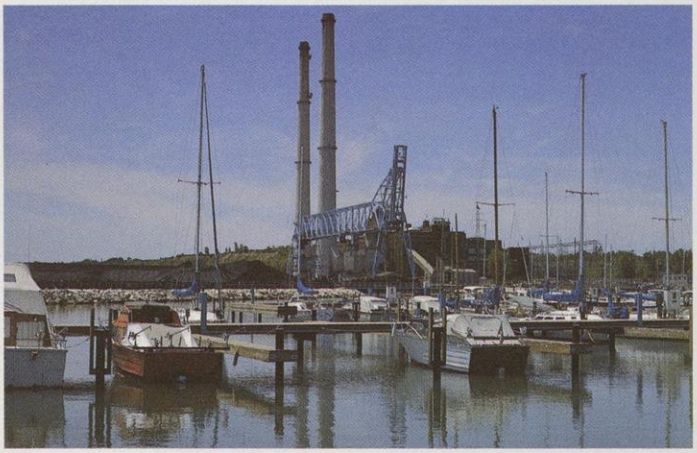
Currently, Wisconsin has commercial ports at Superior, Ashland, Marinette, Green Bay, Sturgeon Bay, Kewaunee, Two Rivers, Manitowoc, Sheboygan, Port Washington, Milwaukee and Kenosha. Some concentrate on shipping bulk products to other Great Lakes ports, while the remainder diversify to include overseas shipments. Tonnage varies considerably: in 1979 about 12,000 tons were handled at Two Rivers, mostly fresh fish, while in the same year, Duluth - Superior handled almost 48 million tons consisting of iron ore and grain for overseas delivery.

Ashland, Port Washington and Sheboygan specialize in coal and gasoline. Manitowoc, Marinette and Sturgeon Bay handle these plus bulk products such as rock, cement and salt. Ports with diversified cargo including international shipping are Superior, Green Bay, Milwaukee and Kenosha. Kewaunee has a larger diversification of products shipped through a car-rail ferry to Ludington, Michigan. Two Rivers concentrates on commercial fishing, the most important port in Wisconsin of this kind. Racine, which once was a commercial port, is undergoing change. Taking advantage of its port facilities, it is evolving into a large and modern recreational marina.

The current downturn in Great Lakes commercial shipping is affected by both international and domestic factors. Basically, demand from foreign countries for goods traditionally shipped through the Great Lakes is down. At home, the Seaway is disadvantaged because of competition from other means of bulk transport, cargo preference laws, and intrinsic problems like locks, tolls, and freeze-ups.

Until now, the Food for Peace program helped sustain grain shipments through Wisconsin ports. Officially called "The Agricultural Trade Development and Assistance Act of 1954," it feeds thousands of hungry people in less developed countries by sending food. At the same time, it helps dispose of surplus US agricultural products. New cargo preference laws, however, now jeopardize this activity for Wisconsin. The law requires that 50%, and up to 75% in the near future, of Food for Peace must be shipped in American vessels. Unfortunately, most ships working the Great

The Superior Midwest Energy Terminal was built especially to transhipcoal and other products throughout the US.



Coal and gasoline are shipped at Port Washington, which also emphasizes recreational boating.

Commerical shipping at Green Bay backstops the city's paper and other industries.

Lakes are foreign and, because of this, a source of income for Wisconsin agribusinesses, the maritime industry, labor and port groups may dry up. It is essential that these cargo preference laws be changed if this economic network is to remain viable in Wisconsin.

Aside from Food for Peace, other grain exports traditionally shipped through the Seaway are down because grain production capacity by former importers is up. Wisconsin's ports suffer the consequences. At the same time, railroads have become increasingly serious competition. They offer convenient bulk shipment of many products plus the asset of speed. Other disadvantages of Great Lakes shipping include locks of limited size which restrict the length of vessels, a lack of container shipping facilities in the system's ports and the annual lake freeze up, which shortens the season.

Congress has recently instituted a system of user fees and cost sharing for all major water-related activities, including the water transportation system as a means of eliminating federal subsidies. Wisconsin will insist that in the interest of fairness this new user fee policy be applied uniformly to all states, nationwide, which deal with issues and projects related to water resources.

The Seaway and Wisconsin's ports now face a whole new economic reality. To stay in business, they must design and implement a new strategy to confront the current economic situation. Maritime trade specialists say the new strategy must contain three basic elements: 1) Implement policies which lead to more service specialization, 2) Eliminate wasteful competition among Great Lakes ports, and 3) Improve regional planning and cooperation among those interests serving the maritime trade.

Waterborne transportation in Wisconsin is not only a tradition which began with the colonization of the state—not only the grass roots for its economic development — but also the means of support and way of life for thousands of residents in all sectors of the economy. If it thrives, all of us do.

TOXIC SHOCK

Bruce J. Baker,
Director,
Bureau of Water Resources Management

The Great Lakes have toxic chemicals in them nobody's even found yet. For your health's sake, to postpone action while we look for more makes no sense. The cleanup has to start now.

Toxics have invaded the Great Lakes system and pose a threat to all who use its waters. They are a problem everyone agrees must be solved. But at the same time it is very difficult to find agreement on how to do it or sometimes to even agree on what the problem is. Numerous studies have tried to define the dimensions of toxic problems in the Great Lakes. With every new piece of information comes a few answers along with a multitude of new questions. After all the effort put into understanding the toxic threat, it's hard to accept the fact that more remains unknown than known.

What do we know?

Several years of fish sampling have shown presence of the common toxic substance PCB in the Great Lakes. Further investigations have identified PCBs in disturbing concentrations in harbor sediments and tributary streams near places like Green Bay, Milwaukee, and Sheboygan. Even though PCBs are the predominant toxic in the Great Lakes ecosystem, they are by no means the only one present. Many others have been identified.

What is the quantity of toxic substances in the Great Lakes?

The fact that we are finding more and more of them is partly a function of enhanced capability for analysis. Over time, laboratory techniques have regularly improved, allowing detection of extremely small amounts. It is now routine to quantify chemicals as "parts per trillion" — one part of chemical to one trillion parts of water or sediment. Not only are we finding more and more, the more we look the more we find. And we're looking a lot now.

Because advancements in analysis have evolved in the relatively recent past, not enough historical data exists to allow a comprehensive trend analysis. Therefore, the fate of toxic substances in the lakes — what happens to them — is not totally understood. Are they less prevalent now than prior to the cleanup efforts in the 1970s? Although we know PCB levels in the Great Lakes have decreased, we don't know whether the total toxics problem is better or worse.

A more important question may be: **What does the presence of toxic substances in the lakes mean?**

Most people are aware that health advisories exist for consumption of Great Lakes fish. But many are skeptical. Toxics in fish are colorless and odorless, which makes the problem seem remote. Furthermore, the health impacts are chronic or long-term, not acute or sudden. The complexity of such interactions and the obstacles associated with obtaining information make it extremely difficult to demonstrate the precise affect on humans. Neither is there good information on whether greater health risks occur when fish contain a combination of toxic substances. Not only are we unsure of the degree of contamination in the Great Lakes, we don't know what the human health risk is either.

Despite the lack of hard scientific proof about harmful effects of Great Lakes toxics, there is a basis for real concern. For example, some scientists think that deformities found in certain Green Bay birds and the occurrence of fish tumors are shocking evidence of harm caused by toxics. A strong case can be made for prevention and cleanup. At a minimum, most people believe we should strive to improve water quality to the point where fish consumption advisories can be cancelled. It only makes good sense to eliminate toxic substances from the environment, particularly the food chain.

The next question is: **What should be done to prevent and clean up the problem?**

Clearly, a vigorous effort should be made to eliminate or minimize introduction of toxics to the Great Lakes. Past discharges have demonstrated how these substances can react to prevail in the ecosystem. Recent discussions among the Great Lakes states and the development of a toxic substance control agreement can help reduce discharges. In addition to toxics from municipalities and industry, we need to look at other sources that result from our way of life. Ultimate control of toxics may require some changes in consumer products and lifestyles.

Even after all sources are controlled, we are still faced with the toxic substances that were already in the environment before controls were initiated. Contaminated sediment will still cause fish advisories. In-place pollutants have not received enough attention over the past years of cleanup effort. Some scientists think if nothing is done about sediments, any improvement in water quality is far in the future. And cleanup projects must continually recognize that just moving the sediment inland to contaminate other water resources is no solution. But the fact is that a real Great Lakes toxic cleanup of the quality everyone desires will not be possible without a substantial commitment to managing in-place pollutants.

Toxics are the most important Great Lakes water quality issue we face, even if its dimensions aren't fully known. The threat to health may be impossible to quantify, but there is very good reason to be concerned. Best way to attack the problem in areas of most concern is through the so-called remedial action plan (see page 18) which takes an entire ecosystem approach. It is only through comprehensive action of this type on a broad front that the problem of toxic substances in the Great Lakes can be solved.

TOXICS IN THE GREAT LAKES

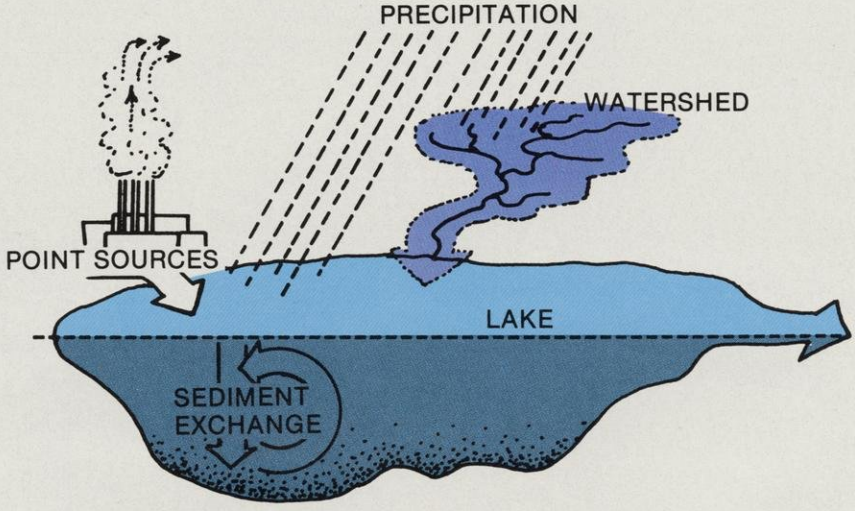
Name	Use	Probable Source	Found In	Characteristics/Health Effects
Ammonia	By-product of municipal sewage wastewater	Municipal wastewater discharge.	Lower Fox River and Green Bay	Removes dissolved oxygen. Kills fish.
Asbestos in taconite tailings	By-product of iron ore mining	By-product of iron ore mining. Secured on-land disposal ordered by court April 1980.	Lake Superior	Airborne effects may include asbestosis, lung cancer; water-borne effects not known, but cancer is implied.
DDT, chlordane, dieldrin, aldrin	Pesticides used widely in Great Lakes region to control insects and rodents. DDT banned in 1971; others now restricted.	Residues from previous widespread use; runoff from agricultural and forested areas, leaching from improper waste disposal sites; and atmospheric deposition.	All five Great Lakes	Bioaccumulation in fish, wildlife and humans. Persistent in the environment. Long-range effects can include reproductive disorders in wildlife; suspected cause of cancer in humans.
HCB (hexachlorobenzene) HCBD (hexachlorobutadiene)	Pesticides, wood preservatives, fungicides; by-products of chloralkali industry; used in production of synthetic rubber.	Industrial discharges, agricultural runoff, disposal of waste products.	Lake Erie	Bioaccumulation in fish, wildlife and humans. May produce skin rash, headache and nausea. Suspected cause of cancer.
Heavy metals (mercury, lead, arsenic, cadmium, copper, chromium, iron, selenium and zinc)	Wide variety of industrial uses - from antiknock agent in gasoline to paints, pipes pesticides, glass and electroplating.	Industrial discharges, medical profession wastes via municipal discharges, agricultural runoff, disposal of waste products; mine tailings; urban non-point sources.	Lake Superior, Lake Ontario, Lake Huron, and Lake Erie	Excessive levels of heavy metals bioaccumulate in fish and wildlife. Human consumption of contaminated food may cause a variety of health problems. Mercury can cause brain damage, birth defects. Lead can cause anemia, fatigue, irreversible brain damage, especially in children. Cadmium can cause kidney damage, metabolic disturbances. Arsenic can cause damage to the liver, kidney, digestive system, bone marrow; suspected cause of cancer in humans. Copper, chromium, iron, selenium and zinc are toxic to fish.
Mirex	Insecticide used to control fire ants; flame retardant; plasticizer.	Was produced, processed in Great Lakes region until ban in 1975; spills.	Buffalo, Niagara Rivers; Lake Ontario	Bioaccumulation in fish, wildlife and humans. Persistent in the environment. Suspected cause of cancer in humans.
PAHs (polyaromatic hydrocarbons)	Variety of industrial uses	Industrial oil and grease dischargers; by-product of all types of combustion; urban nonpoint sources; smelting.	All five Great Lakes	Persistent in the environment. Can induce cancer and cause chromosome damage in fish, wildlife and humans.
PBBs (polybrominated biphenyls)	Fire retardant	Industrial discharges	Lake Huron	Bioaccumulation in fish, wildlife and humans. Can cause birth defects and possibly cancer in laboratory animals.
PCBs (polychlorinated biphenyls)	Insulation for electrical capacitors, transformers; plasticizer, carbonless copy paper, wide industrial use. Total ban except by special EPA, permit in July 1979	Industrial discharges, municipal sewage treatment plant discharges, harbor sediments, low-temperature incineration of wastes; atmospheric deposition.	All five Great Lakes	Bioaccumulation in fish, wildlife and humans. Persistent in the environment. Test monkeys developed reproductive failures, skin and gastrointestinal disorders. Probable human carcinogen.
Phenols	Usually found in conjunction with other more complex organic compounds.	By-product of petroleum, paper products manufacture, industrial wastewater, discharges refineries and spills.	All five Great Lakes	Can cause taste and odor problems in drinking water. Toxic to fish.
Dioxins, Furans	No known technical use	Microcontaminants in chlorophenols and banned pesticide 2,4,5,-T. Also bleach kraft paper process and atmospheric deposition.	All five Great Lakes	Bioaccumulation in fish. Probable human carcinogen. Cause of birth defects and reproductive disorders in wildlife.

CONTROLLING LAKE MICHIGAN'S NONPOINT SOURCE POLLUTION*

Craig V. Walters,
Water Quality Planning Analyst

More than half of the state's priority watershed projects are at work in the nonpoint source cleanup of Lake Michigan.

MAJOR INTERACTIONS IN GREAT LAKES SYSTEM



Major sources of pollution in the Great Lakes system. A large amount comes from nonpoint sources through the hundreds of watersheds that feed the lakes.

Nonpoint source pollutants are those carried by runoff water from the land surface. Although difficult to locate and point out, their effects on the waters which receive the pollutants often are not. It's estimated that more than 50% of the phosphorus that enters Lake Michigan comes from nonpoint sources. In addition, toxic materials, sediment and a host of other pollutants are carried into the Great Lakes by rainfall and snowmelt.

Nonpoint impacts are most visible near the shore on Lake Michigan. On Lake Superior the impacts are minimal. Defined as the shallow area that extends one-half to three miles into the main body of the lake, the near-shore area acts like a lake within a lake. Here the bad effects of nonpoint pollutants are manifest more rapidly than in the lake as a whole. The most obvious results are filling of harbors with sediment, nuisance algae blooms, poor water clarity, and the presence of toxic materials in fish and sediment.

Ever since 1979, work has been underway to reduce this threat to the Great Lakes through the Wisconsin Nonpoint Source Water Pollution Abatement Program. Administered by DNR's Bureau of Water Resources Management, the program selects critical drainage areas called priority watersheds for intensive evaluation.

Nonpoint pollutants hurt Lakes Michigan and Superior in many ways. For instance, toxic materials limit the trout and salmon fishery because contaminated fish are unsafe to eat or must be consumed in limited quantity. Although not all toxics are generated by nonpoint sources, research shows significant amounts are washed off streets, rooftops, and industrial yards. Sedimentation of harbors is a common Great Lakes problem. Much of this sediment is derived from eroding croplands and streambanks. Beach closings and fish kills are often the result of manure runoff from barnyards, feedlots, and cropland fields. Cattle allowed to enter streams and lakes destroy fish habitat and increase streambank erosion. All of these sources can be managed to reduce their contribution of nonpoint pollution.

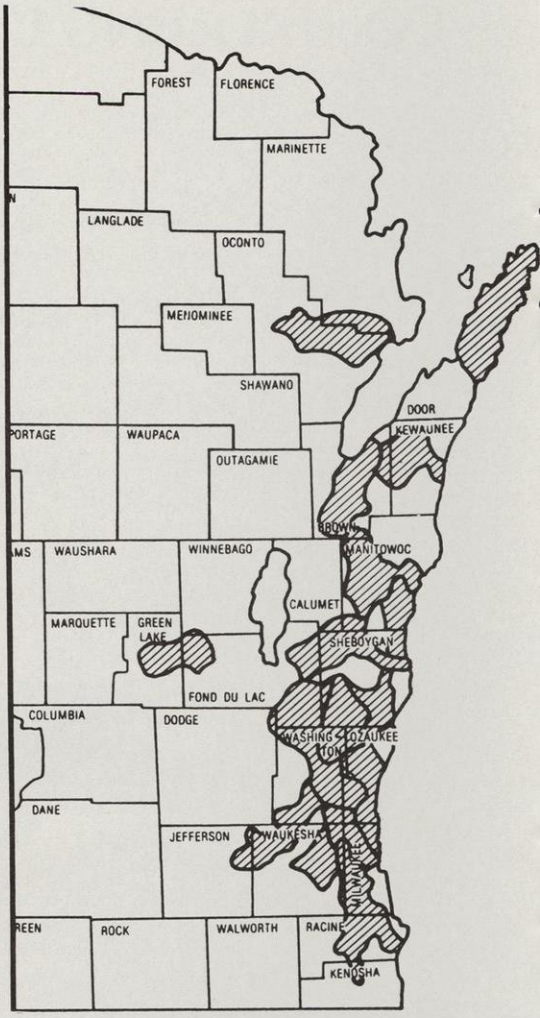
Wisconsin's Nonpoint Source Pollution Abatement Program is designed to achieve maximum water resource improvement or protection per dollar spent. On Lake Michigan, this means that pollutants from Wisconsin's 16 priority watershed projects should be reduced by 30 to 40%.

These 16 projects encompass diverse regions of the state. They range from the heavily urbanized Menomonee River watershed in Milwaukee to watersheds such as the Sevenmile-Silver Creek project in Manitowoc and Sheboygan counties where 90% is farmland. Similarly, the practices required for control are also different. In rural areas, practices will reduce soil erosion and transport of sediment and attached pollutants as well as prevent manure and other animal wastes from entering waterbodies. In urban areas, different techniques will be used to cut back pollutants deposited on the land surface. Others will delay stormwater runoff to let pollutants settle out.

Projects proceed in two phases. The first is watershed assessment, a detailed inventory of both current and potential water resource conditions and the location and magnitude of

*For more detailed information on Wisconsin's Nonpoint Source Pollution Abatement Program see the special report in Wisconsin Natural Resources magazine for January-February 1986.

Silt and pollutants pour out of the Milwaukee River into Lake Michigan after a rainstorm. *Photo by Roger Bannerman*



Wisconsin's priority watershed cleanup projects that will reduce the pollution load in Lake Michigan.

nonpoint sources. Using this information, realistic objectives are set and a pollution control strategy devised to achieve them. For example, a typical objective might be protection of current nearshore water quality adjacent to the watershed so that recreational and other beneficial uses can continue. To achieve this, a reduction in phosphorus and sediment from the watershed might be necessary. The assessment might then determine that this can best be achieved through a combination of controls such as reduction of cropland erosion, eliminating critical barnyard runoff and detention of urban storm water. Nonpoint source assessments also provide information needed to prioritize sources to determine which should be attacked first.

Following watershed assessment is the implementation phase. This is carried out by local management agencies — cities, counties and villages within the watershed. They are responsible for fulfilling recommendations in the watershed assessment. DNR shares the cost of required pollution controls and supports other efforts that will successfully implement the project.

Approximately 50% of all Wisconsin's priority watershed projects are in Lake Michigan's drainage area and have specific objectives relating to the lake's water quality. The results of these projects will make a significant contribution to the overall health of the Great Lakes.

LAND USES MOST LIKELY TO PRODUCE SIGNIFICANT NONPOINT SOURCE POLLUTION

LAND USE	POLLUTANT
Urban:	
Industrial	Toxics, oil & grease, phosphorus
Commercial	Toxics, phosphorus
Residential	Phosphorus
Construction	Sediment, phosphorus
Rural:	
Cropland	Sediment, phosphorus, toxics
Barnyards	Phosphorus, bacteria, organics
Eroding Streambanks	Sediment

LAKE MICHIGAN IS ALIVE WITH DUCKS

William E. Ishmael,
Assistant Wildlife Manager,
Pike Lake State Park

More birds than you can imagine, of every species, use the west shore.

Bufflehead. Numerous waterfowl including this one fly the lakes. So do many other birds. At Cedar Grove, south of Sheboygan, 117 different species have been banded in the past 30 years. *Photo by Herbert Lange*

Lake Michigan has been called the greatest freshwater fishing hole in the entire world, yet few people realize that the shoreline and outlying waters are a veritable menagerie of non-aquatic wildlife. This is especially true of the Wisconsin shore.

Not only do the bays, harbors and open waters provide important feeding and resting areas for migratory and wintering waterfowl but the shoreline itself acts as a migration corridor for a wide variety of raptors and songbirds. The lake and shoreline seem to act as a migration "funnel" between northern breeding sites and southern wintering areas.

Among the waterfowl that fly the lake are oldsquaws, common and red-breasted mergansers, greater and lesser scaup, ruddy ducks, common goldeneye, and bufflehead. Canada geese often home in on the shoreline before swinging south to Illinois and Kentucky. Occasionally, even "sea ducks" such as the surf scoter or white-winged scoter and tundra swans stop off enroute to northern Canada or the mid-Atlantic coast.

Highest waterfowl use comes in fall when great numbers of ducks and geese head south from the Canadian breeding grounds and local birds gather in staging areas to prepare for departure. Bufflehead, greater scaup, and ruddy ducks that winter on the Atlantic coast cross Lake Michigan in migration. Its protected bays and harbors offer a welcome rest area midway in their journey. Lesser scaup, common mergansers, and Canada geese tend to follow the shoreline. In November, rafts of scaup numbering over 3,000 are often seen offshore at Sheboygan and Milwaukee. Hawks, owls, and eagles also migrate in autumn and many ride the thermals along the lakeshore on their way south. Kestrels and sharp-shins tend to leave first, in late summer, followed by ospreys, falcons, and broad-winged hawks in September. Finally the redtails, roughlegs, goshawks, and eagles travel through. At Cedar Grove, south of Sheboygan, more than 32,000 birds of 117 different species, have been banded in the past 30 years. In 1985 alone, 732 raptors and 71 owls were banded there.

Although fewer species are present in winter, the population of oldsquaws may number 12,000 and the bulk of these are found off the Milwaukee shore. These birds prefer deep water and at times form huge flocks several miles out. Because of this they are not as commonly seen as overwintering red-breasted mergansers and goldeneye that frequent shallow bays, river mouths, and power plant outlets.

The return to Lake Michigan starts in March. Oldsquaws may remain well into April before departing for arctic nesting grounds.

By early summer the migrants are gone and resident waterfowl move inland to nest. Now, songbirds, particularly grassland nesting species such as bobolinks and dickcissels, are common on the remnant prairies and grassy areas of the shoreline. As summer progresses, resident broods of ducks and geese again show up in the bays and harbors.

This cycle repeats itself annually off the Wisconsin shore to continually remind us of how lucky we are to have such a resource in "our own backyard."

WHERE TO SEE BIRDS NEAR GREEN BAY

Jim Raber,
DNR, Wildlife Staff Specialist

Green Bay offers excellent opportunities to see a wide variety of aquatic birds at ice-out in April, and again during the migrations in October and November.

Observation points are numerous from the city of Green Bay along the west shore of the bay, north to Marinette. One can use roads which dead end at the bay, and observe from shore, or watch from a boat or canoe that can be put in at one of the several launching sites along the west shore. A good pair of binoculars works well, but a spotting scope is best.

One of the best places is on the inside of Longtail Point, or the north end of Dead Horse Bay. Access there can be gained at a small DNR launching site off Harbor Lights Road north of Green Bay.

If you're not inclined to rough it, literally hundreds of ducks and giant Canada geese can be seen at the Green Bay Wildlife Sanctuary, a city park, or Barkhausen Preserve, a county park. The Sanctuary is located on the east side of the Fox River at the south end of the bay, while Barkhausen is several miles north of Green Bay along the west shore.

LAKESHORE BALD EAGLES FAIL TO REPRODUCE

Charlene M. Gieck,
Bureau of Endangered Resources

Wisconsin's bald eagle population has been increasing ever since the first breeding survey in 1962. In 1985, 214 active territories were found concentrated in the northern third of the state. But while there has been successful inland reproduction in the four counties that edge the south shore of Lake Superior—Bayfield, Ashland, Douglas and Iron—shoreline nest sites have had continued reproductive failure. In 1985, only five territories (down from nine in 1984) were occupied along the mainland shore and on the Apostle Islands. Three others showed some degree of activity. Only four young were produced in 1985. There were 13 in 1984.

Eagle reproductive failure appears to be associated with environmental contaminants. Eggs collected from the south shore of Lake Superior between 1976 and 1982 show higher levels of organochlorine pesticides, PCBs, and mercury than those from the remainder of the state. Studies also found young bald eagles that died mysteriously in the nest prior to fledging. Carcasses and addled eggs have been collected for analysis in an effort to determine the cause. Feeding behavior and commonly consumed food items of Apostle Island eagles are also being studied.

Further investigation of Lake Superior eagles is necessary. The DNR bureaus of Endangered Resources, Research, and Wildlife Management along with the University System, US Park Service, Forest Service and Fish and Wildlife Service will be working together to monitor the status of this population.

LAKE MICHIGAN: A WORLD CLASS FISHBOWL

Lee T. Kernen, Chief,
Great Lakes and Boundary Waters

"The demand for all kinds of fish continues to increase and it is impossible to meet it."

The quotation above about Lake Michigan doesn't surprise a lot of people. But when it was written does — 84 years ago on December 30, 1902. The author was Wisconsin Superintendent of Fisheries James Nevin, and he was speaking only of commercial fishing! Imagine if he were here today!

Concern over fishing on Lake Michigan goes back a long way. Declines in the commercial catch of whitefish and lake trout prompted the construction of a temporary fish hatchery in the engine house of the Milwaukee Water Works in 1875. Soon after, size limits were placed on both fish and nets, and in 1885 the Governor appointed three special wardens to supervise the Great Lakes fishery. All the rules and regulations for the lakes, then and now, stem from an obvious conclusion borne out by experience worldwide: that people can easily overfish any water — even an ocean. Most early regulations protected fish by making it more difficult to catch them — they closed the season, required a certain mesh net or imposed a size limit. In the 1980s we still need some of these rules, but now another issue has arisen. We know that fish production in Lake Michigan is finite — that it can produce only so much. But who should catch the fish?

Historically, improvements in commercial fishing gear and boats contributed to a steady decline in valuable species — whitefish, lake trout, herring, perch and chubs. The sport fishery was mostly limited to perch caught off city docks and piers. Few boats were used.

Disaster came when exotic species like smelt, sea lamprey and alewives entered Lake Michigan. The lamprey finished off what overfishing had started. By 1953 lake trout had vanished. Soon the smallest chub of all, the bloater, so named because it "puffs up" when caught in gill nets, exploded in numbers. So too, did the second invader from the Atlantic, the alewife. By the 1960s, alewife so dominated Lake Michigan that harvesting them commercially by trawler for animal feed only scratched the surface.

A better way to restore balance to Lake Michigan's beleaguered fisheries was to stock trout and salmon to prey on the hordes of alewife. Wisconsin's modern Lake Michigan fish management program began in 1963 when 9,000 rainbows were released in a Door County tributary stream. Lake trout rehabilitation, coordinated by the Great Lakes Fishery Commission, began in 1965. From then on, an average of one million federally-produced lake trout were stocked annually in Wisconsin waters. Stocking was to continue under a commercial fishing ban until natural reproduction took over.

In 1966, Michigan brought coho and chinook salmon—Pacific Ocean predators that occupy the same habitat as alewife—to Lake Michigan. Wisconsin coho stocking began in 1968, and chinook in 1969. By the late 1970s, Wisconsin was stocking about two million chinook and a half million coho a year.

This innovative stocking program not only succeeded in controlling alewife, but also gave birth to a spectacular

DID YOU KNOW?

That chinook salmon are the best bargain in fish management. They cost only 2 1/2¢ each to raise and all two-plus million stocked in Lake Michigan cost only $60,000. Over 200 pounds of chinook are caught for each pound stocked.

That the relatively tiny but flavorful perch far outnumber trout and salmon in angler's coolers on Lake Michigan.

That walleye are making such a strong comeback in Green Bay that 30,000 were caught by sport anglers in the Fox River below the DePere Dam in 1985.

That sport anglers catch over 5-million pounds of trout and salmon each year from the Wisconsin waters of Lake Michigan — twice the amount of lake trout taken by the commercial fishery 50 years ago.

That some Great Lakes trout and salmon migrate between lakes. Finclipped coho caught off Racine in 1985 were originally stocked at Marquette Harbor on Lake Superior in 1984.

That although a contaminant problem still exists in Lake Michigan, in 1985 fish were the "cleanest" since testing began. Most trout and salmon contain only a quarter of the PCBs they did eight years ago.

That even before the Department required it, smaller, "low profile" nets were used voluntarily by commercial perch boats in Southern Lake Michigan to avoid trout and salmon.

That the main commercial species including whitefish, chubs, perch and alewives all reproduce well enough to sustain their populations without stocking, if adult fish are given adequate protection.

That much of the information DNR needs for management purposes is obtained by riding along on commercial fishing boats and observing and measuring their catch.

trout and salmon sport fishery that attracts anglers from throughout the world.

Lake Michigan now has a much more "balanced" fishery than 20 years ago. Stocked trout and salmon thrive. Alewife are much reduced. Yellow perch are making a strong comeback both in the lake proper and in Green Bay. Lake trout are abundant, but not yet reproducing by themselves and the prospects are not good. Chemical contaminants are decreasing but still remain a problem in the larger, fatty fish.

Today the 350,000 Lake Michigan sport anglers are a heterogenous mix of pier, shore, and stream anglers and trollers who charter, moor or trailer their boats. They catch 650,000 trout and salmon a year or about one out of every 10 fish stocked.

The economic benefit generated by sport fishing in Lake Michigan is somewhere around $60-million annually. By comparison, DNR spends $1.5-million each year to run the program, of which about $1-million are hatchery costs to raise seven million fish.

The commercial fishery, meanwhile, has survived far better than in most neighboring states and the 175 licensees are faring well in a closely regulated fishery. Their whitefish harvest hovers around one million pounds annually. Both the chub and perch fisheries are controlled by a quota system and both species are increasing in abundance under careful management. Alewives caught by commercial trawlers for pet food comprise the greatest poundage of harvest.

The Lake Michigan fishery is a huge success story, and under a finely-tuned management program should continue to produce great fishing each year. But who should catch the fish?

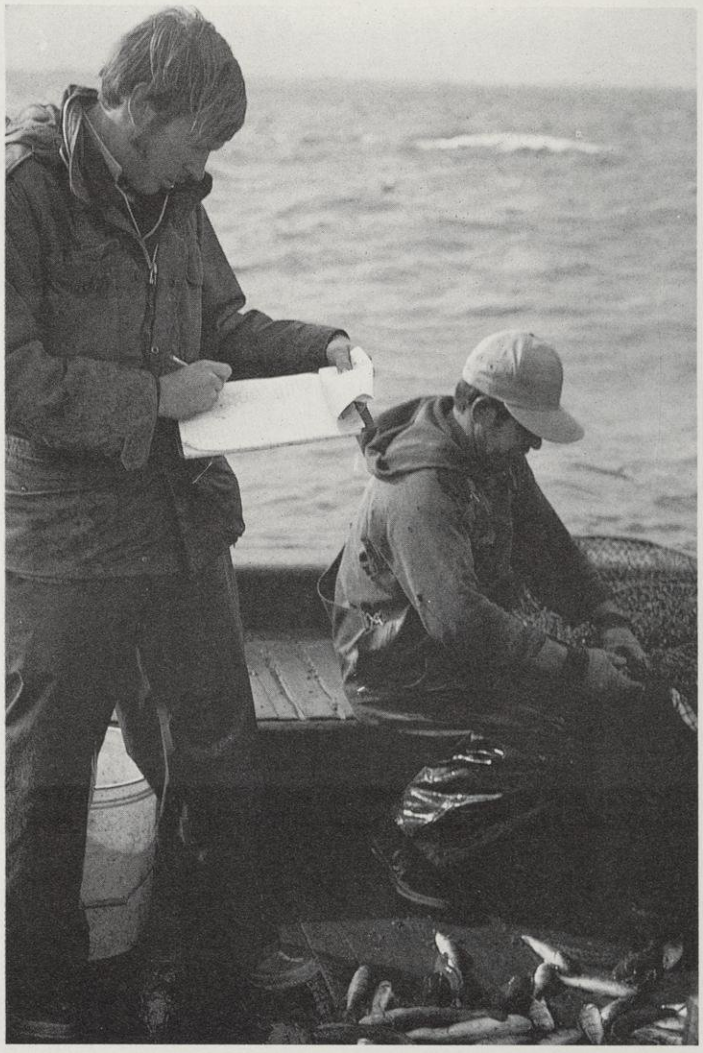
Some are clearly commercial — chubs and whitefish, for instance. These species cannot be adequately harvested by a sport fishery. Others, like smallmouth bass and brown, brook and rainbow trout were long ago classed as sport fish and there is little argument as to who should catch them. But there is a gray area. Both sport and commercial anglers would like to catch lake trout, walleye, northern pike and perch. Historically, the commercial industry relied on these species at certain times, but today some are "off limits" until populations recover. Increasing numbers of sport anglers are demanding that these species be theirs exclusively, or that they be granted a larger share.

And, finally, a third category exists. Alewife, smelt and baby chubs make up the food supply of large predator fish. Because salmon growth rates have dropped in southern Lake Michigan, sport anglers want these fish protected against commercial harvest to provide food for the trout and salmon. Now, cries of "save the alewife!" are heard along Lake Michigan. We've come full circle in a short 20 years!

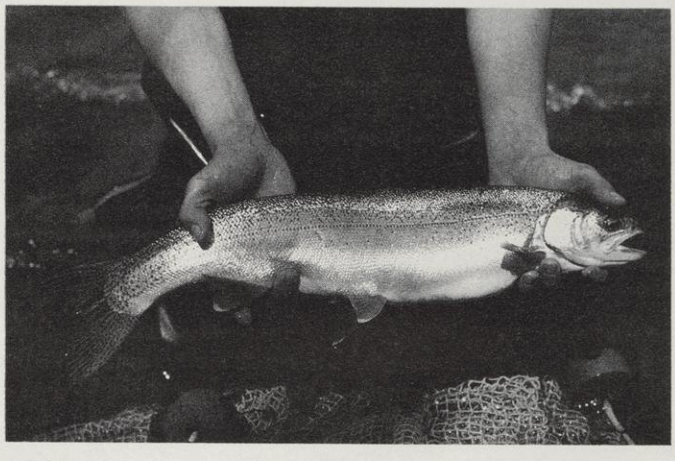
From 1983 to '85, DNR fish managers met with sport and commercial groups to develop a plan that would allocate the Lake Michigan fishery fairly between them. Heated debate was the rule, not the exception. Finally, each group had to give a little, and like any compromise, no one was completely satisfied. The plan that evolved actually lists the number of fish both can catch and offers suggestions to get at problem areas. DNR uses it as a baseline from which to develop new sport and commercial regulations to fine-tune Lake Michigan management.

These regulations implement a decision on Great Lakes fisheries by the Natural Resources Board: "The Board endorses a flexible management system for the protection, development and utilization of the waters and fish populations of the Great Lakes for the maximum public benefit."

This means everyone gets a "slice of the pie." The size of that slice will be determined jointly by the Department working with those who fish the lake. It won't be easy.



Research keeps track of fish stocks. Lake trout are not yet reproducing naturally in Lake Michigan.



A lake run rainbow caught at Pikes Creek.

Facing page: The large fish is a chinook salmon, the other a coho. Anglers catch 650,000 trout and salmon from lake Michigan each year and generate about $60-million in economic benefit.

Lake Superior. Photo by Jean Meyer©

Great Lakes Facts

- Fifteen of Wisconsin's coastal counties contain 40% of the entire population of the state.
- One-fifth of all US manufacturing is located along Great Lakes shores.
- In 1983, 23.7 billion kilowatt hours of hydroelectric power were generated in the US by waters flowing through the Great Lakes. Seventy US power plants use the lakes' water for cooling and for boilers.
- Thirty-five million people live within the Great Lakes basin, and 26 million draw their drinking water from the lakes.
- In 1983, 78.6 million tons of commercial cargo were shipped through the Sault Ste. Marie locks, and 49.7 million tons passed through the St. Lawrence Seaway.
- Water-based recreation and tourism in the region is estimated to generate between $8 billion and $12 billion for the region's economy. Sports fishing alone produces almost $1.5 billion.
- Ninety-eight state parks, 39 provincial parks, and 12 national parks border US and Canadian Great Lakes shores.