



State of the Lake

1992 Governor's Report on Lake Erie

January 1993

*Prepared by the Ohio Lake Erie Office on
behalf of the Ohio Lake Erie Commission*

Acknowledgements

This publication involved the efforts of many dedicated individuals. It is with special appreciation that we extend our thanks to those who helped in writing the articles, providing data, charts, and photographs necessary for the completion of this report. We gratefully acknowledge these individuals below:

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*Outside Cover Photo courtesy of Lauren Popovich
Inside Cover Photo courtesy of Dan Dimitrov*



Lake Erie is not only extremely important to me as Governor of the State of Ohio, but also on a very personal level. Having lived along its southern shore for most of my life, many of my fondest memories both growing up and of my family, are centered on fishing, boating, swimming, and all those activities that Ohioans are privileged to enjoy on the Lake. From these experiences, I realize that these privileges come with great responsibilities: To be good stewards of the Lake so that we can provide clean water and a healthy ecosystem to future generations.

It is no secret that the recent history of Lake Erie is not sterling. Closed beaches, contaminated fish, immense algal blooms, and combustible rivers were not a source for great pride. However, as we celebrate this year, the 20th anniversary of the Clean Water Act, it is appropriate that we really do celebrate. Through the determination and sacrifice of the entire nation, many billions of public and private dollars have been invested in water treatment, environmental remediation, and coastal development throughout the Great Lakes. The result is that today, Lake Erie has come back. An abundant fishery, clean beaches, enhanced shoreline park system, new marinas, and an improved transportation network make the quality of life along our Lake Erie shoreline second to none.

As we take pride in our accomplishments, however, we all know that there remains much to do. We need to ensure that every fish caught in Lake Erie is safe to eat; that every beach is safe for swimming; and every contaminated harbor and river is restored.

Towards these goals, we have made significant progress during the past two years by:

- *Establishing the Ohio Lake Erie Commission and Ohio Lake Erie Office to focus attention and resources on the Lake at the highest levels of state government.*
- *Protecting, restoring, and enhancing approximately 3,800 acres of coastal wetlands.*
- *Completing the first grant cycle of the Lake Erie Protection Fund; awarding over \$450,000 for Lake Erie research.*
- *Completing Stage 1 of the Remedial Action Plan for three of Ohio's Areas of Concern.*
- *Increasing the awareness of Ohio citizens on Lake Erie water quality and coastal management, through the Ohio Coastweeks program.*
- *Creating the "Lake Erie License Plate", which will greatly increase the revenues and ability of the Lake Erie Protection Fund to protect and restore the Lake.*
- *Instituting comprehensive paper and oil recycling programs for the governments of the Great Lakes states.*


I also see a bright future for Lake Erie and the rest of the Great Lakes in 1993. Several new initiatives should come to fruition, including:

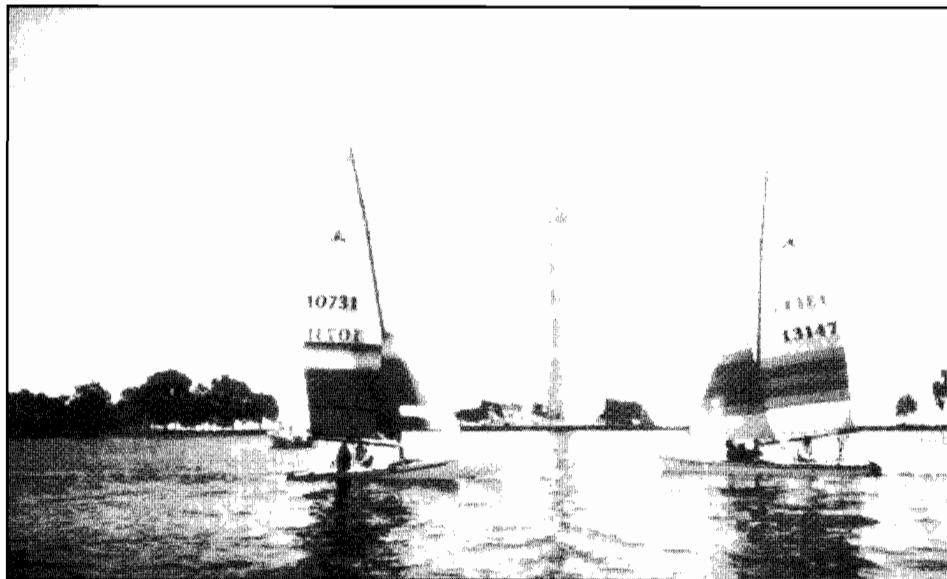
- *Ohio's inclusion into the federal Coastal Zone Management Program.*
- *Completion of standardized fish advisories and testing protocols throughout the Great Lakes.*
- *Implementation of the Great Lakes Water Quality Initiative, which will seek to eliminate pollution in the most effective and efficient manner.*
- *Completion of the Great Lakes Oil Spill Initiative, which will go a long way in preventing accidental spills of petroleum in the Great Lakes.*

As the new chair of the Council of Great Lakes Governors, I look forward to the opportunities that these initiatives hold for the Great Lakes.

Lake Erie has always been Ohio's most valuable natural resource. Today, especially, it serves as a catalyst for rebuilding the economy of northern Ohio. Our challenge is to foster this rebuilding in a manner which does not repeat the mistakes of the past. We have a rare opportunity to pass down to our children a Lake which is cleaner and healthier than what we received. We must not squander that opportunity.

This report, which is a joint effort of the Governor's Office and the Lake Erie Commission, reports on our progress as of January, 1993.


George V. Voinovich
Governor



Lillian Frye



I share Governor Voinovich's love for Lake Erie and his deep commitment to protect and enhance it. Having spent much of my professional life working towards fulfilling the vision of the Clean Water Act, I have witnessed the enormous progress that we have made in restoring our Lake. Yet I understand that considerable effort lies ahead. That effort must be shared by all Ohioans if we are to succeed. We have many difficult challenges before us that will require our working together, if we are to solve these problems.

This past year I have been privileged to serve as chair of the new Ohio Lake Erie Commission. I share this responsibility with the directors of the Ohio Departments of Agriculture, Development, Health, Natural Resources, and Transportation. This Commission provides a forum for directors to focus attention and coordinate policies and programs amongst the various departments of state government. As the meetings are open to the public, it has provided an access for citizens of Ohio to express their opinions concerning Lake Erie. I invite you to take advantage of this opportunity in the next year.

The Commission was very pleased this past year to open and staff the Ohio Lake Erie Office. Through a grant from the Ohio Water Development Authority, this office opened its doors January, 1992 in Toledo. In its first year, the office has already had a definite impact on Lake Erie through administration of the Lake Erie Protection Fund, public education, and representing Ohio's interest throughout the Great Lakes Basin. We believe the future is bright for this office, and will greatly contribute to our efforts to enhance our Great Lake.

The Commission has prepared this report to bring attention to both our accomplishments during the past year, and suggest where our future efforts should be focused. I hope you find the report informative and thought provoking.

A handwritten signature in dark ink, reading "Donald R. Schregardus". The signature is written in a cursive, flowing style.

Donald R. Schregardus

Director, Ohio Environmental Protection Agency
Chair, Ohio Lake Erie Commission

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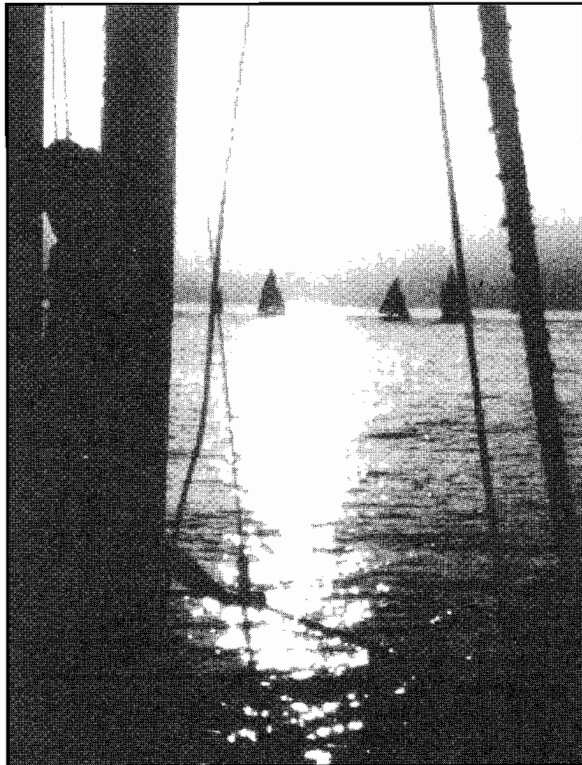
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The first year of business of the Ohio Lake Erie Office has been exciting and encouraging for all of us. It has been a period of finding our niche and how we can be most helpful in serving the people of Ohio. Everywhere we have turned, we have found people who are deeply committed to preserving and enhancing our Great Lake, and want to see our office succeed. To all of you who have helped and encouraged us, we are extremely thankful.

Our goals for the future are straight forward. First, we want to maximize the revenues and professionalism of the Lake Erie Protection Fund (purchase your Lake Erie license plate today!!). Second, we want to expand the Ohio Coastweeks program to dozens of quality events throughout the state that will increase the awareness of all generations of Ohioans of Ohio's most valuable natural resource. Third, we want to implement Ship-Ohio from idea to reality; generating new cargo moving through Ohio's seaports. Finally, we want to realize the full potential of the Ohio Lake Erie Commission; in drawing together government and the public for dialogue and action on Lake Erie's most pressing issues.

I, again, want to thank everyone in the Lake Erie community who have welcomed and helped us. We look forward to a productive 1993.

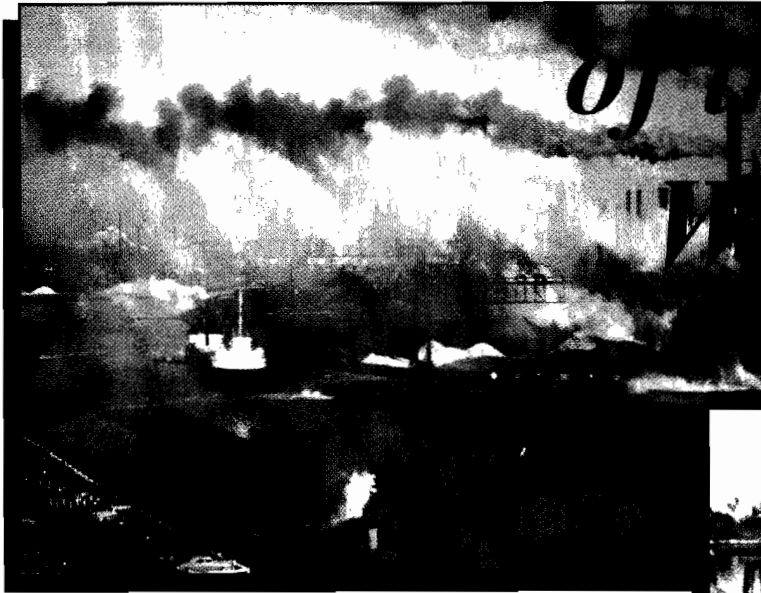


Patti Costin

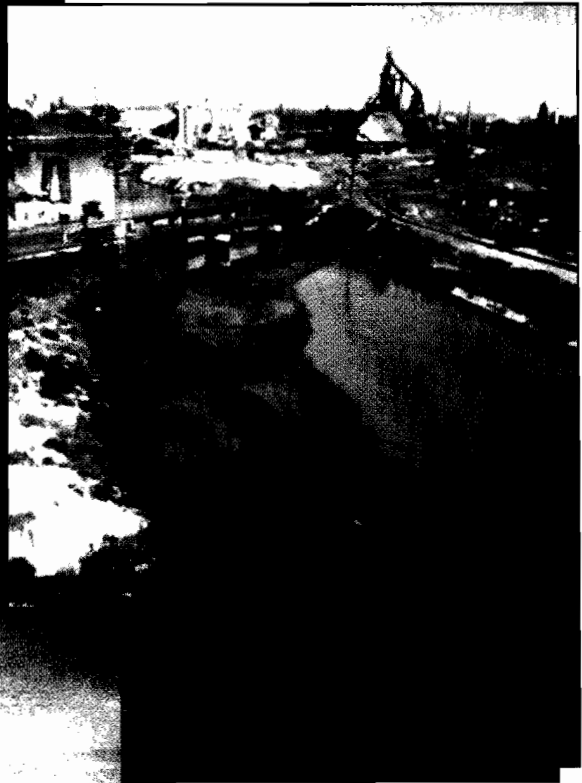
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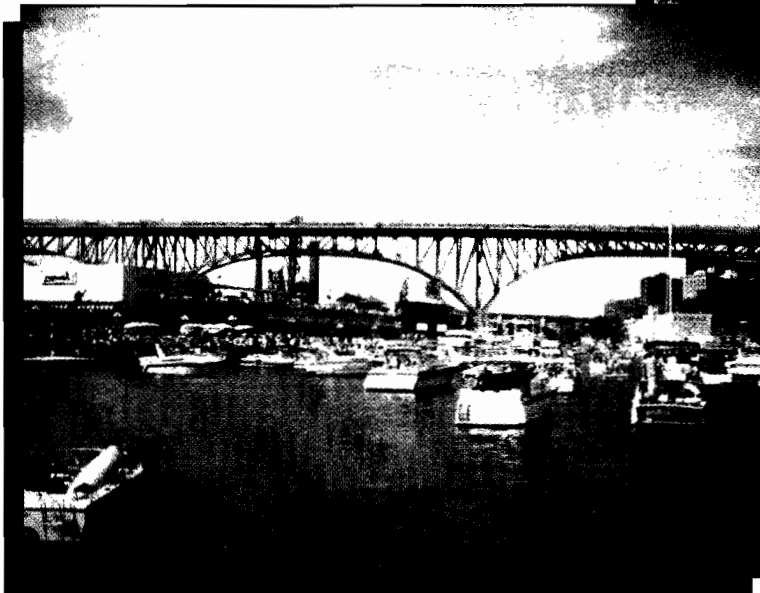
Twenty Years of the Clean Water Act



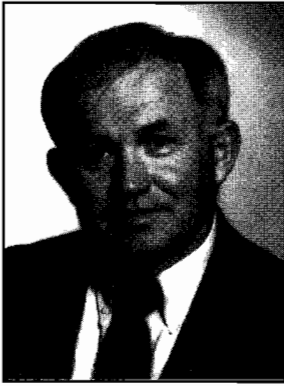
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Ohio Environmental Protection Agency



Agriculture is the grassroots industry of Ohio involving people and families working together with business towards a common goal. Our farmers and growers have long been the backbone of Ohio providing a significant contribution in the area of fruits, vegetables, grains, and over 90% of the state's nursery stock and grape industry. This wealth is largely due to the Lake Erie basin with its fertile soil and climatic conditions.

Not so long ago, Lake Erie and its farmland was suffering due to extreme abuse through chemical runoff and over tilling. Farm communities and producers came together with the Ohio Department of Agriculture and worked to modify activities to stop this damage. Practices have become more conservative by using prescription farming, lowering phosphorus runoff, and conservation tillage.

Today more and more people are working together. The future of Ohio's agricultural, commercial, and recreational industries is bright and prosperous.

Many great strides for restoration, remediation, and preservation have and are being made. This section of the State of the Lake Report discusses some of the progress that has been made since the Clean Water Act was enacted twenty years ago. Many of those efforts will continue so that future generations can enjoy Lake Erie as much as we do today.

Fred Dailey, Director, Ohio Department of Agriculture

State of the Lake Report 2000-2001

Lake Erie was declared dead in 1970 from serious pollution problems that threatened its productivity and value as a natural resource. Four categories of pollutants contributed to the Lake's failing health; nutrients, sediment, bacteria, and toxics. Excessive nutrient loadings caused mats of floating algae, odors, poor aesthetics, and the creation of oxygen-depleted areas at the Lake bottom. Tributary silt loadings increased turbidity, choked biological communities, and carried contaminants adhering to sediment particles into the Lake. Bacteria from poorly or untreated sewage created health hazards and closed beaches. Toxic chemicals accumulated in fish, wildlife, and sediment, causing fish consumption advisories. The collective effect of these pollutants nearly spelled disaster for Lake Erie.

The critical condition was, to a great extent, responsible for the public outcry that resulted in the passage of the Clean Water Act amendments in 1972. The Clean Water Act provided for the development of cleanup objectives, timeliness, treatment technologies, and, most importantly, the funding to implement the proposed program. The major pollutants of concern, their impacts, and the improvements brought about by the Clean Water Act are addressed as follows.

Nutrients

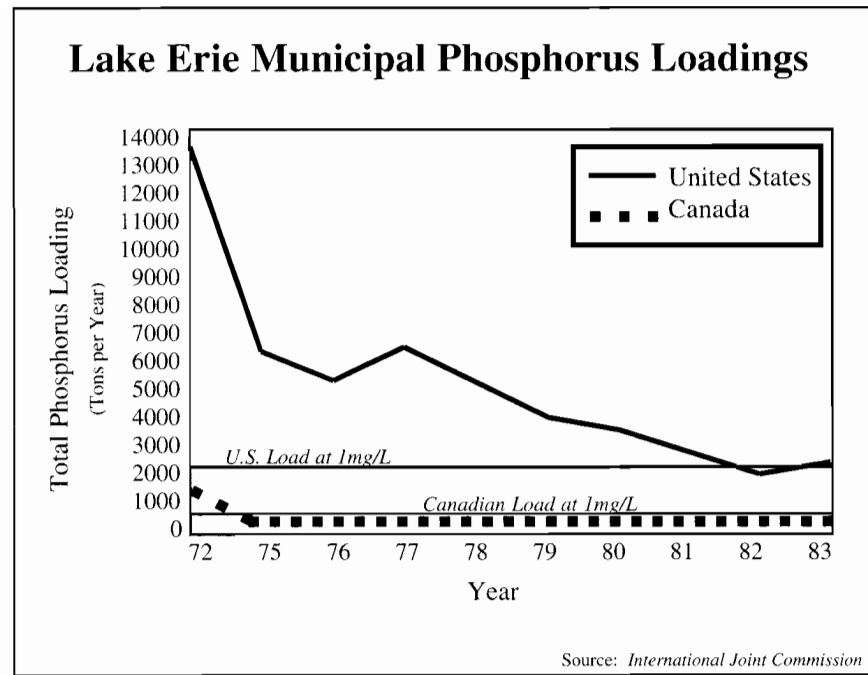
Nutrients are the base of the food web. These include phosphorus and the various forms of nitrogen, as well as several other elements. These nutrients support the phytoplankton community, the primary link in the Lake Erie food chain, but excessive amounts can wreak havoc on the whole system. Phosphorus was identified as the nutrient of concern in Lake Erie in 1970.

Before 1972, most sewage treatment plants did not remove phosphorus. Phosphorus in detergents increased the loads coming from sewage treatment plants and septic systems. Effluent concentrations of phosphorus averaged 7 mg/l (milligrams per liter.) Runoff from farms was another major source of phosphorus. The Detroit River, which supplies approximately 90 percent of the flow to Lake Erie, was the largest source of phosphorus, followed closely by the Maumee River. Total external loads to the Lake peaked at 28,000 tons in 1968.

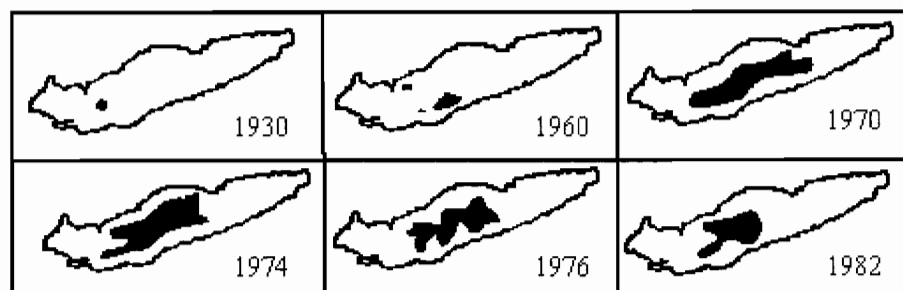
The effects of phosphorus on Lake Erie were visible and very disturbing. Massive algal blooms, composed mostly of nuisance blue-green algae, became commonplace.

During the summer months, waters in sheltered bays and the near shore often resembled pea soup. Shorelines were rimmed with what appeared to be aqua paint.

Floating mats of scum were found even in the open Lake. Long filamentous algae called



Anoxic Bottom Waters in the Central Basin



Source: Charles Herdendorf, Ohio Sea Grant

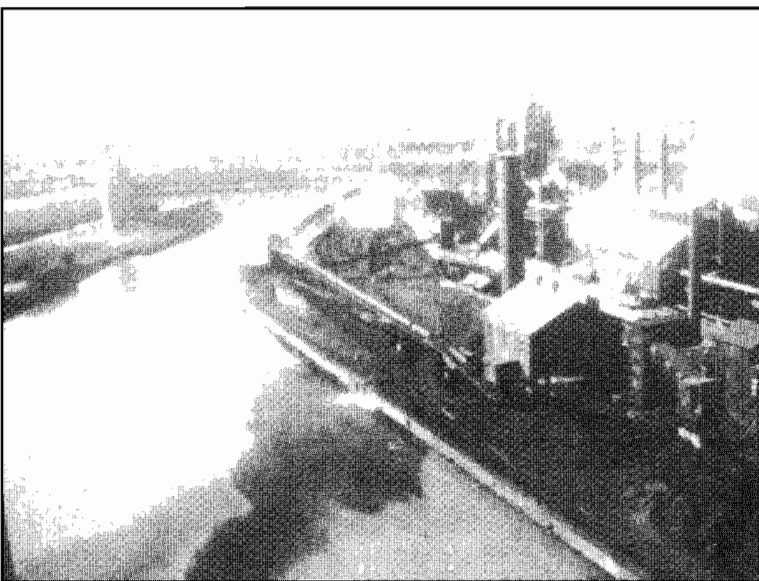
Cladophora attached to nearly every available hard surface and washed ashore in thick mats along with numerous dead fish. In addition to the obvious visual impact, the smell of this decaying mess kept many beaches deserted. Taste and odor problems plagued shoreline communities that drew their water supplies from the Lake.

Tons of decaying algae raining down on the Lake floor depleted the bottom waters of oxygen, killing aerobic macroinvertebrates and driving desirable fish species from the Lake. Mayflies, a primary food source for desirable game fish, were wiped out and have yet to make a comeback. This total oxygen depletion is called anoxia. Under anoxic conditions, certain pollutants in the sediment are regenerated back into the water column. Since Lake sediments had become highly polluted with phosphorus, there was now an internal, largely uncontrollable source of phosphorus.

In 1972, the United States and Canada signed the Great Lakes Water Quality Agreement, which was the impetus for reducing Lake Erie phosphorus levels. The Clean Water Act provided funding for constructing phosphorus removal facilities at municipal wastewater treatment plants and implementing programs to reduce runoff from agricultural lands. In 1988, Ohio passed a law banning the use of phosphorus in laundry detergents throughout the Lake Erie basin.

Today, phosphorus loading from Ohio's major wastewater treatment plants is at the level established by the Great Lakes Water Quality Agreement. The average discharge concentration is now 0.5 mg/l. The average discharge

concentration is now only 0.5 mg/l. Since 1989, conservation tillage practices have increased by nearly 200 percent in the Maumee River basin. Throughout the Lake Erie Basin, county phosphorus reduction committees are actively working to meet the phosphorus reduction goals established in the Ohio Phosphorus Reduction Strategy. Farmers throughout Ohio are demonstrating the power of stewardship and commitment to improving environmental quality by voluntarily participating in phosphorus reduction activities.



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Today, it is rare to see an algal bloom on Lake Erie. The area of anoxia occurring on the lake bottom has been reduced, and total annual phosphorus loading is close to the values established in the Great Lakes Water Quality Agreement.



Satellite image of a sediment plume into Lake Erie from the Maumee River. Photo courtesy of Toledo Metropolitan Area Council of Governments.

Sediment

As the Lake Erie Basin became increasingly populated, land was cleared for farms and communities. Wetlands were drained and cultivated, thus eliminating a natural filter which prevented sediment from entering the Lake. Soil erosion increased as fields were plowed right to the edge of streams and rivers ultimately flowing to Lake Erie. Many streams and rivers were channelized to prevent flooding. This, in turn, provided faster flows and a more direct route for sediment to reach the Lake.

In addition to the obvious aesthetic impacts, increased sedimentation covered invertebrate communities in rivers and the Lake, suffocated fish eggs and choked spawning grounds. The increased turbidity destroyed beds of aquatic plants by restricting light penetration, and eliminated less tolerant, clean water fish species.

Much of the sediment washing into the Lake was fine silts and clays, the type of particles to which pollutants adhere. Thus, in addition to the obvious visual impacts, the increased sediment loading also meant increased loads of nutrients and toxic chemicals. Many of the non-point source phosphorus control programs are aimed at decreasing the runoff of sediment.

Bacteria

The original sewage systems, constructed in cities growing along the Lake Erie shoreline, were often little more than a series of sewers draining wastes away from populated areas and combining to empty into the rivers and Lake at one common point. Sewers were generally constructed to contain both sewage and storm water runoff. Early sewage treatment plants had only primary treatment, which did little more than remove solids before discharging wastes to the nearest body of water.

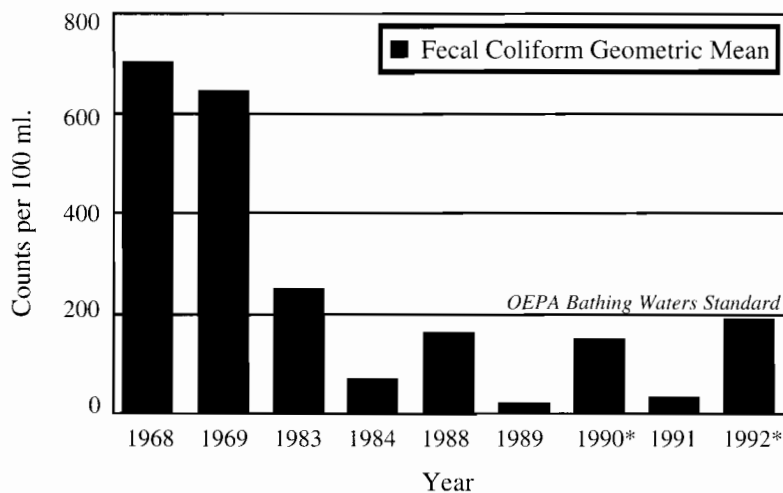


John Neuman grew up around his father's business, Neuman Boat Line, in Sandusky. He began working on the ferries as soon as he was old enough. Eventually, he took over the business in the early 1980s.

John feels that the Clean Water Act of 1972 had a definite effect on commercial boats using Lake Erie. Prior to the Act, commercial vessels were not required to have sewage treatment systems on board. John remembers that when he and his father, Harold Neuman, installed treatment systems in their four vessels "It cost nearly the amount it did to build their first automobile ferry in 1955." Most companies complained about having to install the systems but "...it was well worth the investment to see the Lake in the beautiful condition it is in today."

Lake Erie has improved immensely since the enactment of the Clean Water Act. Anyone who has helped in anyway - no matter how small - can be proud of that fact. In John's opinion, "Lake Erie is more beautiful and alluring today than at any other time in over 50 years."

Edgewater Beach Fecal Coliform Counts (Compilation of 15 samplings)



*Elevated levels in 1990 and 1992 are attributable to heavier than normal rainfall. Additionally, a combined sewer overflow regulator at Edgewater Park was malfunctioning in 1992.

Source: Ohio Environmental Protection Agency

By the 1960s and early 1970s, most sewage treatment plants had only the most basic treatment. The discharge contained extremely elevated concentrations of bacteria, with potential for spreading of disease and infections. Overloaded sewer systems designed to discharge only during periods of heavy rain, often overflowed continuously, even in dry weather. Raw sewage floating in rivers and along the lake shore was common. Most of Lake Erie's beaches were closed as health hazards during the 1960s.

The Clean Water Act required all sewage treatment plants to upgrade to at least secondary treatment. Construction of retention basins, separation of sewers, and construction of interceptors have reduced the discharge from combined sewer overflows. However, many areas still experience elevated bacteria counts from combined sewer overflows, particularly following heavy rainfall.

Toxics

The presence of toxic chemicals in Lake Erie was less obvious than the visual impacts resulting from phosphorus enrichment and sediment loading. However, by the time the presence was realized, the effects were farther reaching, longer lasting, and more devastating to the ecosystem. The unrestricted point source discharge of metals and organic chemicals, and the non-point source runoff of pesticides allowed these toxics to contaminate sediment and bioaccumulate in fish and wildlife. Some of these pollutants biomagnify as they move up the food chain, meaning a seagull feeding on many slightly contaminated fish eventually will become highly contaminated.

High loads of mercury from chlor-alkali plants on Lake St. Clair and the Detroit River resulted in a ban on commercial fishing for walleye and white bass in Lake Erie in the early 1970s. Elevated concentrations of the pesticides

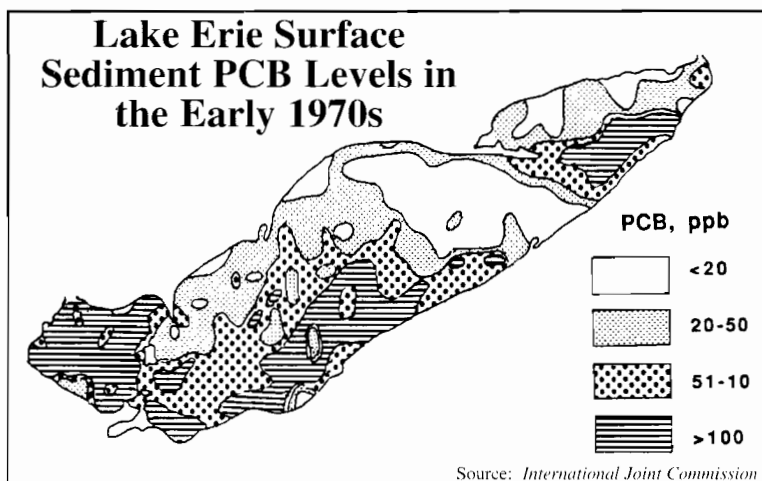
DDT, its by-products (i.e., DDE) and dieldrin caused eggshell thinning and reproductive problems for herring gulls and bald eagles, resulting in declining populations.

All of the harbors at the mouths of the major Ohio tributaries contain heavily polluted sediments. The deep, dredged channels became sinks for pollutants and sediments moving down the rivers. Discharges from oil refineries, steel mills, and chemical companies caused foul-smelling waters and floating patches of oil and grease. Oil-soaked debris, accumulating along the bends of the Cuyahoga River, ignited several times. The 1969 fire branded the River as a national symbol of environmental neglect and helped trigger the first serious programs to clean up the Great Lakes.

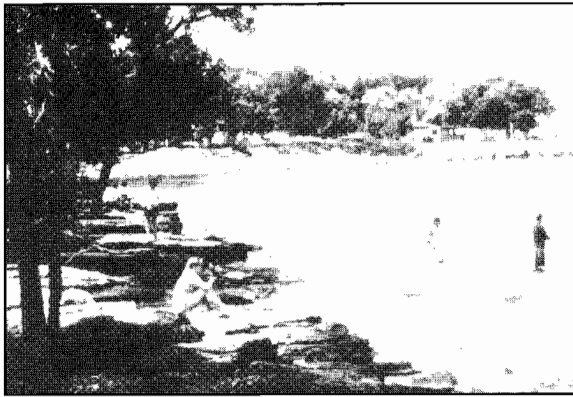
Polychlorinated biphenyls (PCBs), synthetic chemicals introduced in 1929, were discovered to be concentrating in sediments, fish and wildlife. PCBs were very stable compounds with excellent electrical and temperature insulating abilities, and were widely used. In relation to a massive PCB poisoning incident in Japan, problems associated with exposure to PCBs were first realized in 1968. Shortly after that, PCBs were identified as potential carcinogens in laboratory animals. Their widespread occurrence throughout the Great Lakes became a major concern, one that continues today.

The National Pollutant Discharge and Elimination System (NPDES) program of the Clean Water Act required all dischargers to obtain a permit to discharge to the U.S. waters. This program has helped considerably to reduce the discharge of pollutants. The development of water quality standards, also required under the Clean Water Act, further helped to restrict effluent pollutant concentrations. Pretreatment of industrial wastes restricted the flow of toxics to municipal wastewater treatment plants.

In addition to the requirements of the Clean Water Act and the Great Lakes Water Quality Agreement, the Council of Great Lakes Governors adopted a Toxic Substances Control Agreement in 1986, pledging to work together to reduce toxic loadings to the Great Lakes. The Great Lakes Critical Program Act of 1990, amending the Clean



Charles Fink



Improved water quality has benefited the people and the economy of Ohio's North Coast. Photo courtesy of Arnold W. Ehram.

Water Act, established the Great Lakes Initiative to develop water quality criteria common to all the Great Lakes to protect human health, aquatic life, and wildlife. The Pollution Prevention program has spawned a number of efforts to minimize waste production at the source, rather than relying on treatment and remediation. The Remedial Action Plan groups for Ohio's four Areas of Concern are developing remedial plans for restoration.

All of the efforts have helped to improve the Lake Erie ecosystem. The Cuyahoga River has under-

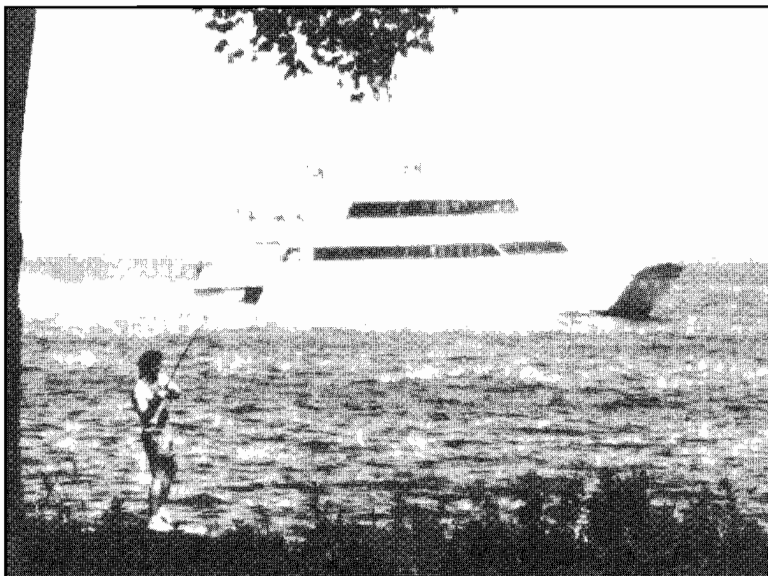
gone a dramatic transformation from a debris choked waste treatment lagoon to a "public playground." Aquatic life has returned to all of the harbors. The nearly exterminated bald eagle population has made a progressively successful comeback.

We have measured many successes, but we must remain aware that Lake Erie still has many problems: contaminated sediments remain a source of pollution to the lake; anoxia remains a problem in the central basin; nitrate concentrations in the lake are increasing; a fish advisory exists for carp and catfish; and much shoreline habitat and buffering wetlands have been destroyed.

We have learned that despite the successes under the aegis of the Clean Water Act, the Act alone is not sufficient to restore the water quality in Lake Erie. The authority of all of the environmental laws passed at the state and

federal levels must be brought to bear.

We can no longer direct our efforts at individual facilities, individual actions, and individual sources alone - the focus must shift to the resource ... to take a holistic approach. We must also create partnerships of common interest and shared responsibility. There must be sharing of scientific results and coordination across a broad spectrum of the public and private sectors to assist in development and implementation of the actions needed to continue the improvements to Lake Erie.



John E. Rees

Water Quality



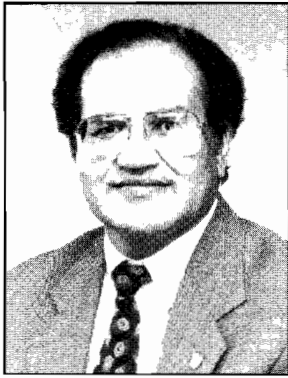
Skip Kremer



Todd Swanson



Ohio Environmental Protection Agency



This section of the State of the Lake Report details the protection and remediation activities of many dedicated people and agencies relating to water quality and pollution issues of Lake Erie. As evidenced by much of the information contained in this report, there has indeed been a dramatic improvement in the water quality of Lake Erie since the mid-1970s. With increased awareness and interest in many environmental issues of the Lake by various local, state, and federal agencies and citizen action groups, Ohio has witnessed the rebirth of Lake Erie.

We can be proud of our past and present progress on improving Lake Erie. I feel Ohio continues to demonstrate its determination and commitment to addressing the various water quality and pollution issues facing regulators. Initiatives and programs are either in place or are proposed to address the Lake as a drinking water source, its commercial and recreational activities, pollution control and abatement, fish advisories, and recent concerns and problems associated with zebra mussels and other exotic, non-native species.

As a state agency and a member of the Ohio Lake Erie Commission, the Ohio Department of Health will continue in our commitment to work in concert with other member agencies and other interested groups to protect Lake Erie for both present and future generations.

Pitamber Somani, Director, Ohio Department of Health

Contaminated Fish in Lake Erie

The Ohio Department of Health (ODH) issued an advisory in 1987 recommending that no one eat any carp or catfish caught in Lake Erie. These species were found to have unacceptable levels of contamination with PCBs. This advisory is still in effect.

The Director of the Department of Health issues advisories on the safety of eating non-commercial sport fish in Ohio. The ODH issues an advisory to warn citizens about the health risks of eating contaminated fish: advisories are only to provide information and improve informed decision-making about the risks and benefits of eating fish. The form of the initial advisory is a press release, with printed materials sent to affected health departments and agencies. Once each year, ODH reviews all new data and then releases an update and summary of all advisories. With each advisory, it also recommends simple ways to reduce risk from the listed contaminants by using appropriate methods of preparation and cooking. The method may vary with the kind of chemical in a fish. For example, if a fish is contaminated with PCBs, mirex, or chlorobenzene, then removing the fat before cooking will significantly decrease the amount of these contaminants. The Ohio Department of Natural

Resources (ODNR) also summarizes the advisories each year in an informational brochure.

The process of issuing an advisory starts with data on the kind and concentration of chemicals in fish tissue. ODH officials use the Food and Drug Administration (FDA) action levels to determine safe concentrations of chemicals in fish. If the chemicals are not on the FDA list, then ODH uses its best scientific judgement to assess the toxicity of contaminants or the potential adverse human health effects that could result from a significant exposure. The risk is evaluated by estimating the following: amount of contaminant (dose) ingested, how much fish a person eats; how many of the fish contain a contaminant; the concentration of contaminant in fish tissue; and the amount of contaminant removed during preparation and cooking.

The Governors of the Great Lake states signed the Great Lakes Toxic Substances Control Agreement in May 1986. One provision of the agreement was that consistent fish consumption advisories be adopted by the 1987 fishing season. Representatives of the Great Lakes states and Ontario have met numerous times and reached partial agreement on a uniform process. The process included how to collect samples, how to assess risk, how to develop advisories, and how and when to report them. This Great Lakes Fish Advisory Task Force expects to approve the final document for a uniform protocol in early 1993.

The ODH also issues beach and contact advisories for the State of Ohio. They are issued by a less complicated process than the consumption advisories. Beach advisories change more rapidly than the other two because they are based on high bacterial amounts rather than chemical or heavy metal amounts. This fluctuation can be caused by many different variables. One example is the relationship between high rainfall

1992 Lake Erie Basin Consumption Advisories

No one (adults & children) should eat the species designated when removed from these waters:

<i>Body of water</i>	<i>Advisory Area</i>	<i>Species</i>	<i>Contaminant</i>
Lake Erie	ALL WATERS	Carp and Catfish	PCBs
Ottawa River	I-475 N of Wildwood Preserve, Toledo TO Maumee Bay, Lake Erie	ALL	PCBs
Black River	31st St. Bridge, Lorain TO Lake Erie	ALL	PAHs
Ashtabula River	24th St. Bridge, Ashtabula TO Lake Erie	ALL	PCBs, Hexa- and Penta-chlorobenzene, Tetrachloroethane

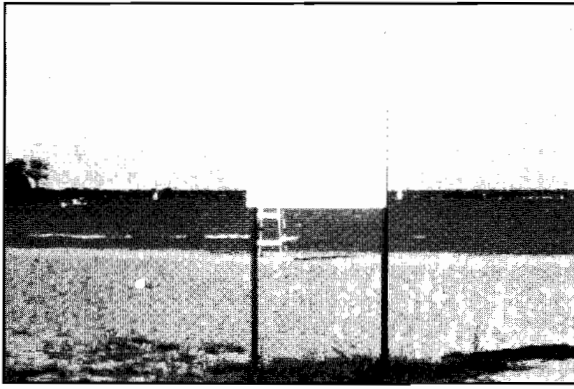
Source: Ohio Department of Health

1992 Lake Erie Basin Contact Advisories

No one (adults & children) should swim or wade in these waters:

<i>Body of water</i>	<i>Advisory Area</i>	<i>Contaminant</i>
Ottawa River	Secor Rd., Toledo, TO Maumee Bay, Lake Erie	PCBs
Black River	31st St. Bridge, Lorain TO Lake Erie	PAHs

Source: Ohio Department of Health



International Joint Commission

amounts and increased bacterial levels. This condition was evident during the mid to late summer of 1992, when much of Ohio experienced record rainfall levels. Of the 62 beaches routinely monitored by various local health departments, ODNR, and ODH, nearly half were posted at sometime with water quality advisories to restrict swimming. Officials were prompted to issue these advisories by elevated bacteria levels due to the runoff caused by the frequent storms. It is encouraging to note that

within a few days after these storms, water quality at most of these beaches had returned to well within acceptable levels.

In 1992, only two Lake Erie beaches were closed for the season because of water quality conditions, compared with four that were closed in 1986 and 11 in 1967. As these statistics show, Lake Erie has shown improvements since 1986 and even more improvements since 1967, but there is more to be done before all the fish in Lake Erie can be eaten and all her beaches and waters are safe at all times, for everyone.

Zebra Mussels and Other Exotic Species

The introduction of an exotic species into a lake or stream poses challenging problems to scientists, aquatic resource managers, and users, particularly when such an occurrence is rapid and unexpected. This is the situation faced today by those who are currently assessing the potential impact of the introduction and colonization of zebra mussels in the Great Lakes Basin.

These exotic freshwater mollusks are believed to have entered the lower Great Lakes Basin in 1986 as yearlings which were deposited through the discharge of ship ballast water. Within a very short time, the mussels have managed to spread rapidly throughout the Great Lakes and into major river systems such as the Hudson and Susquehanna Rivers in New York, the Ohio River, the Illinois River, the Tennessee River, and into the heartland of America by way of the Mississippi River. Environmental changes and economic damage quickly spread with the zebra mussel as they began clogging pipes in water treatment, utility, and manufacturing plants at numerous locations.

Adult zebra mussel females can produce 30,000 to 40,000 eggs, which hatch throughout the late spring and summer months. Larval zebra mussels

(veligers) are free-swimming creatures for a period of eight to ten days. Within this period, they must find a solid surface upon which to attach. Cold temperatures, low dissolved oxygen levels, and the possibility of predation pose additional threats.

During the past two years, electric and water utility trade groups, together with government agencies, colleges, and universities, have provided funds for vital research and information efforts. Some of these efforts are showing promise in helping to control the zebra mussel. There are some “industrial strength” ways that zebra mussels are being controlled in the commercial industry. The methods currently being used seem to be environmentally safe and effective when undertaken by trained and knowledgeable personnel. The most widely used methods today are:

Thermal control: Water is heated to 100 to 110 degrees Fahrenheit for a minimum of one hour, resulting in rapid death for most zebra mussels.

Chlorination: Chlorination has proved to be effective in controlling zebra mussels at the point of raw water intake. The use of chlorine requires site-specific testing to determine the appropriate concentrations. There is a concern about the negative effects of chlorine on non-target species. Therefore, dechlorination at the point of discharge is required.

Filtration: Zebra mussel veligers are approximately 70 microns in size when they hatch. While there are many effective screening and filtering strategies that can be used to combat juvenile and adult mussels, these microscopic larvae would be difficult on systems requiring high velocities of water.

Molluscicides: Chemicals specifically to kill mollusks have been developed. These have proved to be effective in industrial and power plant applications.

Organometallic toxicants: Tributyl tin oxide or copper coatings may effectively prevent zebra mussels from attaching to surfaces such as boat hulls and buoys. However, they are relatively expensive, difficult to apply, have a short service life, and may result in negative environmental impacts on non-target species.

Others: Silicone-type nonstick coatings are being tested and may prove useful. Copper pipe is effective in limiting zebra attachment. However, the high costs will probably prevent widespread use in boats and industrial plants.



Ohio Sea Grant



Despite chemical controls, zebra mussel removal and disposal remains a concern for Lake Erie water intakes. Photo courtesy of the City of Toledo.

The use of chemicals such as chlorine and molluscicides by the general public could result in ecological harm, leading to even greater cleanup costs. A few industries in the Lake Erie Basin are using thermal control methods, but molluscicides are the most commonly used form of industrial control for zebra mussels. The public can help control the spread of zebra mussels by doing the following:

Scraping: If you have zebra mussels on docks or piers, this is the currently recommended method of removal. Be advised that live zebra mussels may be able to reattach to hard surfaces, so the scraped mussels should be caught in a bag or bucket. This is especially important if the mussels are dead, because they foul the water and create an obnoxious odor as they decay. A large buildup should be avoided because the mussels' waste products can damage docks and piers.

Drain your boat: When transporting a boat drain all bilge water, live wells, and bait buckets before leaving the infested or suspected areas. Leftover bait should not be transported to uninfested waters.

Flush/rinse your boat: Thoroughly flush hulls, outdrive units, live wells (and pumping systems), bilge, trailer frames, anchors and anchor ropes, bait buckets, raw water engine cooling systems, and other boat parts and accessories that typically get wet using hot water. Using a pressurized steam cleaner or high pressure power washer would also be effective, require less time, and be environmentally compatible.

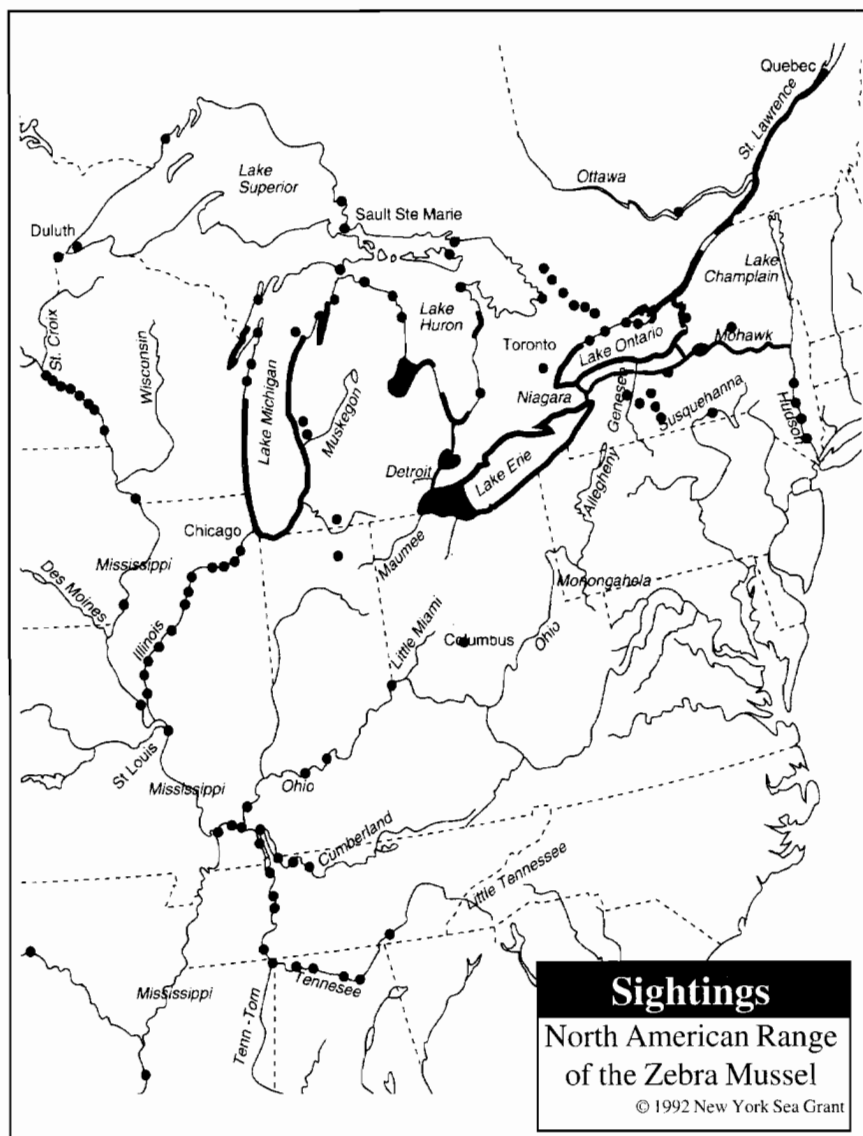
Boats remaining in water: Remember, mussels can attach to outdrives, covering or entering water intakes and result in clogging, engine overheating, and damage to cooling system parts. Mussels on or around props and shafts can increase drivetrain wear. If possible, avoid leaving outdrives in the down position. Hulls and drive units should be inspected and scraped free of mussels.

Anti-fouling paints: Anti-fouling paints may be effective in preventing attachment of zebra mussels to boat hulls, outdrive units, propellers, and other underwater boat components and accessories. Hull waxes do not appear to be effective.

On the positive side, zebra mussels are enhancing water clarity through their filtering abilities. An adult zebra mussel is capable of filtering up to one liter a day. In some localized areas of the Lake, it is believed that the density of mussels is sufficient to completely filter the water column each and every day. The result of this filtering has been astounding. Measurements in the western basin have shown a four-fold increase in water clarity from eight years ago. Areas that not long ago were coated with dense mats of algae, now show great water clarity.

These dramatic changes in clarity are causing fundamental changes in Lake Erie's physical and biological structure. For instance, with increased water clarity, light now reaches the bottom in many shallow areas. With this light, the growth of bottom plants (macrophytes) has greatly increased. This growth in turn provides food and habitat for many species of invertebrates and fish that could not live there before. With many such changes occurring at the same time, the final equilibrium of the Lake's ecosystem is anyone's guess.

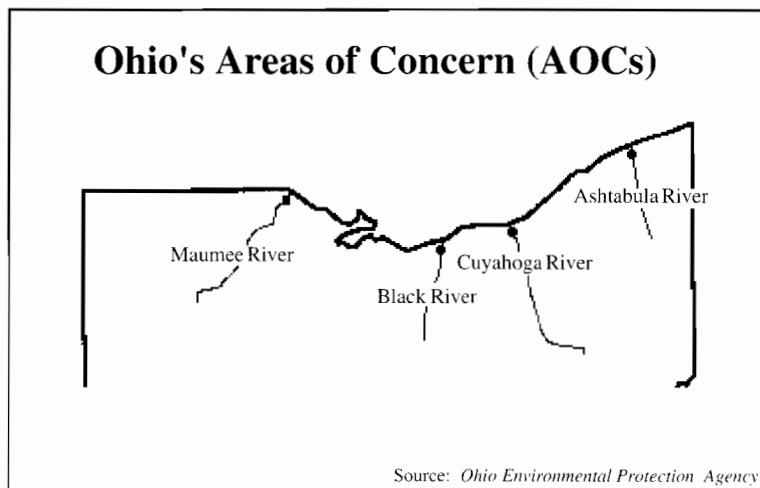
Some of the other exotic species that have moved into the Great Lakes are the river ruffe and the spiny water flea. The ruffe is a cool or cold water fish from northern Europe that resembles the yellow perch. In just a few years it has become the dominant species in Minnesota's St. Louis River and has spread to other parts of Lake Superior. The ruffe is a fierce competitor for food and habitat. The ruffe has not yet reached Lake Erie. There is great concern that if it does, it could decimate the native yellow perch population.



Spiny water fleas are large zooplankton found in all the Great Lakes and several inland lakes. Although they are less than one-half inch long, they may compete with small fish for food and can disrupt the ecosystem. When they collect on fishing line, they look like bristly gobs of jelly with black spots.

The Federal Aquatic Nuisance Prevention and Control Act of 1990 has aggressively fought the introduction of additional exotic species and the spread of those already in the Great Lakes. The Act sets penalties for intentionally introducing foreign species into the lakes, and provides funding for research

and education. It also establishes a voluntary program for ships entering the St. Lawrence Seaway to exchange their ballast water in mid-ocean to eliminate any exotic freshwater species. To date, an estimated 94 percent of tall vessels entering the Seaway are complying with these guidelines.



Remedial Action Plans

Ohio's Remedial Action Plans (RAPs) have been developed by Ohio Environmental Protection Agency (OEPA) as grassroots environmental restoration and enhancement programs. The Great Lakes Water Quality Agreement between the United States and Canada calls for the restoration of problem areas along the Great Lakes. The International Joint Commission (IJC) has designated 43 such Areas of Concern (AOCs), with four in Ohio along Lake Erie. These impaired areas include the Maumee, Ashtabula, Black and Cuyahoga Rivers. The Maumee River AOC primarily is impaired due to nonpoint source pollution and leaching landfills. The Ashtabula River AOC is impaired by contaminated sediments from past industrial activity. The Black River AOC is on the list because of contamination from past and present industrial activity, municipal wastewater treatment plants and nonpoint source pollution. The Cuyahoga River AOC is a highly industrial, urbanized area with both point and nonpoint source pollution problems.

The RAP committees identify all sources of pollution and the beneficial uses of the waterway that are impaired because of the pollution. They then develop remedial activities to prevent further contamination and clean up the AOCs. There are three stages in a RAP:

Stage 1 - Identify sources, degree of impairment, and geographic extent of impairment

Stage 2 - Identify remedial action alternatives, select remedial action, establish time schedule for cleanup, and identify responsible parties to pay for and implement remedial activities

Stage 3 - Track progress to see if the remedial actions implemented are working

The Maumee, Cuyahoga, and Ashtabula River RAP committees have completed their Stage 1 Reports and are now moving into Stage 2. The Black River RAP is in the middle of Stage 1 and is expected to have a report out in 1993.

The RAPs must embody a systematic and comprehensive ecosystem approach to restoring and protecting the beneficial uses in an AOC. This approach accounts for the interrelationships among land, water, air, and all living things. Historically, regulatory and remediation programs have focused on a single medium (air, land, water) with little attempt to account for the interrelationships between programs and components of the ecosystem. RAP committees develop remedial activities that will address all media, clean up past damages, and prevent damage from occurring. There is a major focus on remediation, but pollution prevention is becoming increasingly important.

Ohio is committed to the RAP process and sees it as an excellent way of continuing the progress Lake Erie has made in recent years. The RAPs bring governments, industry, environmentalists, and citizens together. These diverse groups then work toward the common goal of addressing and conquering the environmental problems in their AOCs.

The RAP Program has initiated studies and remedial actions in the AOCs and has accelerated other remediation already underway. There are nonpoint source programs in both the Black and Maumee River AOCs that facilitate conservation tillage, which in turn reduces erosion and pollution.

All four RAPs have received national attention and federal funds for further actions. One has even been awarded federal money for additional studies as a special line item in the federal budget. The Maumee River RAP



Lester Stumpe has worked with the Northeast Ohio Regional Sewer District (NEORS) since 1981. He came to the NEORS from the B.F. Goodrich Company.

A clean Lake Erie is a great enhancer for the north coast. Lester believes that "By improving the water quality, you make a resource usable and more attractive. Cleaner water provides not only drinking water, but recreational and business opportunities."

Realizing that it is important to understand the relationship between the Lake and its tributaries, Lester endorses the aims of the Cuyahoga Remedial Action Plan. He feels that this effort "...emphasizes the importance of thinking of the watershed as a unit - - an ecosystem approach. If we don't understand the ecosystem, a large amount of money could be spent without the maximum benefits possible."

Over the past several years there have been over \$900 million spent in upgrading the three treatment plants overseen by NEORS. But Lester emphasizes "...these upgrades are not enough. People need to be educated, because most don't realize that things they do as a part of their daily life are also contributing to the problem."

Stage 1 Report identified landfills as a major pollution source. To accurately assess which ones were causing the problems, more data was needed. Because of the recommendations in the Stage 1 Report, the federal government awarded OEPA \$1.3 million dollars in 1992 to gather this needed information. Additional funding recently was appropriated to continue the study.

The Ashtabula Stage 1 Report identified contaminated sediments as being the biggest environmental concern. Ohio has committed \$7 million to dredge those sediments, contingent on receiving federal funds. A number of investigations are occurring associated with the cleanup of the Fields Brook Superfund site. The U.S. Army Corps of Engineers has agreed to dredge moderately polluted sediments from shoaled areas in the river as an interim measure. This will keep the navigation channel open until plans for a full-scale cleanup of the more highly contaminated sediments can be determined.

The Cuyahoga River RAP committee initiated fish tissue analysis, bacteriological studies, biological surveys, and modeling of the ship channel to determine if it was possible to alleviate the chronic low levels of dissolved oxygen. The Cuyahoga River RAP committee also created a nonprofit corporation to assist in obtaining funding to implement activities and coordinate public involvement.

An intensive environmental quality survey was conducted on the Black River in 1992. Additional studies on the occurrence of tumors in brown bullheads will be done in 1993 and 1994.



As part of the Maumee RAP committee's educational outreach, students measure the water quality of the Maumee Area of Concern. Photo courtesy of the Toledo Metropolitan Area Council of Governments.

Education is an important component of Ohio's RAPs. An informed public is better prepared to make the tough decisions needed to restore the AOCs. All of the RAP committees conduct public meetings and workshops that both inform the public and solicit input from the public. They also publish newsletters and fact sheets, participate in public events, maximize media coverage, and give presentations for interested groups. The Cuyahoga RAP committee is developing a curriculum for area schools to teach students about the environment. The Maumee River RAP committee gets high school students involved in the monitoring of local streams and rivers. The Black River committee has a volunteer monitoring program. All of the RAP committees have videos detailing water quality and other issues of concern in the AOCs.

Ohio's RAP committees have accomplished much more than is highlighted here, but much remains to be done. The goals for all

four RAPs is to virtually eliminate pollution and its sources so we no longer have any AOCs. This will require long-term commitment, coordination, cooperation, communication, and change. We'll need to celebrate every success, no matter how small, to generate the enthusiasm and determination that eventually will restore our Areas of Concern.

Governor George V. Voinovich and Environmental Protection Agency Director Donald R. Schregardus have made pollution prevention a top priority for the State of Ohio. Pollution prevention is implementing changes to manufacturing processes and business practices to reduce the amount of pollution generated. This differs from the traditional approach of treating or controlling pollution after it has been produced.

The Ohio Environmental Protection Agency (OEPA) Pollution Prevention Section (PPS) has focused much of its activity on Ohio's Lake Erie Basin. Five recently completed projects identify hazardous waste generation and management activities, toxic chemical releases, waste minimization activities, and waste minimization planning activities in the Lake Erie Basin. These projects also included a review of state and provincial pollution prevention efforts in the Great Lakes Drainage Basin, and compared these activities with U.S. EPA's Pollution Prevention Action Plan for the Great Lakes. A series of pollution prevention case studies that document Ohio industries' efforts in preventing pollution are also included as part of this overall effort. This effort has identified the quantities of hazardous wastes and toxic chemical releases generated in the Lake Erie Basin portion of Ohio.

PPS is continuing to focus its efforts on encouraging the reduction of these wastes. During 1993, a series of new activities will be completed related to pollution prevention in the Lake Erie Basin. These activities will include: developing a series of pollution prevention fact sheets; developing guidance and tracking systems for hazardous waste (Class I) underground injection well facilities which are required to develop hazardous waste minimization and treatment plans; identifying perceived and actual state statutory, regulatory, or policy impediments to pollution prevention; providing technical assistance for hazardous waste generators and facilities in the Lake Erie Basin; reporting on the use of waste minimization requirements in enforcement settlements;

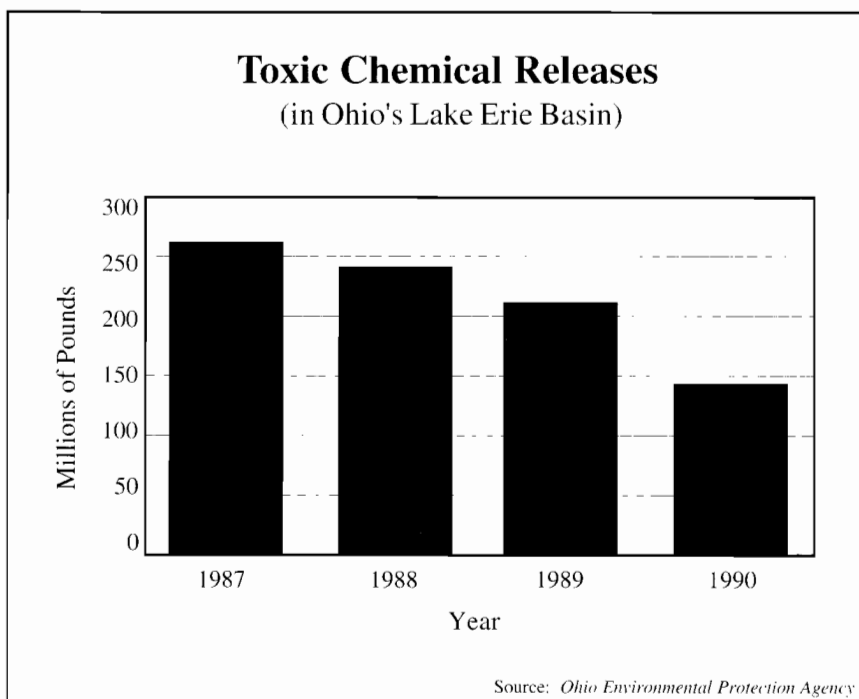
developing waste minimization planning guidance for Ohio hazardous waste facilities in the Lake Erie Basin; developing a pollution prevention strategy for the Lake Erie Basin portion of Ohio; and investigating how lab waste from research and educational labs in the Lake Erie Basin contributes to hazardous waste generation. These activities are scheduled for completion in October 1993.

The PPS has been working with other OEPA programs to integrate pollution prevention into current regulatory activities. Hazardous waste generators and permitted facilities in the Lake Erie Basin have been required to certify that they have waste minimization programs and report on progress. Since 1986, generators sending waste to the Envirosafe Landfill (Oregon), and the Chemical Waste Management, (Vickery) underground injection facility, have been required to prepare waste minimization plans. Both of these facilities are within the Lake Erie Basin. Since 1989, Ohio hazardous waste generators have filed waste minimization annual reports. Recently, waste minimization planning requirements have been added to hazardous waste permit terms and conditions.

OEPA is now integrating pollution prevention requirements in some environmental enforcement cases. The OEPA is pursuing this condition to encourage environmental improvements, not just penalties, as a result of

enforcement. Some offers of settlement may include reduced monetary penalties in exchange for commitments to develop waste minimization or pollution prevention plans or to install source reduction processes beyond those required by law.

In February of 1991, U.S. EPA initiated a voluntary pollution prevention program referred to as the 33/50 Program. The goal is to reduce the release of 17 targeted chemicals by 33 percent by 1992, and 50 percent by



1995. In December of 1991, Governor Voinovich sent letters to Ohio companies releasing these chemicals in an effort to gain 100 percent participation in the 33/50 program.

The Pollution Prevention Section also is working with U.S. EPA on the Pollution Prevention Action Plan for the Great Lakes. This plan establishes a broad-based program for reducing toxic chemical loadings into the Great Lakes. It targets pollutants (33/50 Program's 17 TRI chemicals) and geographic areas (Remedial Action Plan Areas of Concern). Reduction goals will be established in Lakewide Area Management Plans and progress will be measured through the Toxic Release Inventory (TRI).

On May 18, 1992, the Council of Great Lakes Governors signed the Great Lakes Recycle Agreement. The purpose of the agreement is to decrease waste and boost the market for recycled products by requiring all state agencies to use recycled copy paper and re-refined lubricating oil in daily operations. On May 22, 1992, Governor Voinovich signed Executive Order 92-174V authorizing implementation of the agreement in Ohio.

The Great Lakes Pollution Prevention Challenge is coordinated by the Council of Great Lakes Governors and is related to the Pollution Prevention Action Plan. The Challenge will develop sector-specific projects. These include one coordinated by Michigan's Office of Waste Reduction Services for the major automobile manufacturers. OEPA and the Cleveland Advanced Manufacturing Program are involved in that program. Also included in the Challenge are regional awards programs and a report on identification of barriers to pollution prevention.

The PPS is working with OEPA's Division of Water Quality Planning and Assessment to implement pollution prevention initiatives in the Remedial Action Plans for four Areas of Concern along Lake Erie. These include the Maumee, Black, Cuyahoga and Ashtabula Rivers. OEPA provided training for Remedial Action Plan coordinators in June 1992 to assist them in this effort.

A landmark accord was reached this past year as the Council of Great Lakes Governors and many of the nation's largest oil companies announced

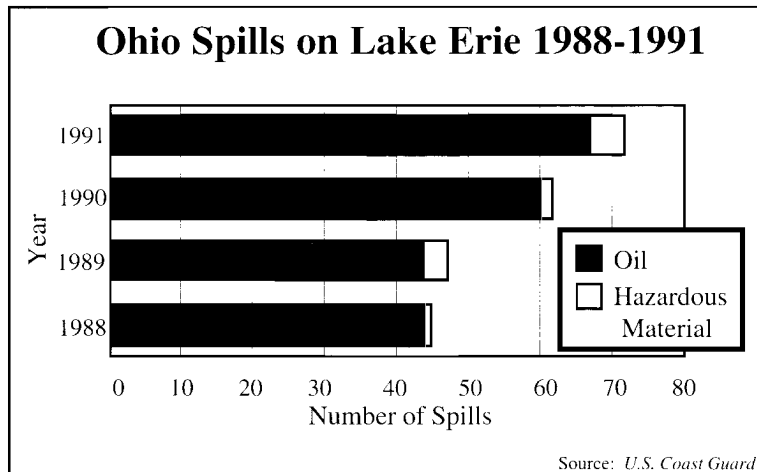


Commander John Grenier is the commanding officer of the U.S. Coast Guard Marine Safety Office in Cleveland. In this position, John serves as Captain of the Port, and is responsible for the security and safety of maritime commerce and the environment within his zone.

Having been on the Lakes for only two years, John was a little apprehensive coming to Cleveland. "I had been told that the Lake was so polluted you could walk on it — I was surprised to see people swimming in it!"

He attributes the success in spill prevention over the past 20 years to the improved attitude of the regulated community. He sees industry as being "much more conscientious and serious in their pollution prevention efforts."

Implementing the Oil Pollution Act of 1990 will be a huge undertaking for the Coast Guard, requiring some 90 new initiatives. One of the biggest benefits should come from the efforts of the newly formed Port Area Committee. John said that "this committee was formed to foster even more coordination between the local communities and the regulatory agencies. The new plan requires us to address beforehand, some very sensitive issues, such as using dispersants or the burning and disposal of spilled oil. Solving these problems during a crisis doesn't work."



the implementation of the Great Lakes Spill Protection Initiative. The pact is aimed at improving the Great Lakes region's ability to prevent oil spills and more effectively respond to spills that do occur — protecting one of the nation's most vital resources.

The goal of the Initiative is to ensure that the Great Lakes are well-protected against environmental damage from crude oil and petroleum product

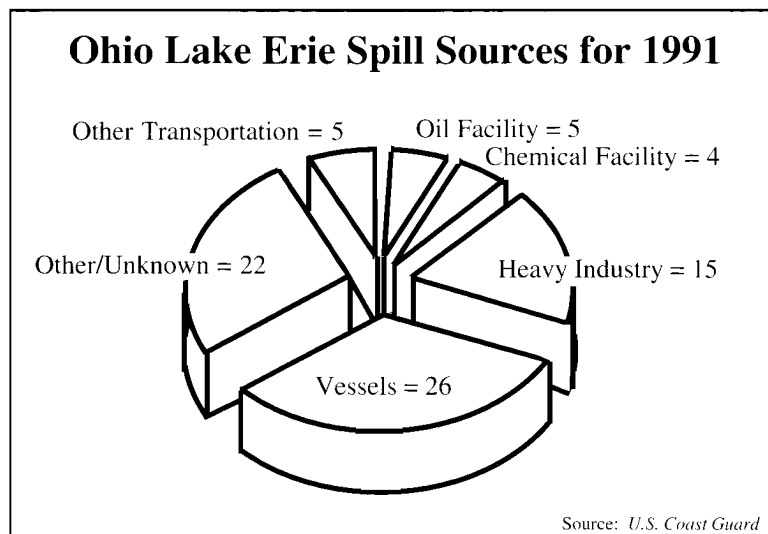
spills. Both the Council and the region's petroleum executives believe that the goal will be reached by following the Initiative's outline:

Assuring adequate spill response

Undertaking complementary state initiatives to promote spill protection

Developing cooperative approaches to spill prevention

Expanding participation in spill prevention and response efforts



The Great Lakes are particularly vulnerable to the damage spills can cause because they are a "closed" water system and serve as a source of drinking water for nearly 24 million people. In addition, the Great Lakes are home to vast amounts of fish and wildlife, and are a center of recreation and tourism. The U.S. Coast Guard reported that over 5,000 oil and chemical spills occurred in the basin during the 1980s.

While the agreement focuses on oil companies, transporters of petroleum products, marine carriers of bulk cargo,

and entities maintaining inventories of fuels and other petroleum products, it is primarily intended to be an on-going relationship between the government and the private sector, seeking out solutions to the problems of environmental damage caused by hazardous material spill.

In 1989 Ohio joined the U.S. EPA and the other Great Lakes States in a process to develop water quality standards and implementing procedures to be applied to dischargers in the Great Lakes Drainage Basin. At that time, it was recognized that the states bordering the Great Lakes has varying water quality standards and implementing procedures. The Great Lakes Water Quality Initiative (GLWQI) is an effort to have uniform standards and implementing procedures applicable throughout the Great Lakes Drainage Basin.

This voluntary effort was made mandatory by the Critical Programs Act of 1990, an amendment to the Clean Water Act. Section 118 of the Clean Water Act was amended to include the requirements that U.S. EPA publish guidance on water quality standards and implementation procedures for the Great Lakes Drainage Basin. This guidance must conform with the objectives and provisions of the Great Lakes Water Quality Agreement, an agreement between the United States and Canada on Great Lakes water quality and is no less restrictive than national water quality criteria and guidance. The Act requires that the guidance specify numerical limits on pollutants in Great Lakes waters to protect human health, aquatic life and wildlife, and include guidance on antidegradation policies and implementation procedures. Within two years of publication of the final guidance, the Great Lakes States are required to adopt water quality standards and antidegradation policies and implementation procedures for waters within the Great Lakes Drainage Basin that are consistent with the guidance.

GLWQI guidance were drafted and expected to be published in the Federal Register for public comment in the 1993. The draft guidance includes numerical aquatic life criteria for 17 pollutants, numerical human health criteria for 20 pollutants, and numerical wildlife criteria for four pollutants. The guidance also includes procedures for deriving additional numerical criteria as data becomes available. Specific procedures are included for implementation of criteria and antidegradation policies in permits for point source dischargers.

The drafting of the GLWQI guidance was a collaborative effort of the U.S. EPA, U.S. Fish and Wildlife Service, National Park Service, and Great Lakes States, and involved the participation of environmental groups, the regulated community, and the general public. In December 1991, the GLWQI Steering Committee, composed of representatives of U.S. EPA and the Great Lakes States, recognized that all parts of the draft guidance were not agreeable

to all participating parties, but agreed that they were ready for public review and comment. The U.S. EPA Science Advisory Board is reviewing portions of the guidance and its recommendations will be considered in developing the final guidance.

U.S. EPA is conducting a preliminary economic impact analysis of implementing the guidance. If the estimated cost exceeds \$100 million per year, a regulatory impact analysis will be prepared prior to publication of the final GLWQI guidance. The Council of Great Lakes Governors has contracted to have an independent study of the costs and benefits of implementing the GLWQI guidance. The results of this study will be used by the Governors when commenting on the draft GLWQI guidance during the public comment period. U.S. EPA has begun a second round of guidance development to focus on sources of pollutants not adequately addressed in the initial round. This second round is not mandated by the Clean Water Act, but is essential to result in the meaningful reduction of pollutant loadings to Lake Erie and the other Great Lakes.

Nonpoint Source Pollution

The term “nonpoint source” (NPS) pollution is unfamiliar to most Ohioans. Yet, it is the most prevalent source of pollution citizens encounter. Nonpoint source refers to the polluted runoff reaching streams, rivers, lakes, and underground aquifers from a variety of human activities. It has become clear that the impact of nonpoint source pollution on water quality ultimately depends on the way the land is managed.

The degree to which water quality in the Lake Erie Basin is affected by NPS pollution is documented in Ohio’s “Nonpoint Source Assessment.” Of



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the 7,081 miles of streams in Ohio’s Lake Erie Basin, 1,170 miles have known water quality problems attributable to a combination of point sources and nonpoint sources.

Ohio’s Nonpoint Source Pollution Initiative for Lake Erie is designed to deal with the wide variety of nonpoint sources found in the Lake’s watershed.

These sources include: sediment from cropland, construction sites, and streambanks; nutrients (phosphorus and nitrates) from cropland runoff, barnyard runoff, and land application of manure; runoff from city lawns, parking lots, and roadways; and failing home septic systems.

Because agriculture is the largest land use category in the Lake Erie Drainage Basin, a majority of Ohio's NPS initiatives for the basin are directed toward agriculture. These initiatives have taken the form of voluntary programs with strong interagency cooperation and local, grassroots support.

Common to these voluntary programs is the theme of pollution prevention, where the emphasis is on control and prevention of NPS pollution rather than on remediation or cleanup. In controlling nonpoint source pollution, prevention is more cost efficient and effective than cleaning up the pollution after it has been deposited.

RAP Implementation Projects

An excellent example of pollution prevention is one part of the Remedial Action Plan (RAP) implementation projects. Currently underway in the Black and Maumee River Areas of Concern (AOCs) this project was designed to implement Ohio's Nonpoint Source Management Program and RAP recommendations, which identify land management practices, specifically conservation tillage, as the best way to reduce sediment and phosphorus loading of streams and rivers. These practices are referred to as best management practices (BMPs). Agricultural BMPs often utilize natural materials such as plant residue (vegetation) to slow the rate of runoff, prevent the movement of soil and attached particles, and hold water and pollutants in a specific area.

The Black and Maumee RAP implementation projects have made over \$800,000 in federal grants available in the form of cost-share money to help farmers purchase conservation farming equipment that leaves more residue on the soil surface, install land treatment practices such as winter cover and filter strips, and construct livestock manure handling facilities. Both of these voluntary projects have experienced widespread acceptance by the agricultural community, thus indicating a willingness on the part of farmers to shoulder more of the costs of NPS pollution prevention.

Conservation Tillage/Phosphorus Reduction

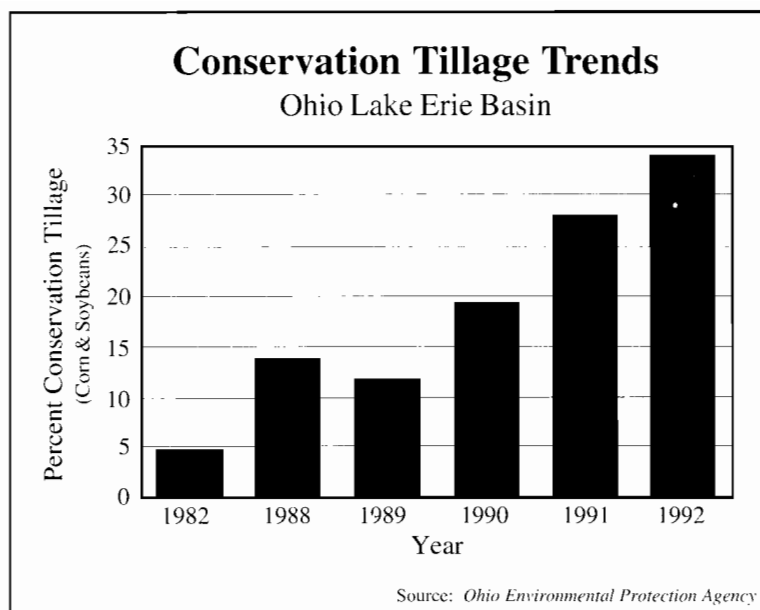
One of the most effective and widespread agricultural BMPs is conservation tillage. This practice involves leaving at least 30 percent of the soil's



Ray Cedoz has been farming in Curtis since 1954. Because of his love for the land and Lake Erie, he volunteers his time to the Ohio Department of Natural Resources' Coastal Resources Advisory Council.

Ray and his wife, Jeanette, grow corn, soybeans, wheat, and alfalfa on approximately 600 acres within the watershed of the western basin. He has been practicing conservation tillage methods for the past ten years. Over those years he has seen the demand for fertilizers on his land decrease. Ray attributes this to "the increase in worms and other biological activity in the soil. Since the amount of worms has increased, so have their castings and this has given us much more fertile soil." In the past he had to use more phosphorus for his beans, but now he says "I only use phosphorus as a starter."

Minimum tillage on Ray's land, and that of other conservation farmers, has proven to actually increase the levels of phosphorus, nitrogen and potash, as well as helping Lake Erie by decreasing the amount of runoff. "I would like to see everyone do their part to help the lake," says Ray. "Creating larger berms, maybe ten foot wide, on drainage ditches would considerably reduce the amount of runoff, chemical and soil, that goes into Lake Erie and her tributaries."



surface covered with crop residue after planting to allow for the interception of rainfall, reducing runoff, yet providing for a good seed bed. Through this method, erosion control is attained.

In 1972, phosphorus reduction goals were set by the United States and Canada using years of data and models to determine the levels necessary to improve water

quality conditions in Lake Erie. Each country was given a reduction goal, which the U.S. EPA broke down by state. In 1972, the U.S. goal was to reduce phosphorus loading to Lake Erie had reduced the goal to 2,269 metric tons annually. Most of this reduction came from the cleanup of municipal and point sources of pollution.

In 1982, the International Joint Commission realized that the majority of the remaining phosphorus remaining phosphorus reduction would have to be achieved by reducing nonpoint sources of phosphorus. Ohio was assigned 1,390 metric tons (MT) of the target load reduction for phosphorus to Lake Erie. Sources were given individual goals as follows:

Nonpoint Sources

Agriculture	900 MT
Urban runoff	112 MT
Combined sewer overflows	73 MT
On-site sewage	45 MT

Point Sources

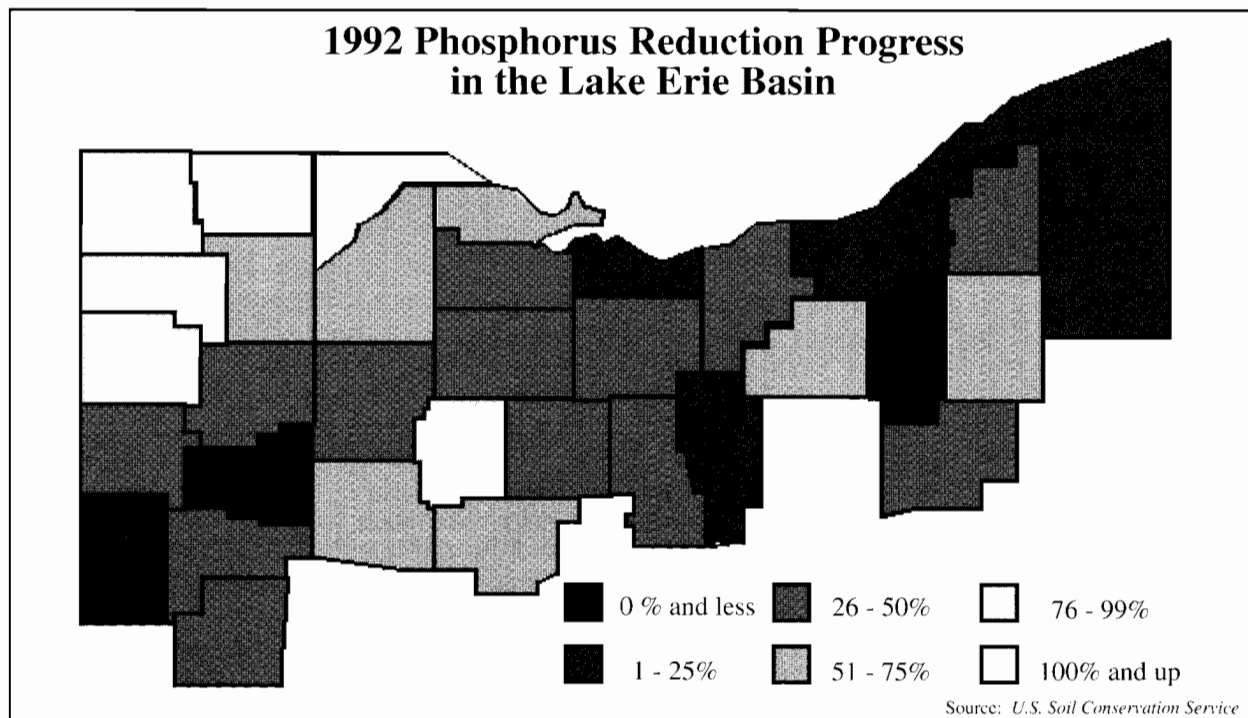
Major Municipal	229 MT
Major Municipal	25 MT
Industrial	2 MT
Other	4 MT

Ohio further divided its phosphorus reduction goals to assign each county in the Lake Erie Basin a target reduction goal. Each Soil and Water Conservation District/Soil Conservation Field Office formed a County Phosphorus Reduction Steering Committee to help develop an action plan to

correct water quality problems within their communities. These locally driven phosphorus reduction committees have increased awareness of phosphorus as a pollutant and helped land users link their management practices with water quality in Lake Erie.

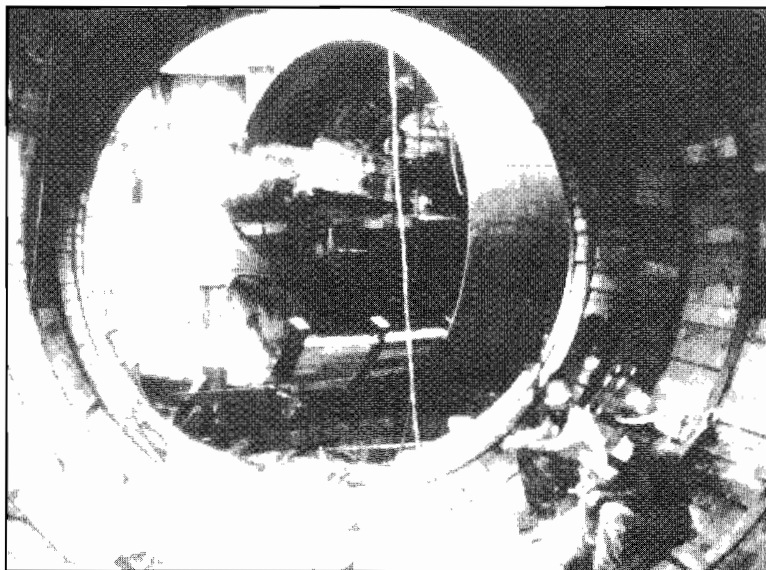
The wide acceptance of conservation tillage significantly reduced the amount of soil and fertilizer entering the Lake and its tributaries. In 1992, Fulton County achieved its phosphorus reduction goal. According to data collected by Heidelberg College, phosphorus in the Maumee River has been reduced by 936 MT; a 36 percent reduction since 1976. The reduction in phosphorus from nonpoint sources is the reason for 75 percent of that reduction. In the Sandusky River, phosphorus has been reduced by 204 MT; 34 percent reduction since 1976. Approximately 86 percent of this reduction in phosphorus is attributable to a reduction in nonpoint sources. Since the 1982 agreement with Canada, Ohio has reduced agricultural phosphorus loading by 427 metric tons. This is 48 percent of the established goal of 900 metric tons.

Other voluntary NPS pollution initiatives in the Lake Erie Basin are successfully addressing manure management practices and non-agricultural sources of phosphorus and sediment such as construction sites and urban storm water. There are over 20 nonpoint source projects currently underway in the Lake Erie Basin.



During dry weather, wastewater from homes, businesses, and industry travels through combined sewers to the wastewater treatment plant. When it rains, however, the sewers receive pollutants from the runoff of streets, lawns, farm fields, parking lots, and any other surface on which the rain falls. This, in combination with excess storm water causes the combined sewers to overflow, sending a mixture of storm water and sewage directly into rivers and streams.

A Combined Sewer Overflow (CSO) Abatement Program can reduce the amount of wastewater flowing into rivers and streams by collecting the overflow and storing it in an underground tunnel until the rain stops. The wastewater is then conveyed to the wastewater plant for treatment. The City of Toledo has undertaken an extensive project to create its own CSO



Construction of Toledo's CSO Pipeline Storage Tunnel System. Photo courtesy of the City of Toledo.

Abatement Program. Its CSO Abatement Program was designed to address the problems associated with overflow, and emphasis was also placed on increasing stream oxygen levels, reducing bacteria concentrations, and improving stream aesthetics.

Toledo's CSO Pipeline Storage Tunnel

System consists of three storage tunnels, each 13 feet, 6 inches in diameter. This system will collect the initial flush from street catch basins and sewers, and store the combined wastewater until it can be pumped to the treatment plant. The CSO tunnel system will collect and store from 50 to 80 percent of the overflows from 12 combined sewer areas.

Combining these diverse nonpoint source initiatives with efforts to control point source pollution throughout the watershed will ensure clean, clear water for the people of Ohio.

Coastal Resources



Ohio Department of Natural Resources



Ohio Lake Erie Office



Charles Fink



Lake Erie, our Great Lake, is a very special component of the Great Lakes ecosystem. It is unique among the Great Lakes for many reasons. It is the most shallow lake and relatively warmer than the others. It is one of the most productive fresh waters found anywhere. Because of this Ohio may justifiably claim to be the "Walleye Capital of the World."

Only larger in area than Lake Ontario, Lake Erie is smaller by volume than the other Great Lakes. Yet, population density in the Lake Erie basin is easily the greatest among the Great Lakes and the use of Lake Erie waters for power generation, domestic uses, manufacturing, and commercial uses exceeds that of any other lake. Only Lake Michigan comes close.

Ohio's coastal area extends from our in-lake borders with the Canadian province of Ontario and the states of Michigan and Pennsylvania to Ohio's shorelands along 262 miles of coast. Many complexities underlie our coastal legacy.

While the loss of coastal wetlands has been profound, the remaining Lake Erie marshes have international importance for North American waterfowl. Partnership ventures are restoring thousands of acres of wetlands in the coastal area. And, while some urban ports have deteriorated, many are being reborn through waterfront redevelopment.

As with the rest of the Great Lakes basin, we face many complex environmental problems in the coastal area and Lake Erie basin. At the same time, we are presented with exciting opportunities to develop, restore, and revitalize the natural and cultural resources of the coastal area. This section of the State of the Lake Report describes just some of the important coastal management issues and how we are developing a comprehensive and coordinated program to meet these challenges.

Frances S. Buchholzer, Director, Ohio Department of Natural Resources

Water Quality

Lake Erie is an exceptional source of high quality water. Over 3 million gallons are withdrawn from the Lake each day in Ohio. Although Ohioans usually think of domestic water needs for drinking, bathing, and washing; these are only a small fraction of the water used in Ohio. The majority is used in industry and to produce electricity. In fact, many cities along the Lake are beginning to aggressively market their accessibility to vast quantities of pure and inexpensive water.



Twenty-eight community water systems, which provide water to 2.5 million residents, use Lake Erie as the source of their raw water. In total, these systems produce over 473 million gallons of finished water on an average day. All of the systems treat and disinfect the water prior to distribution, which is required by state regulation.

The Great Lakes governors and premiers signed the Great Lakes Charter in 1985 in order to protect the

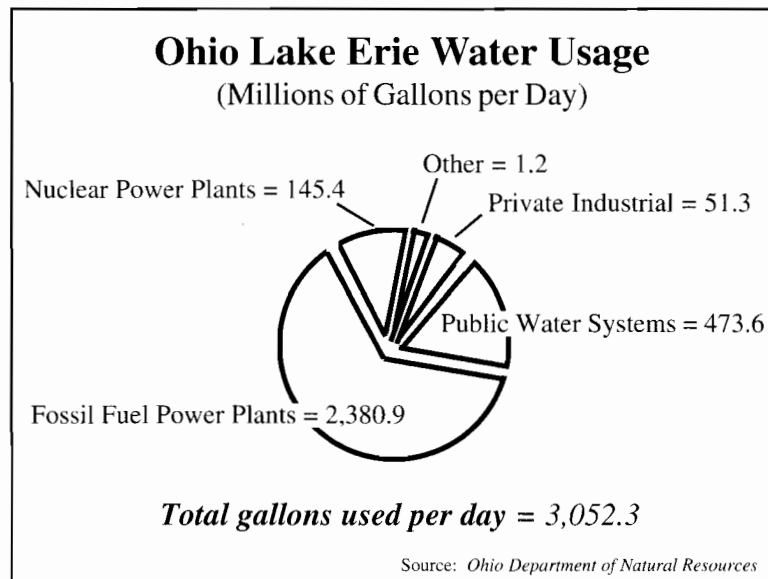
Great Lakes from diversions. The Great Lakes Charter recommends programs that the states and provinces need to adopt and implement to begin to protect the Great Lakes waters. In 1984, Ohio passed a law requiring a permit for diversions from the Lake Erie basin of more than 100,000 gallons per day. In 1988, the Ohio General Assembly passed House Bill 662, which establishes the other Great Lakes Charter programs in Ohio law. Under Ohio's diversion law, two existing municipal diversions from the Lake Erie basin were permitted in 1985. No other applications for new diversion in Ohio have been received.

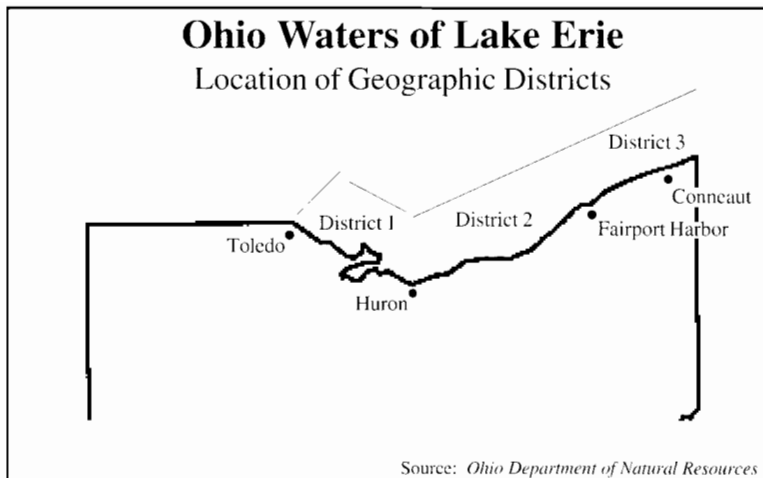
The federal Water Resources Development Act of 1986 requires approval of all the Great Lakes governors for any new or increased diversion of Great Lakes water out of the Great Lakes basin. In 1991 and 1992 the Ohio Department of Natural Resources (ODNR) and the Governor's Office reviewed and discussed a proposed diversion to Lowell, Indiana, out of the Great Lakes basin. Ohio did not object to the diversion because the proposed diversion was under the Great Lakes Charter threshold of 5 million gallons per day. The proposal was not approved due to Michigan's objections.

Pursuant to the Great Lakes Charter, a Great Lakes Regional Water-Use Data Base was created at the Great Lakes Commission. Each Great Lakes state and province submits annual data on use of Great Lakes basin waters. Ohio data is compiled from ODNR's Water Withdrawal Facility Registration and Water Planning Programs.

Lake Erie Fish Stocks

Complexities inherent in managing Lake Erie's fisheries are evident in the current population trends; upward for walleye, downward for yellow perch and white bass, and upward for smallmouth bass. The walleye, again, are back. Lake Erie experienced two of its best years of walleye reproduction in 1990





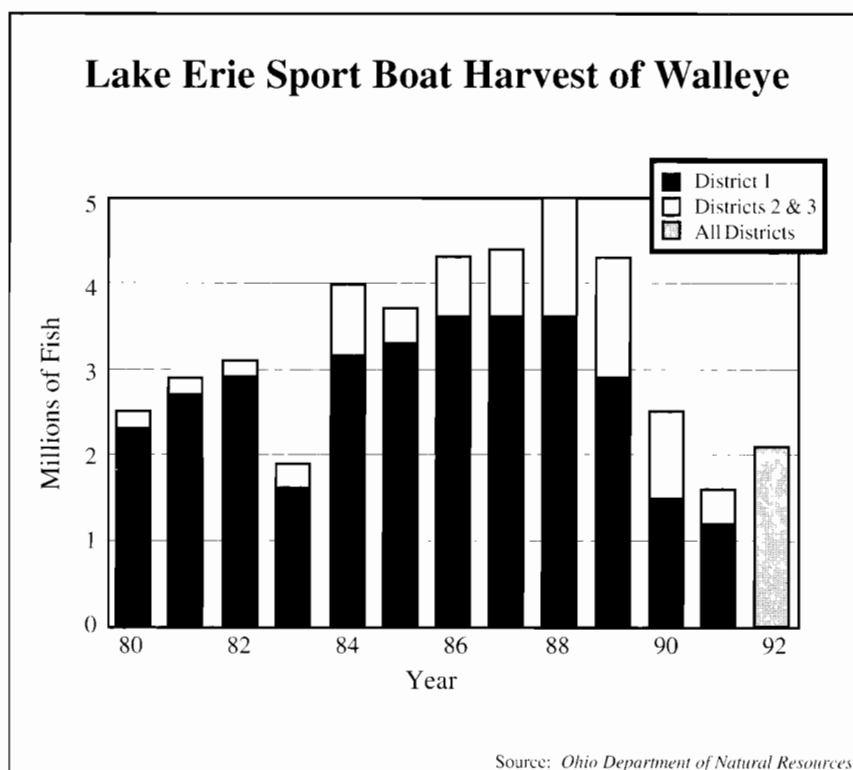
and 1991, following several years of poor spawning success. Ohio Department of Natural Resources' (ODNR) Division of Wildlife research data indicate walleye numbers are climbing again, with noticeable fishing improvement in 1992. If projections hold up, it may be necessary to consider increasing the daily walleye limit in order to more fully utilize Ohio's share of the lakewide walleye

quota. Harvest quotas, as set by the Great Lakes Fishery Commission's Lake Erie Committee, were 5 million walleye in 1991, and 6.2 million in 1992. Ohio's 1992 walleye quota share was set at 3.2 million.

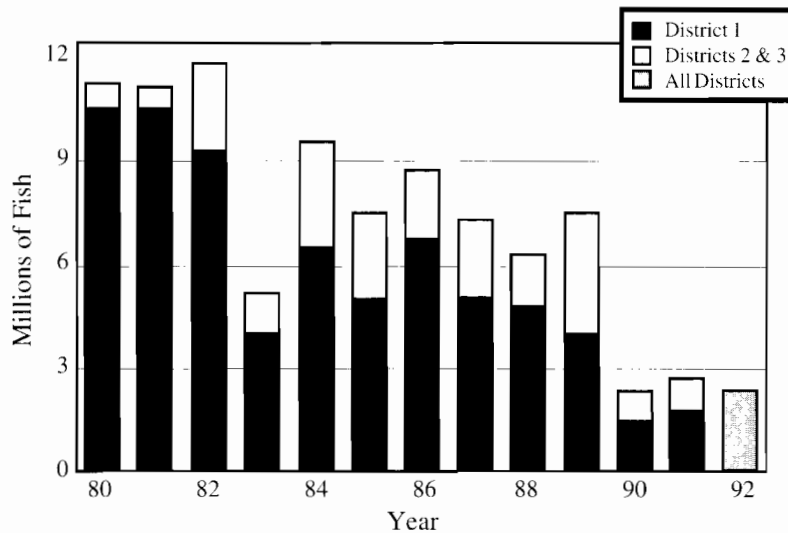
The past few years have shown higher hatches for walleye, and now that these fish are reaching "keeper" size, the harvests appear to be increasing. The catch rate of walleye in the western basin of Lake Erie was three times higher in the early part of 1992 than in 1991. Catches of fish exceeding 24 inches in length were more common. Lakewide walleye harvest in 1992 was 2.1 million, which is a significant increase over the 1.6 million fish taken in 1991. Fisheries

biologists anticipate that the upward trend in the walleye population should continue into 1993.

The yellow perch population numbers are more troubling. In response to a continuing decline in yellow perch stocks in Lake Erie, Ohio has proposed reducing the commercial harvest beginning in early 1993. Yellow perch stocks have declined to their lowest levels in 15 years due to poor reproduction and survival since 1987. Spawning success in 1991 was poorer than in the previous two years, and significant improvements in the



Lake Erie Sport Boat Harvest of Yellow Perch

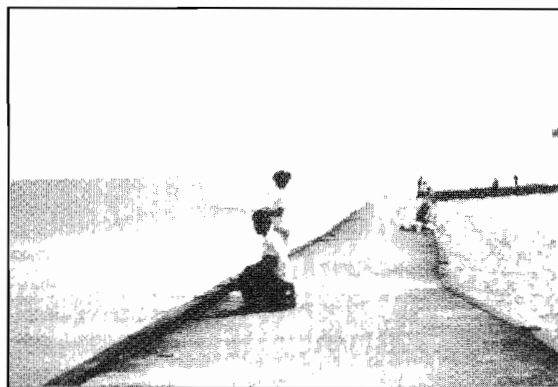


Source: Ohio Department of Natural Resources

population are not anticipated in the near future. The decline is believed to be related to high harvests, predation, and competition from other species. Sport fishing harvest of yellow perch was 2.4 million fish in 1992, continuing a downward trend. Sport fishing effort for yellow perch was the lowest ever record indicating satisfaction has decreased dramatically in recent years.

The Lake Erie smallmouth bass fishery is showing a trend of increased recreational harvest. In 1991, more than 41,000 smallmouth bass were taken, up from 39,000 in 1990 and 26,000 in 1989. Reproduction in 1991 was at a high level, and smallmouth abundance is projected to remain stable through 1995.

The fisheries of Lake Erie generate millions of dollars in revenue every year. Although there is a fluctuation in fish stocks, Lake Erie continues to produce large numbers of fish and the outlook is encouraging for both sport fishing in the future.



Gene Gus, of Port Clinton, has lived on Lake Erie his entire life. Born and raised in Cleveland, he moved to the Port Clinton area in 1977 to run a charter fishing service. Gene's love for the lake began as a child, when his father would take him fishing off downtown Cleveland.

Gene has watched the charter industry increase over 35 fold in the past 15 years. Having seen the dramatic increase occur, he claims that the "current demand for charter boats could have never been met by the few original charter services."

Even though there has been an increase in the sport fishing industry Gene doesn't believe that "the Lake can be over-fished by hook and line. ODNR monitors the fish hatches each year and regulates the limits per person on certain species. They have done a great job of regulating limits for a long time and should never hesitate to do what is best for the Lake, even if that means lowering a limit."

Gene remembers a time when people came to the lake to fish, catch their limit and go home. But this time seems to have passed. It has given way to a time when "people want to bring their families to enjoy all the wonderful things that Lake Erie has to offer - not just fishing."

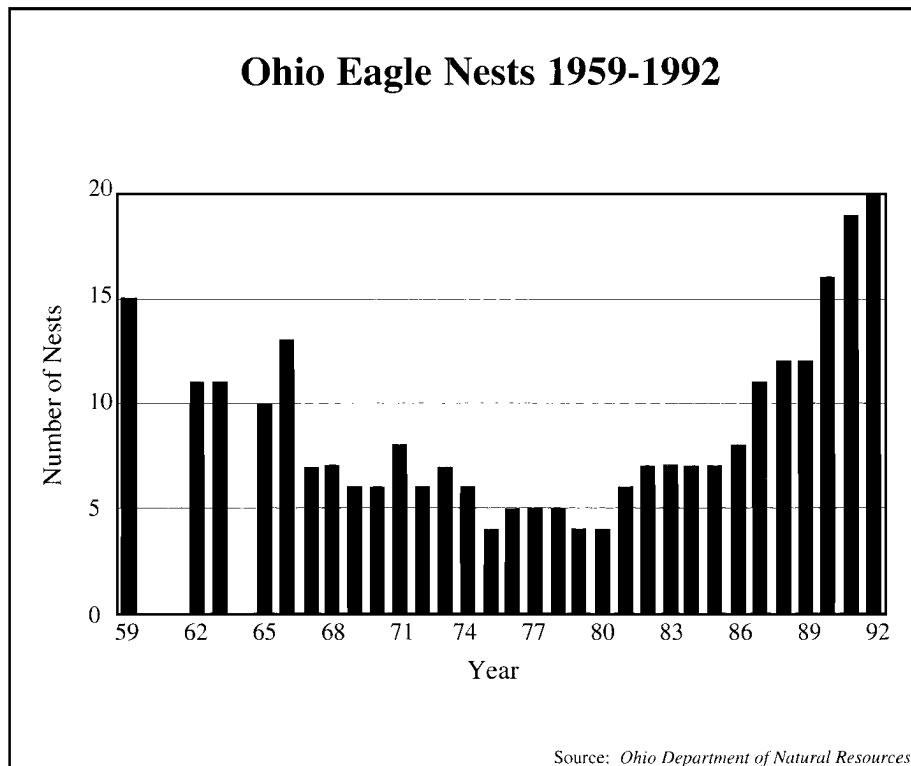
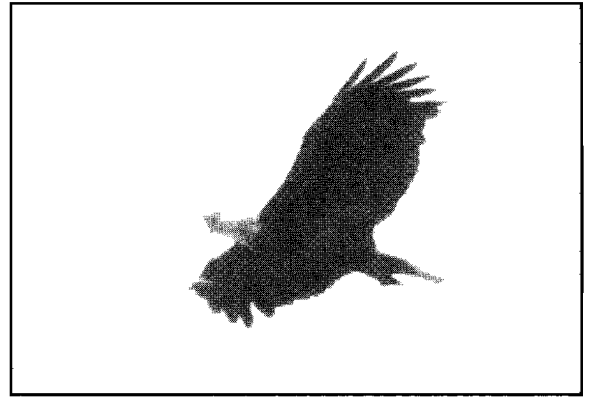
Bird Populations

Bald Eagles

Once again our national symbol can be seen along the western basin of Lake Erie in increasing frequency. Surprising as it is to many Ohioans, the bald eagle has not

always been a common sight in Ohio. In this state and across this country, the bald eagle has experienced severe declines in population due to habitat loss and toxic contaminants.

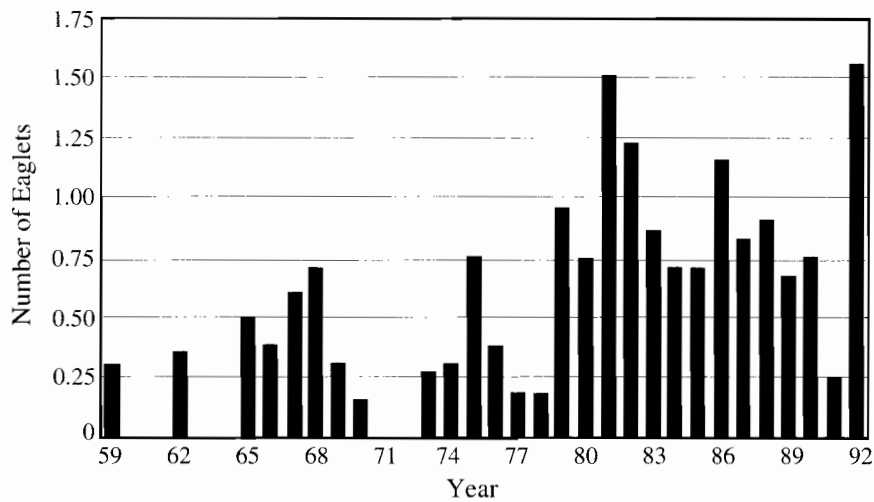
By 1979, Ohio's population dipped to four breeding pairs with very spotty reproduction. That year marked a turning point for the fortunes of the bald eagle in Ohio. The Ohio Department of Natural Resources' Division of Wildlife initiated a restoration project with four major objectives designed to stabilize and reverse the declining population trend in Ohio. These objectives were education, rehabilitation, nest stability, and population augmentation. Education goals were to educate the Ohio public of the importance of the eagle and the special protection laws. The bald eagle is the most protected bird in the



world, with three acts of Congress providing coverage. The Migratory Bird Treaty Act, the Eagle Act, and the Endangered Species Act all offer protection, with the Endangered Species Act being the most comprehensive.

Rehabilitation can have population significance when deal-

Eaglets Per Nest 1959-1992



Source: Ohio Department of Natural Resources

ing with endangered species. For example, Ohio was down to eight adults in 1979, therefore each animal was highly important.

The bald eagle is a super canopy nester, requiring extremely large trees. As Ohio was logged over, the large oak, hickory and ash trees were removed, while dutch elm disease killed off the native elm trees. The eagle was left with far inferior tree species, such as cottonwood, over much of its range. These large brittle trees often failed under the huge weight of the eagle's nest and the timing of that failure resulted in lost eggs, young, and adults. The objective of the restoration plan was to go into territories with poor nest trees, locate a suitable tree and erect an artificial nest base to offer ready alternatives to the nesting pair.

The fourth objective, and probably the most important, was population augmentation. This employed the technique of fostering captive born young into wild nests for the wild eagles to raise. Many of Ohio's birds could not hatch their own



An Ohio eleven week old bald eaglet. Photo courtesy of Jim Fisher.

eggs but made good parents. This operation increased productivity not only to stable production levels, but to levels capable of resulting in growth. By 1988, the Ohio population had climbed to self-sustaining levels, allowing for the discontinuation of fostering. A major factor assisting this restoration plan was the outlawing and subsequent decline in the pesticide DDT. This pesticide was a major cause of the reduced production ability that led to the population crash.

Today, the population level stands at 20 breeding pairs. This was the goal set by the Ohio Division of Wildlife for the year 2000. Breeding pairs are now capable of hatching their own eggs and are expanding into territories once thought of as questionable eagle habitat. On the surface, the Ohio population, much as the continental population, is showing great strides in expansion. However, a more in-depth look shows there are still questions and concerns. The unprecedented success of 1992, when 31 eaglets fledged, obscures the massive failure in 1991, when an estimated 60 percent of all Ohio eaglets died in the nest. As far as population structure, 1992's success will more than make up for 1991's failure, but does not eliminate what happened. The cause of the failures remains unknown. Preliminary data analysis for contaminants show mixed results, and only more in-depth analysis may shed light on the situation.

The health of the breeding population is also of concern. Levels of DDT, outlawed since 1972, though showing a dramatic reduction, still remain above levels associated with normal reproduction in bald eagles. Levels of PCB's, also illegal since 1972, remain well above levels associated with normal reproduction, and are not decreasing. As a result, intensive monitoring of the breeding population will continue in 1993.

A second area of concern is that of habitat. Ohio continues to exert increasing pressure on the wetland habitat base and with that, the bald eagle. Ongoing research conducted by the Ohio Division of Wildlife on habitat use by fledgling bald eagles raises concern about Ohio's habitat base. Unlike the adults, newly independent fledglings are showing little tolerance to human activities. How many eagles can be forced into the few inviolate areas we have left before stress or epidemics interact is unknown. In 1992, as many as 25 to 30 eagles had been seen at one time on the Ottawa National Wildlife Refuge.

In summary, the 1992 bald eagle nesting season has been an exceptional bright light on what has been an extremely successful Ohio Division of Wildlife endeavor. While there are questions and important concerns, we are heading in the right direction.

Ring-billed Gulls

Another cause for concern is the disappearance of the ring-billed gull colony, which formerly nested at the mouth of the Maumee River. The colony, which at 2,000 to 3,000 pairs was one of the largest on the Great Lakes, met total reproductive failure in 1991. All young died in the egg or during the initial stages of hatching. The cause of the failure is unknown and no eggs were

available for analysis. An intensive sampling program was planned by the Ohio Department of Natural Resources' Division of Wildlife and the U.S. Fish and Wildlife Service for 1992. However, the colony failed to return to nest in 1992. Remnants of the colony are believed to have joined populations along the Michigan Lake Erie shoreline and the Detroit River. The ODNR will continue to monitor the site for signs of a colony returning.



The Ring-billed gull colony that was at the mouth of the Maumee Bay was one of the largest on the Great Lakes. Photo courtesy of Mark Shieldcastle.

Coastal Area Wetlands and their Restoration

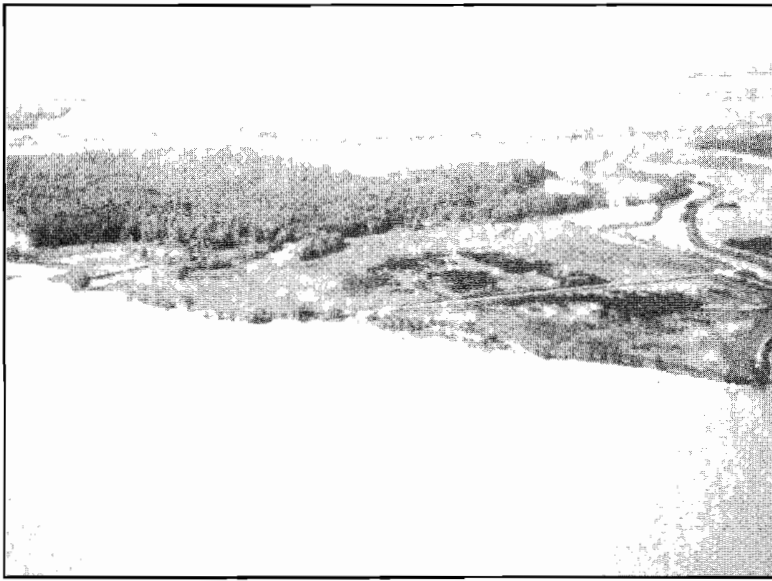
There has been a steadily increasing public awareness of the value of wetlands and growing concern nationwide over our vanishing wetland resources. The federal government's Status and Trends Report on the nation's wetlands has given Ohio the unwelcome notoriety of being among the states having the greatest percentage losses of wetlands. There has been a continuing conversion of Lake Erie marshes and coastal area wetlands to other uses, often irreversible. This is a result of ever-increasing pressures from commercial development, agriculture, lakeshore living, and recreation.

Ohio's coastal wetlands are especially important to waterfowl and other migratory species. In pre-settlement times, the former Great Black Swamp of northwest Ohio was comprised of nearly 300,000 acres of marshes spreading eastward along Lake Erie. Today, an estimated 30,000 acres remain. However, the outlook for coastal wetlands is looking better all the time, reflecting positive trends in wetlands conservation statewide.



The construction of new dikes at Pickerel Creek Wildlife Area is part of a \$1.5 million project which will restore 860 acres of Lake Erie coastal wetlands.

Wetlands protection issues seem as complex and dynamic as wetlands themselves. While touching on some of these, we are highlighting coastal



Pickerel Creek Wildlife Area

wetlands restoration because of its critical importance to state and national priorities for wetlands conservation. Indeed, we are dedicated to establishing Ohio as one of the nation's leading states in wetlands restoration.

The past several years have been busy and productive. Under the broad umbrella of the North American Waterfowl Management Plan (NAWMP), the Ohio Department of Natural Resources' (ODNR) Division of Wildlife and

its many partners protected, restored, and enhanced approximately 3,800 acres of Lake Erie wetlands. Notable highlights include:

Private Land Wetland Restorations: The Lake Erie marshes are a prime focus area under NAWMP. Private wetlands are an important component of Lake Erie's coastal marshes and many potential restorations exist. The Ohio Division of Wildlife has been working with private landowners to restore converted wetlands and spends \$50,000 annually statewide to assist with the restoration of small wetlands. Several hundred acres have benefited from this program, many of which are in the coastal area or the Lake Erie watershed.

Pickerel Creek Wildlife Area: A flagship project under the NAWMP has restored 860 acres of old field and cropland to wetland habitat. The Ohio Division of Wildlife, Ducks Unlimited, and other partners attracted \$750,000 in federal matching grants, which assisted this unprecedented partnership in creating habitat for waterfowl, bald eagles and other wetland wildlife.

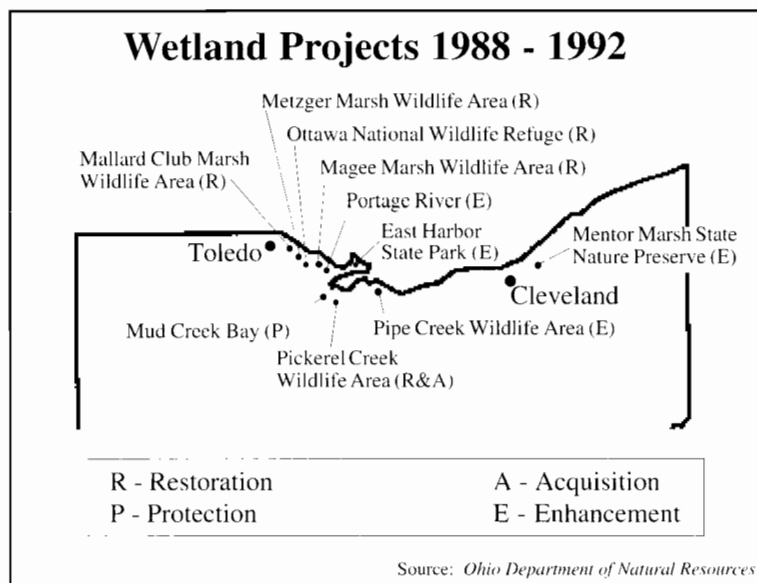
Mallard Club Marsh Wildlife Area: More than 400 acres between Maumee Bay State Park and Little Cedar Point National Wildlife Refuge are being restored to productive wetland habitat by the Division of Wildlife, Maumee Valley Audubon chapter, Ducks Unlimited, and others.

Pipe Creek Wildlife Area: In Sandusky Bay, is home to the largest common tern colony in the state. The site was initially developed to serve dredged material disposal and mitigation needs for habitat destruction associ-

ated with nearby waterfront development. The Ohio Division of Wildlife has assumed ownership and has begun a large effort to develop 100 acres of marsh by rebuilding dikes, debrushing nesting islands, and installing water control structures.

Approximately 400 acres of marsh have been restored or enhanced, including restoration of the Turtle Creek Bay Marsh Unit, a 182 acre section that had been inundated by the turbid waters of the bay for 20 years. Several adjacent landowners, Ducks Unlimited, and the National Fish and Wildlife Foundation are cooperating with the Ohio Division of Wildlife. Magee Marsh is also where Ducks Unlimited's "Blue Goose" bulldozer performed its first marsh restoration project, enhancing 150 acres of emergent wetland and nesting cover.

Adjacent to Sandusky Bay, Mud Creek Bay was designated as a waterfowl refuge in a cooperative venture between the Ohio Division of Wildlife and the Winous Point Shooting Club. This 2,400 acre bay is the most important migration area for black ducks on the continent.



At East Harbor State Park, the Ohio Division of Parks and Recreation is cooperating with the Ohio Division of Natural Areas and Preserves to restore wetlands habitat for rare plant species. This applied research project is receiving funding assistance from the Lake Erie Protection Fund. Knowledge gained will be useful for land management decisions, and wetlands restoration and management projects in other parts of the coastal area.

Wetland habitat improvements are being realized through the cooperation of the Ohio Division of Natural Areas and Preserves, the City of Mentor, and Mentor Marsh Board of the Cleveland Museum of Natural History. In order to mitigate wetlands loss due

to roadway reconstruction, wetland habitat improvements are being developed within Mentor Marsh State Nature Preserve, which should benefit wildlife use of the area and enhance the recreational experience of visitors to the area.

In addition to wetlands restoration, there are other activities being undertaken which are important to the conservation of coastal wetlands. The Ohio Division of Wildlife, in cooperation with the U.S. Soil Conservation Service, The Ohio State University Center for Mapping, and ODNR's Division of Soil and Water Conservation, is developing Ohio's first-ever statewide inventory of existing wetlands using state-of-the-art computer technology and satellite imagery. Coastal area wetlands were the first to be analyzed in this project.

No naturally functioning coastal wetland in the entire Great Lakes is studied, monitored, and researched more than the Old Woman Creek State Nature Preserve and National Estuarine Research Reserve. Established through a state and federal partnership with the National Oceanic and Atmospheric Administration, it is the only such reserve in the entire Great Lakes. Monitoring and research at Old Woman Creek is producing information on wetland processes and functions, the effects of nonpoint source pollution in the watershed, and other data which will be applied to coastal management decisions in the future. The recreation and public education benefits derived from the Ohio Division of Natural Areas and Preserves' management of this facility are invaluable to coastal management.

Congress has designated and mapped six areas along the Lake Erie shore as units of the Coastal Barrier Resources System. Federal flood insurance and financial assistance is prohibited for development on these barriers. Lake Erie wetlands are the prime beneficiary. Congress established the Coastal Barrier Resources Act to discourage development of coastal barriers in order to accomplish three goals:

- Minimize loss of human lives and property

- Reduce wasteful federal expenditure for emergency relief and flood insurance

- Prevent the destruction of fragile coastal ecosystems and the abundant wildlife they support

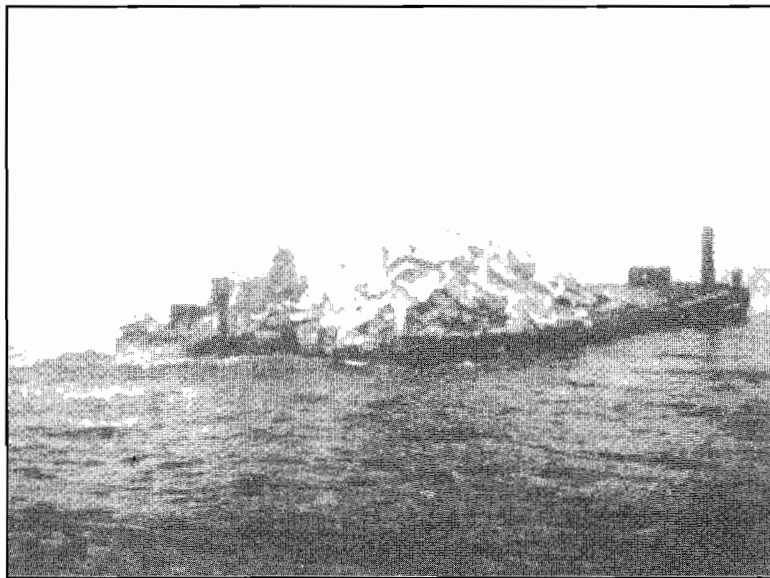
The Act established a 186 unit System along the Atlantic and Gulf coasts, and expanded it with the addition of the Great Lakes, in which federal funding

for roads, bridges, sewers, water lines, housing, and insurance prohibited. The State of Ohio is adding to the system five state-owned sites (Sheldon Marsh, Old Woman Creek, Kelleys Island North Pond, Mentor Marsh, and Headlands Dune State Nature Preserve) and one owned by The Nature Conservancy and Lake County (Arcola Creek).

Artificial reefs have been constructed throughout the world in both freshwater and saltwater habitats. When constructed with the proper materials, placed in the right location, and developed with a specific purpose and plan, artificial reefs have proven to be successful fisheries management projects.

The Ohio State University's Sea Grant Extension Program developed a Lake Erie Artificial Reef Project during 1983. The purpose of the project was to develop demonstration artificial reefs within close proximity to ports of shelter and small boat access, and to evaluate the feasibility and productivity of the artificial reefs.

Ohio's artificial reef project began in 1984. The Ohio Department of Natural Resources received permits from the U.S. Army Corps of Engineers and authorized Sea Grant to initiate construction on the first

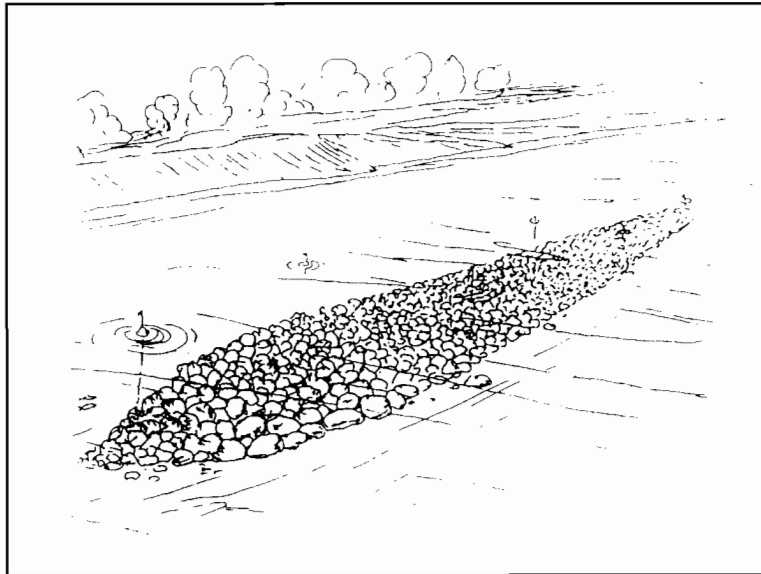


Construction of the artificial reef off of Lorain. Materials for this project were donated by a variety of sources. Photo courtesy of Ohio Sea Grant.

reef in Cuyahoga County. Since that time, reefs have been completed in Cuyahoga County in 1987 and in Lorain County in 1989. Additional reefs are on hold awaiting scientific evaluation of the Cuyahoga and Lorain County structures. The Lorain County reef consists of two structures; one about 370 meters long and the second about 183 meters long. The Cuyahoga County reef consists of one structure 213 meters long in 8.5 meters of water and a series of "rubble piles" in deeper water. The North Central Advisory Committee

of Ohio Sea Grant Advisory Service generated the materials and financial resources and distributed the materials along the Lake for construction of the Cuyahoga and Lorain County reefs.

Anecdotal reports from private anglers and charter captains have both revealed that reefs provide good fishing opportunities for smallmouth bass, yellow perch, and walleye. Amateur underwater video from 1989 and 1990 disclosed a high concentration of fish on the artificial reefs.



An artistic rendering of an artificial reef. Drawing courtesy of Ohio Sea Grant.

In 1992, two formal research efforts were conducted at the Lorain artificial reef site. The first project involved a rigorous underwater VHS video assessment to determine fish species, numbers, diversity, and seasonality of habitation at the artificial reef site. The second research effort was conducted to determine the economic impact of the artificial reefs.

Results from the two research efforts will be used to assist coastal communities in deciding on whether to construct artificial reefs. They will also be used by the scientific community for Great Lakes artificial reef development.

Ohio Coastal Management Program

Since Ohio's Coastal Management Law went into effect in March 1989, the state has made steady progress in developing policies and putting into place the authorities and organization to implement the Ohio Coastal Management Program. It is a multi-faceted program concerned with all aspects of protecting, managing, and developing the land and water resources of the coastal area.

Ohio's policies are being organized and prioritized with continuing input from the general public, local jurisdictions, state, federal and regional agencies,

and independent organizations. As a result, the state has identified its top priority coastal management issues:

- ✿ Increasing and improving access to Lake Erie and shoreline areas
- ✿ Controlling toxic and nonpoint source pollution of coastal waters
- ✿ Protecting and restoring coastal wetlands and other ecologically sensitive areas
- ✿ Encouraging sound economic development emphasizing waterfront development and redevelopment
- ✿ Managing coastal erosion hazard and flood hazard areas

Ohio Department of Natural Resources (ODNR) is working with local jurisdictions and the State's federal partner, the National Oceanic and Atmospheric Administration (NOAA), to complete the final stages of program development. The Lake Erie erosion hazard area is being mapped, and rules for enforcing the erosion hazard area are being prepared. Taken together with other coastal management policies adopted since 1989 and mechanisms developed for coordinating activities among governmental agencies, these rules will get the Ohio program ready for formal adoption.

Preparation of a final draft program document and a programmatic environmental impact statement are underway. Under a cooperative agreement with NOAA begun October 1, 1992, ODNR is working toward a goal of federal approval and full federal funding in the fall of 1993.

Lake Erie as a Public Trust

The Ohio Department of Natural Resources (ODNR) has worked very hard since passage of the State's Coastal Management Law to assert the State's interest in and control over the territory of Lake Erie. This law delegated responsibility for the administration of Lake Erie submerged lands to the ODNR. An important task has been educating governmental officials, property owners and developers, and real estate interests on the Public Trust Doctrine.

The waters of Lake Erie within Ohio's boundaries, together with the soil beneath and their contents, belong to the State of Ohio as proprietor in trust for the people of the State. Most Ohioans do not fully appreciate how the waters of Lake Erie, the lands beneath, as well as the living resources inhabiting Lake Erie, are public trust resources.



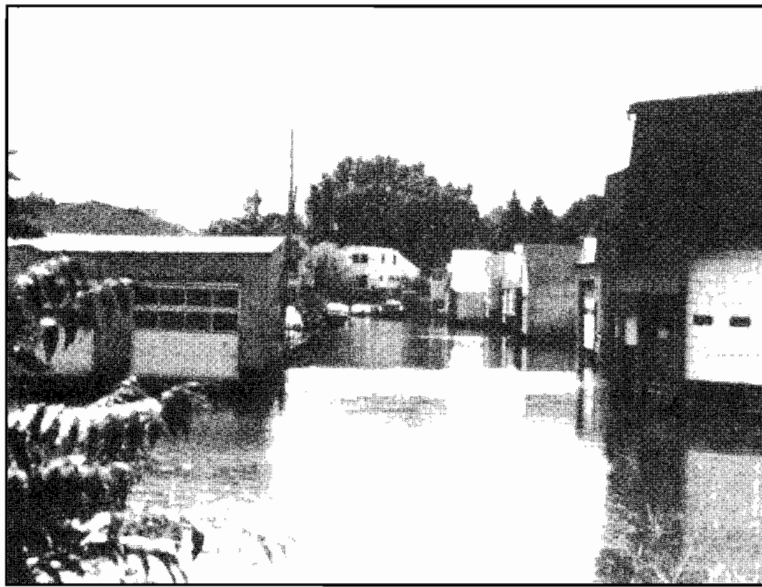
Edith Chase, of Kent, has given a lifetime of service towards preserving Ohio's Lake Erie shoreline. Currently, the president of the Ohio Coastal Resource Management Project and vice-chair of Ohio Department of Natural Resources' Coastal Resource Advisory Council, Edith was inducted this year into the Ohio Conservation Hall of Fame. She also has no plans to retire as one of the Lake's most persistent and effective guardians.

Edith sees the last 20 years generating a much greater public appreciation of the north shore as a valuable resource — but one that needs to be protected. While she fears that "we may be loving the shore to death," Edith is heartened that many more people are much more involved now, individually and collectively, in working for a better coastal stewardship. She says that "it doesn't do any good merely to say, I don't like the system. You have to do something about it."

"Our challenge for the future," she says "is to adopt those lifestyle changes necessary so that humans can live in harmony with the ecosystem. We need to work for a sustainable society for our children and grandchildren."

Title to these trust waters, lands, and resources is a special title, and establishes the right of the public to use and enjoy Lake Erie for a wide variety of public uses. This in essence, is the Public Trust Doctrine, affirmed and reaffirmed by the Supreme Court of Ohio.

Littoral owners of the upland on Lake Erie have no title beyond the natural shoreline, but have the right of access and wharfing out to navigable waters. That right is a property right and is subject to the superior right of the State as the owner of title in trust, and of the United States with the federal government's exclusive power over interstate commerce.



Under Ohio's new submerged land regulations, boathouse developments such as these will require submerged land leases.

The fundamental premise of Ohio's public trust law can now be found in Ohio Revised Code Section 1506.10 (Chapter 1506, Coastal Management). The State of Ohio, as a public trustee cannot abandon public property and cannot convey submerged lands to private persons. However, in exercising ownership and control, the State does control development upon Lake Erie through the

medium of leases to those who occupy state-owned submerged lands.

A publication entitled "Lake Erie: The Public Trust in Ohio" was prepared in 1990 by the Chicago Title Company, ODNR, and Office of the Attorney General of Ohio. It has been broadly distributed by ODNR to lease applicants and to interested parties. Staff of ODNR's Office of Real Estate and Land Management have participated in real estate seminars and workshops, and will continue to provide information and technical assistance to coastal area residents, local officials, and other interests.

On April 20, 1992, an important milestone was reached with the adoption of the first-ever rules for administration of Lake Erie submerged lands. These rules describe application procedures and list the criteria used to determine whether to approve an application for a submerged lands lease. The rules contain a rental rate schedule for all uses including an escalation clause.

The increased predictability of decision making by the State is an outcome of the State's rules, which is especially important to developers and the coastal area's waterfront communities and ports. This bodes well for economic development and waterfront revitalization, as well as protecting important coastal resources and public uses of Lake Erie.

The Office of Real Estate and Land Management has doubled the number of submerged lands leases processed between 1991 and 1992. It has also integrated the environmental review of activities on public trust lands with the submerged lands program. In 1993, the Office will develop a comprehensive inventory of fills and structures upon Lake Erie, and will conduct additional seminars and public education activities targeting real estate interests in particular. Additionally, ODNR is developing application forms and procedures that will simplify and consolidate the regulation of activities proposed on Lake Erie.

The rent received for a Lake Erie submerged lands lease is divided equally between the State and the local port authority, municipality or county that has jurisdiction. The Coastal Management Law provides that rents received by ODNR will be used for the administration of Lake Erie submerged land and also for coastal management grants. As the Coastal Management Program matures, ODNR expects local communities, townships, park districts, port authorities, and nonprofit corporations to benefit in many ways from Ohio's new approach in managing the Lake Erie Public Trust.

Coastal Hazards

Lake Erie Erosion Hazard Area

The Ohio lakeshore stretches 262 miles along the south shore of Lake Erie from Michigan to Pennsylvania. Of this length, 230 miles are along the mainland and 32 miles are around Ohio's numerous islands. Urban areas stretch much of the way along the eastern two-thirds of the Ohio shore, and wetlands and low-lying areas occupy much of the western third.

From Toledo to Huron, the shore consists of low-relief barrier beaches and banks made up of glaciolacustrine sediment, except the Marblehead-Catawba Island area where there are rock bluffs. From Huron to Conneaut, there are moderate to high relief bedrock or till bluffs. Bedrock bluffs can be

detected where there are broad promontories along the shore. Easily eroded deposits make up about 75 percent of the Ohio lakeshore.

Increasingly, development is confronted with the geologic processes shaping the lakeshore. Roadways, homes, and communities built along the Lake are threatened by erosion. There are approximately 2,000 residences within 50 feet of the bluff edge along Lake Erie. Of these, more than 1,100 are within 25 feet of the bluff edge. In the period from 1972 to 1976, estimated damages due to erosion and flooding exceeded \$65 million for the Ohio lakeshore. In 1985, losses totaled \$9 million in Lake County alone. In addition to direct losses, real estate values decline when the building is perceived to be close to the edge of the bluff.

Since the settlement of the coastal area, armoring of the coastline has decreased the rate of bluff erosion. Most wave erosion occurs during spring and fall storms, when the greatest amount of wave energy is expended along the shore. However, structures built in Lake Erie have caused changes in the distribution and width of protective beaches. Jetties built to protect harbors and dredging to maintain harbors and channels disrupt transport of sand along the shore contributing to beach and shore erosion. A structure that protects the shore in one location could worsen erosion on neighboring property because of wave reflection or disruption of sand movement along the shore. Barrier beaches that once lined much of the western basin shore have eroded or have been armored. Along the remainder of the shore, beaches have become narrower and more segmented as protection structures have been built. For many areas long the shore, the best protection against further erosion may be to establish a wide beach, because beaches absorb the wave energy and keep waves from eroding the toe of the bluff. Solving existing erosion problems and developing management strategies requires a better understanding of the geologic processes of the Ohio coast.

ODNR's Division of Geologic Survey is currently involved in a cooperative coastal erosion study with the U.S. Geological Survey. The technical information acquired in these studies will support development and implementation of the Ohio Coastal Management Program.

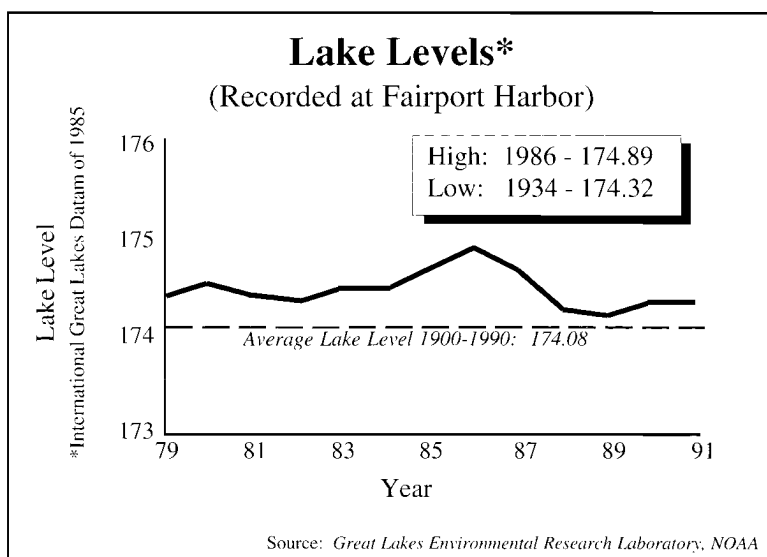
The Ohio Coastal Management Law requires the ODNR to identify the Lake Erie erosion hazard area. It also provides for regulating the construction or redevelopment of buildings within the erosion hazard area by permits issued either by ODNR, municipalities, or counties by the adoption of resolutions or ordinances within zoning/building regulations.

The survey is presently preparing maps that identify the Lake Erie erosion hazard area. Approximately 51 miles are classified by the Ohio Department of Natural Resources (ODNR) as critical erosion areas. After notification to property owners and local governments, ODNR will conduct hearings and will consider objections and recommended modifications to the erosion hazard area. Notification of the final identification will be sent to all property owners and local governments within the Lake Erie erosion hazard area.

At least every 10 years, ODNR will review and may revise the Lake Erie erosion hazard area, taking into account any recent natural or artificial changes that may affect the anticipated recession of the shoreline. Property owners, developers, and local governments stand to benefit from better information, consistent state and local regulations, and the use of scientific methods and objective standards throughout the lakeshore.

Coastal waters include Lake Erie, connecting waters, harbors, wetlands, and the lower reaches of tributaries influenced by Lake Erie. The effects of Lake Erie's fluctuating water levels can reach far into adjoining floodplains and low-lying areas. The Ohio Coastal Management Law defines coastal flood hazard area as "any territory within the coastal area that has been identified as a flood hazard area under the Flood Disaster Protection Act of 1973".

The 1980s saw record high lake levels over the entire Great Lakes Basin. As a result of those high lake levels and several damaging storms, the



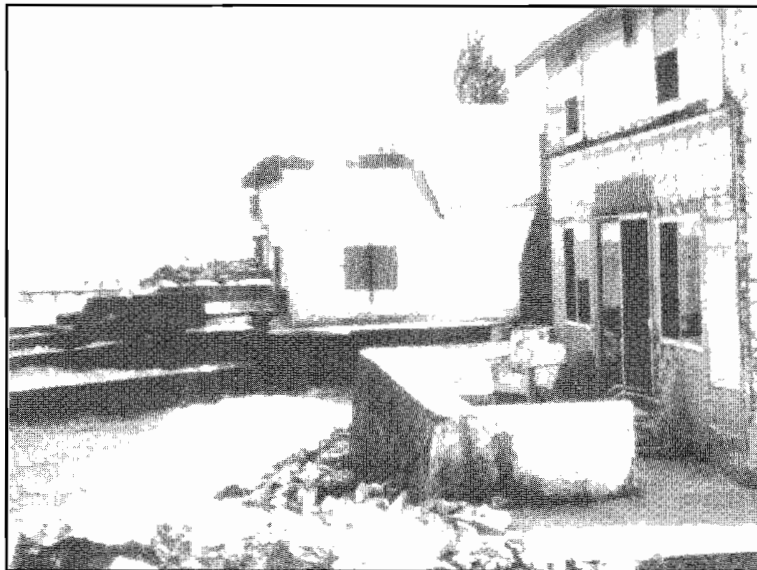
International Joint Commission (IJC) has been studying ways to mitigate high and low water levels on the Great Lakes. Both structural measures, such as regulatory structures on the Niagara River, and non-structural measures, such as land use controls, are being evaluated by the IJC Lake Levels Study Board. A final report from the Study Board to the IJC is expected by March 31, 1993.

Most of the Great Lakes have receded to their long-term average levels since the record high levels in the 1980s, but Lake Erie has remained above its long-term average. Lake Erie, as of October, 1992, was about one and one-half feet above its long-term average.

During the record high levels of 1985 and 1986, erosion rates increased, low areas were inundated, and infiltration and back-flow of sewer lines caused considerable damage in Ohio. Storms with gale force winds from the northeast lasting more than 12 to 24 hours can cause short-term increases in lake levels of five to six feet. It is during such storms that severe flood damage occurs. In November, 1972, a northeast storm caused over \$22 million in damages.

In order to try to reduce future flood damages, Ohio has required, as a part of the coastal management regulations, coastal communities to adopt and enforce hazard regulations. ODNR conducts periodic meetings with coastal communities under a cooperatively funded program with the Federal Emergency Management Agency to ensure local flood hazard regulations are being

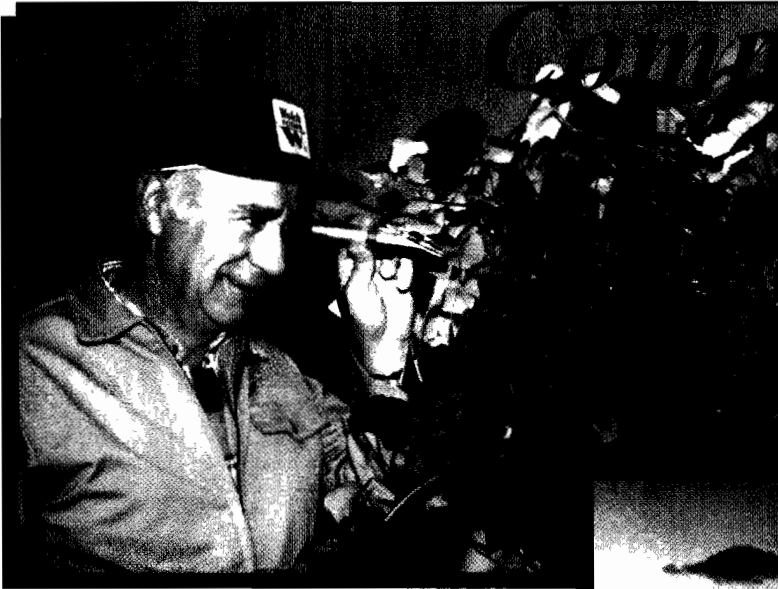
understood and implemented. In fiscal year 1992, community assistance and field visits were conducted in the Village of Bay View, the City of Lorain, Lorain County, and Erie County. All communities have adopted floodplain regulations. ODNR is working



Coastal erosion continues to be a problem for shoreline property owners. These homes in Oak Harbor are in immediate danger of becoming part of Lake Erie. Photo taken in June 1992.

with several coastal communities to update their regulations and to improve enforcement.

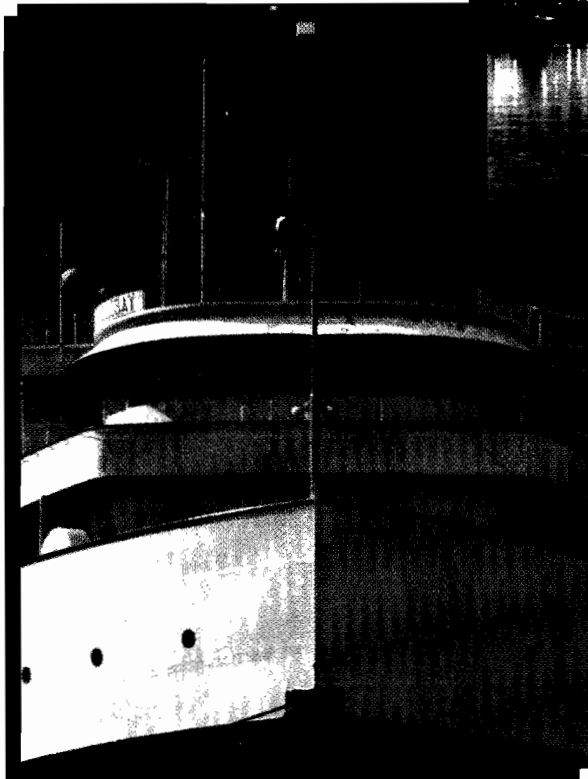
Economy, Commerce & Transportation



Ohio Department of Agriculture



© Chuck Allen Photography



Rob Wetzler



As you can tell from this report, Lake Erie is a resource of unlimited value to Ohioans. The diversity of Lake Erie is demonstrated by its value to so many industries dependent on clean water and transportation. The ability to float 65,000 tons of iron ore on a lake carrier results in lower transportation costs, which keeps Ohio's industries competitive with the world.

As a State agency, it is vitally important to recognize the impacts of our programs and activities on Lake Erie's resources. The diversity of Lake Erie activities creates the potential for conflicts among its many beneficiaries. The Lake Erie Commission is a forum for communication and coordination that allows Ohio to have a singular vision of the activities supported by the Lake. This is vital for industry to operate in an environmentally safe manner, and for recreational and commercial interests to coexist without conflict.

This section of the State of the Lake Report details the industries that benefit from the Lake Erie resource. The maritime and port industries are very visible in their dependence on the Lake. Just as dependent are the industries and utilities on the lakeshore to which Lake Erie's supply of clean water represents their life blood. The State of Ohio recognizes the importance of all these Lake Erie activities, and will continue to work to develop economic opportunities, while protecting the Lake Erie resource that sustains so many activities.

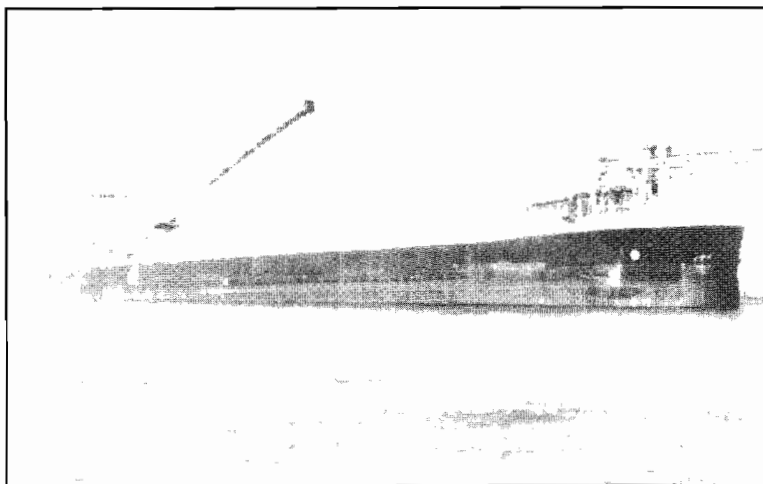
Jerry Wray, Director, Ohio Department of Transportation

Water ports are magnets of commercial activity, and Ohio is blessed with nine Lake Erie ports that facilitate domestic and international trade. The State of Ohio, through the efforts of the Ohio Lake Erie Commission, works to promote and develop the use of our Lake Erie ports.

When the Erie Canal was opened in 1825, the Great Lakes region was unlocked to settlement and, eventually, commercial interaction with the east coast. With bountiful natural resources and water transportation routes, the

north coast of Ohio experienced a boom in population and industrial growth. Ohio's maritime industry was integral in moving the commerce that fueled this growth.

Water transportation remains an important part of Ohio's economy. Today, the State's maritime industry is characterized by the U.S.-flagged interlake freighters that carry bulk cargo for Ohio's heavy manufacturing industries, and the ocean freight-



The M/V Buffalo loading limestone at the Standard LaFarge Dock in Marblehead.

ers that serve as Ohio's direct water link to the world. Foreign trade, combined with interlake commerce, accounts for more than 70 million tons of cargo for Ohio's industries each year.

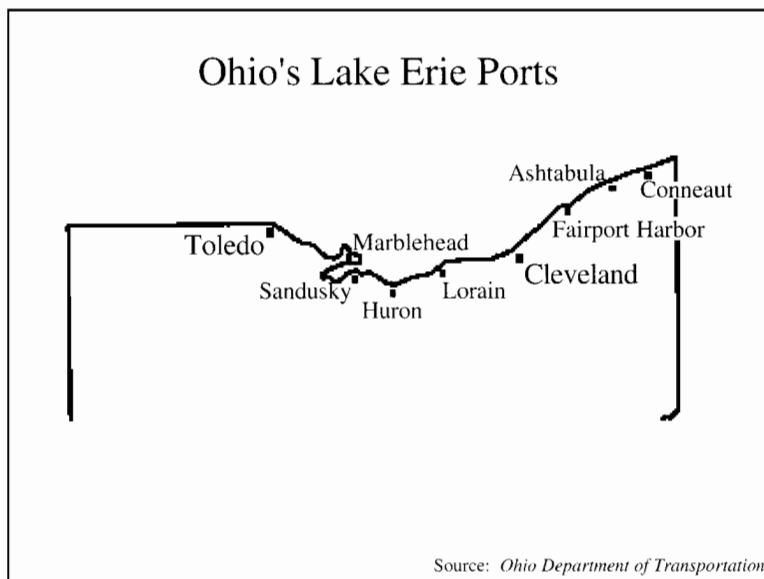
Ohio's nine Lake Erie ports -- Toledo, Marblehead, Sandusky, Huron, Lorain, Cleveland, Fairport Harbor, Ashtabula, and Conneaut -- are as diverse as the cargoes they handle. Marblehead serves one industry, while Cleveland and Toledo have trading links around the world.

Cargoes of iron ore, limestone, and coal make up the majority of commerce handled by U.S.-flagged lake carriers, with coal being the single largest commodity. Iron ore, mostly extracted from mines in Minnesota, is delivered to the ports of Toledo, Lorain, Cleveland, Ashtabula, and Conneaut. Limestone is a key commodity for the construction and steelmaking industries

and is handled in some form by every Ohio port. The ports of Toledo, Sandusky, Ashtabula, and Conneaut are the export points for all of the Appalachian coal shipped on the lakes to domestic and international markets.

Ohio's share of international trade through the St. Lawrence Seaway is mostly handled by the public docks of the Cleveland-Cuyahoga and Toledo-Lucas County Port Authorities. The port of Cleveland is the first major general cargo port west of the St. Lawrence Seaway, and its business is dominated by the steelmaking industry. Iron ore and ferrous metal alloys are moved through the Port for steelmaking firms throughout northeast Ohio. Cleveland's Foreign Trade Zone boasts a steel warehousing facility that handles import and export products for area steelmaking, automotive, and electrical manufacturing businesses.

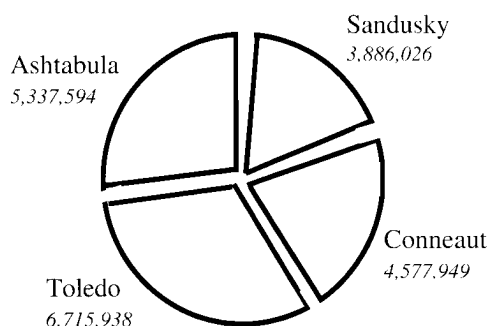
The Port of Toledo offers the largest Foreign Trade Zone on the Great Lakes at 135 acres. International commerce through this port includes steel products, and a wide range of other general cargo, such as newsprint, soap, paint and furniture products.



Toledo - Lucas County Port Authority

Coal Shipments from Ohio Ports in 1991

(Net Tons)



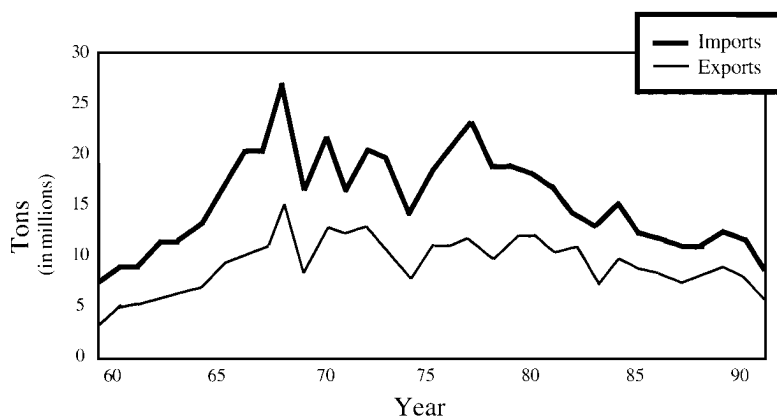
Source: Lake Carriers Association

Ohio's maritime industry is ever changing, reflecting the vitality of Ohio's dynamic economy. Although the maritime industry faces competitive challenges from railroads and trucks, it has been able to adapt and capitalize on new opportunities. In Ashtabula, Conrail invested more than \$12 million in new coal handling machinery, affirming the continued viability of Appalachian coal ship-

ments. The dock at Marblehead was expanded this year to accommodate larger ships and increase limestone shipments.

Passenger vessels continue to be an important part of the Lake Erie maritime industry. The increased popularity of the Lake Erie Islands has resulted in additional services throughout the region. This includes a new, larger vessel to service from Sandusky to Pelee Island and Leamington; and additional vessels connecting Port Clinton to Put-in-Bay and Marblehead to Kelleys Island.

International Shipping through Ohio Ports



Source: St. Lawrence Seaway Development Corporation

Ship-Ohio Campaign

As a leading industrial and agricultural state, Ohio relies heavily on an efficient and economical transportation network to export its goods. While Ohio enjoys the benefit of an excellent rail and highway system for domestic trade, its international links through its Lake Erie ports and the St. Lawrence Seaway have

never been fully developed. As a result, Ohio transportation dollars have been diverted to port ranges on the east and gulf coasts.

In order to enhance the State's water transportation capabilities and keep transportation dollars and jobs in Ohio, the Ohio Lake Erie Commission has embarked on a program to encourage companies to use Lake Erie ports for their international movements. Besides benefiting the State's economy, water-borne transportation is often cheaper for the shipper, more energy efficient, and less damaging to the environment than using trucks or trains to move materials for long distances.

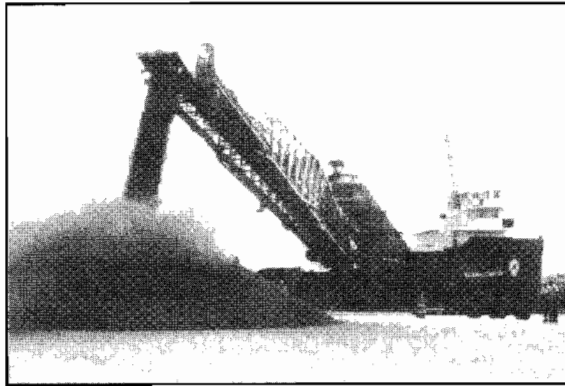
This Ship-Ohio Campaign has several objectives.

The immediate effort is to direct State agencies to import their goods through Ohio ports when it is cost effective to do so. The Ohio Department of Liquor Control is investigating ways to insist that their vendors import their international shipments of alcoholic beverages through Ohio ports. Similarly, the Ohio Department of Administrative Services is also assisting in Ship-Ohio by trying to add a clause to their bid specifications that require State grant recipients to use an Ohio port to import materials, when doing so will result in a lower or equal cost to alternate ports-of-entry.

This campaign is a private and public cooperative effort that is aimed at ensuring Ohio consumers the best price possible on their merchandise. Even more important, Ship-Ohio will keep Ohio's transportation dollars and jobs in Ohio.

Port Improvement

Many efforts are being made by the State of Ohio to improve the maritime industry in Ohio. Efforts are being made to increase the movement through the ports and to improve the capability of the ports by making funding available for improvement projects.



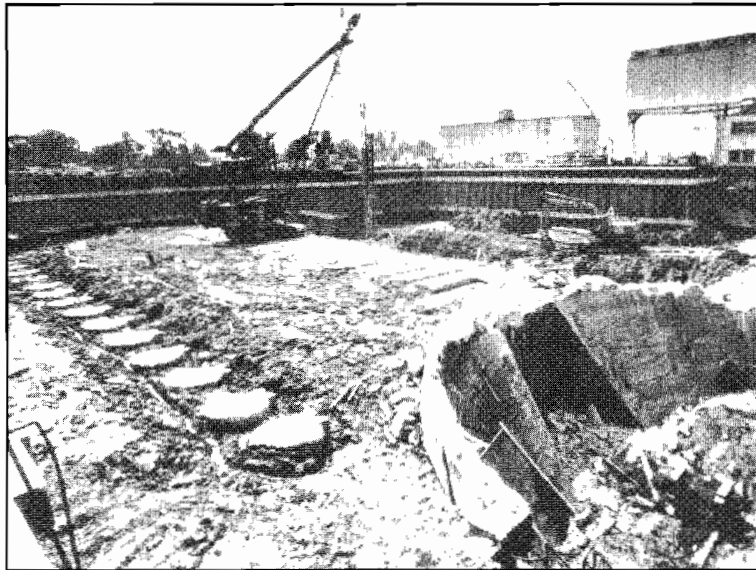
The M/V Agawa Canyon unloading alfalfa pellets at the Port of Toledo. Photo courtesy of the Toledo - Lucas County Port Authority.



Wayne Bratton is president of Trident Marine Corporation, a Cleveland business involved in several aspects of the maritime industry. Wayne has seen the decline in the shipping industry in the Port of Cleveland during the 11 years he has operated Trident Marine. He remembers that when he started "there were as many as 20 ships a day passing through Cleveland. In 1992, there were as little as 20 ships a week."

According to Wayne, the slow economy over the past few years is the major contribution to the slow down in shipping. He says that "people are not purchasing goods such as cars anymore. Since Great Lakes shipping depends heavily on iron ore, cargo shipping is directly affected."

Many efforts by the Ohio Port Industry and the State of Ohio are working to increase the amount of cargo moving through Ohio ports - especially manufactured exports. Wayne agrees with these efforts, saying, "I feel that exported products that are manufactured in Ohio should be shipped through a Lake port."



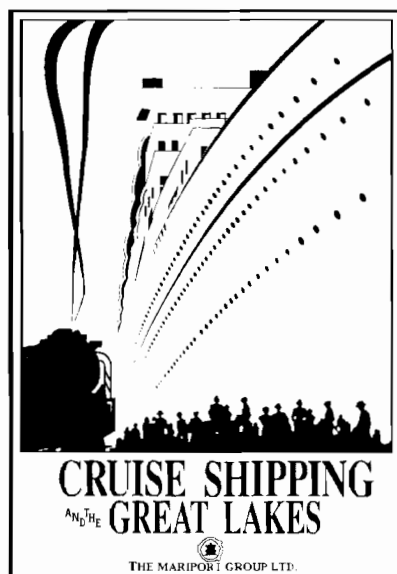
Construction of the now completed drydock extension at the Toledo Shipyard. Photo courtesy of the Toledo - Lucas County Port Authority.

Capital Improvements

The Ohio Department of Transportation's (ODOT) Port Capital Improvement Fund has been expanding the capabilities of Ohio ports. With the financial assistance of ODOT and the U.S. Department of Commerce, the Port of Toledo has increased the length of its main drydock from 650 to 800 feet.

This \$3 million project allows the Toledo Shipyard to accommodate all foreign ships transiting the Lake and 85 percent of the U.S. Lake Carrier Fleet. This project has more than doubled the shipyards' potential market and has already resulted in new contracts and many jobs.

Many other projects have been assisted by the Port Capital Improvements Fund. They include new fendering and roadways at the Port of Toledo, an extension of the Port of Cleveland's main overseas dock, and port master planning projects undertaken at Sandusky, Lorain, Huron, Fairport Harbor, Ashtabula, and Conneaut.



Cruise Shipping

The Ohio Lake Erie Commission has been involved during the past year in a Great Lakes Basin-wide effort to renew cruise service in the Great Lakes. The Great Lakes enjoyed a lucrative vacation cruise industry until the late 1940s when it was lost to other port ranges on the coasts. Those markets have largely matured, however, and cruise passengers desire new and different experiences.

To test the waters, the Ohio Department of Development (ODOD) and the Ports of Toledo and Cleveland are participating in a study that will

determine the feasibility of beginning a new cruise service. What is envisioned are 200 to 400 passenger capacity vessels that would run between U.S. and Canadian origins and destinations, frequenting many different ports-of-call along the way.

The goal of that study is to entice major liner services to begin a Great Lakes cruise service. The State is pursuing this opportunity as it is seen as a new business area for ports with excellent spin-off benefits in image and economic impact to northern Ohio.

Harbor Maintenance

Toledo Harbor is the largest maintenance dredging project on the Great Lakes. Each year, around one million cubic yards of sediment must be removed from the navigation channel to keep the port open to commercial traffic. A temporary resolution was found in 1992 for a long-term impasse over the disposal of their dredged sediments.

For many years, the U.S. Army Corps of Engineers has disposed of the majority of the dredged sediment in the open waters of Lake Erie. This practice was opposed by many local and State agencies as well as the U.S. EPA because of its negative impact on the receiving waters and the close proximity of the disposal site to the water intakes of the Cities of Toledo and Oregon.

An agreement was reached in the spring of 1992 whereby the Army Corps agreed to temporarily dispose of the majority of the sediment in the Port's confined disposal facility. In addition, the many parties have begun assembling a Long-term Sediment Management Plan. This group began its work during the summer of 1992 and has been given an October 1993 deadline for submission of its final report.

The planning group has been charged with looking at all alternatives for disposing of dredged sediment and limiting the volume of eroded sediment entering the Maumee River. An amount of \$400,000 has been appropriated by the U.S. Congress to fund this group. A preliminary list of possible



Woodtick Peninsula, a barrier peninsula in Michigan's waters of the Maumee Bay, is being studied for restoration using clean dredged sediment from Maumee Bay.

management alternatives include:

- Recycling the sediment into a topsoil product
- Upland erosion control
- Streambank protection
- Environmental restoration of Woodtick Peninsula (Michigan)
- Continue open-water disposal
- New confined disposal facility or expansion of current facility
- Conservation farming techniques

In Ashtabula, major hurdles have been cleared this year for interim dredging in 1993. In the Ashtabula River, PCBs released many years ago have created a deep layer of contaminated sediments. Overlaying this highly contaminated layer is a layer that, while still requiring confinement, is much cleaner and may be dredged using conventional procedures. In recent years,

the River has become quite shoaled and impassable to all but small boat traffic.

For the summer of 1993, plans are underway to dredge the navigational channel to six feet for recreational passage. A suitable site for construction of a confined disposal facility has been found and will be constructed near the mouth of the River. The larger problem of the PCB laden sediment layer is still to be resolved. This is the primary issue being addressed by the Ashtabula Remedial Action Plan.



The Ashtabula Harbor is scheduled for interim dredging for recreational boat traffic in 1993.

Agriculture Activity in the Watershed

Ohio agriculture is blessed in many ways. The favorable climate, rich soil, water supply, nearness to markets, and the availability of hard working people are some of the benefits of being an agricultural producer in Ohio. A very special part of this richness is Ohio agriculture's relationship to Lake Erie. Because of Lake Erie, those who farm along the Lake's south shore enjoy additional benefits unique to this area.

The Lake extends the growing season of the fall as the coastal area is warmed by this giant heat reservoir. The Lake also delays the growing season

in the spring by keeping the coastal area cooler. This cooler weather delays the flowering of many crops protecting the buds and blossoms from the damage of spring frost. The result of this “lake effect” is to provide a microclimate that is ideal for the cultivation of orchards, vineyards, nursery stock, and other fruits and vegetables. This microclimate that Lake Erie creates is similar to the natural climate of northern Georgia.

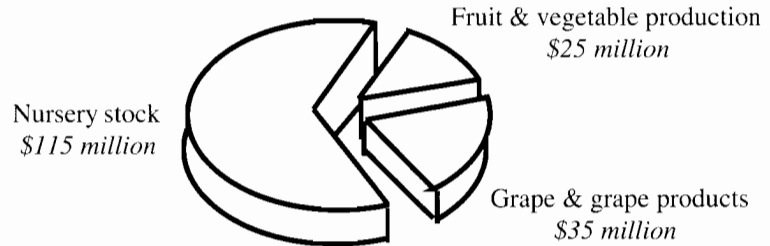
Lake Erie crops contribute greatly to Ohio’s agricultural economy. These figures represent estimates and, certainly combined with their related industries and businesses, contribute greatly to the economic well being of Ohio.

While there is some grape production down state, over 90 percent of Ohio grapes are grown in the Lake region. Over half of the commercial wineries in Ohio are located in Lake, Ashtabula, Erie, and Ottawa Counties. Ohio’s largest wine vineyard is located on North Bass Island and is home to nearly 200 acres of European-type grapevines. Most other commercial grape production is in Lake and Ashtabula Counties, and most of those 1,500 acres are raised for juice, jams, and jellies.

Ohio’s Lake Erie wines have won medals in several major national and international competitions including:

- Eastern International Wine Competition
- Dallas Morning News Wine Competition
- Orange County Fair
- Los Angeles County Fair
- Atlanta Beverage Testing Institute

Ohio Lake Erie Basin Speciality Crops



Source: Ohio Department of Agriculture

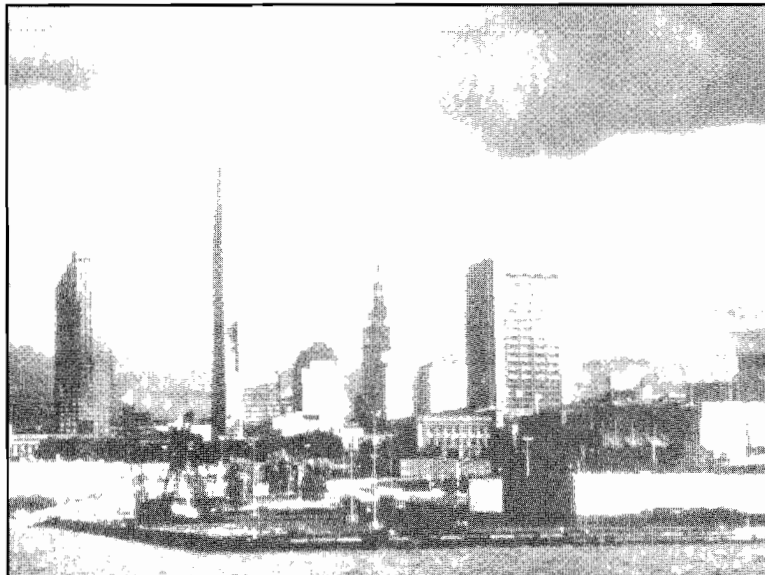


These award winning wines include chardonnays, rieslings, gewurztraminers, vidal blanc, seyval blanc, cabernet sauvignon as well as world class sparkling wines.

Ohio's nursery industry also depends on Lake Erie for beneficial weather and soil conditions. The sandy loam soil near Lake Erie is very conducive to optimum nursery stock production. Lake County east of Cleveland, is Ohio's leading nursery stock producing county with Lucas and Lorain Counties among the top eight. Ohio's nursery or "green" industry provides employment opportunities and aesthetic benefits to the entire State as a result of Lake Erie's unique characteristics.

Lake Erie provides Ohio's agriculture with unique opportunities that would not exist otherwise. Agricultural operations help vitalize the economy, but the extent of its potential impact is immeasurable. Specialty fruit and vegetables are gaining market share as consumers eat a more diverse diet. The nursery industry is also gearing for growth opportunities with the increasing

concern, both private and publicly, for esthetically pleasing surroundings. Ohio's agricultural industry is one that looks forward to utilizing opportunities that Lake Erie provides while ever mindful of the stewardship necessary to protect and nurture such a valuable resource.



Dan Dimitrov

Mineral Extraction Under Lake Erie

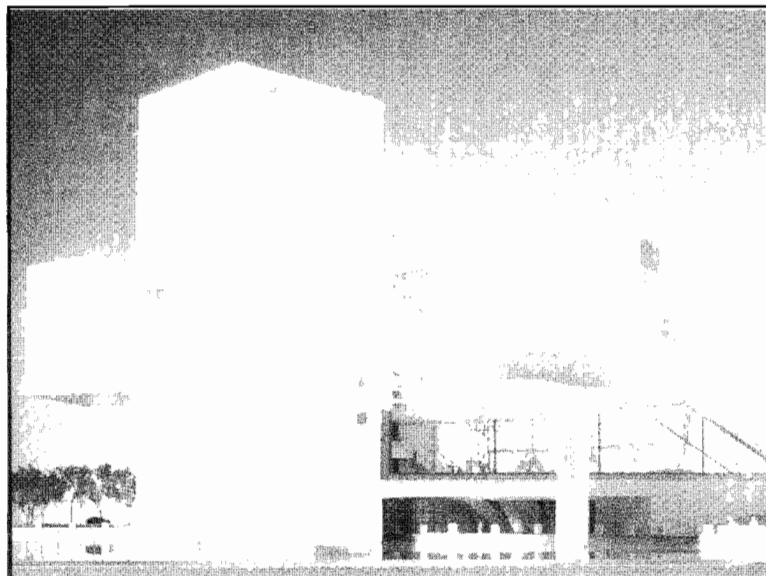
Salt mining operations are active under Lake Erie. These mines are located offshore from Painesville and are mined by Morton International. The mines are worked at a depth of approximately 1,500 feet MSL, or 2,000 feet below the surface of Lake Erie, and cover an area of about 1.25 square miles.

The annual production of salt from Lake Erie is approximately 1.5 million tons. The production process begins with an inspection of the face area and it is scaled for hazards. The salt face is then drilled with 15 foot holes that are 2 inches in diameter. These holes are packed with explosives and the salt face is blasted. Again, the salt face is inspected and scaled for hazards. The salt is screened and crushed after being conveyed along a belt to an underground storage facility. It is then hoisted to the surface. The salt is screened again and stored in silos or outside in bulk piles awaiting shipment by vessel, truck or rail.

The final salt product is used for highway ice control purposes with minor amounts being packaged for direct resale to customers or the retail industry.

Waterfront development is something that has been affecting Lake Erie's shoreline for many, many years. Often times waterfront development can prevent access to the Lake. Recently, however, lakeshore cities have begun to restore their precious shoreline for the public. Lake Erie has so much to offer the citizens of Ohio, including entertainment, employment, and education.

Cleveland is one north coast city that is showing its commitment to Lake Erie and all who visit. North Coast Harbor, Inc., a private non-profit organization, has been working with the City of Cleveland since 1980 to organize the efforts for the North Coast Harbor. The goal is to create a waterfront development project that will transform Cleveland's lakefront into a destination location for family vacations and cultural activities. The program for the harbor anticipates the completion of a high quality public open space and four world-class institutions: the Str. William G. Mather



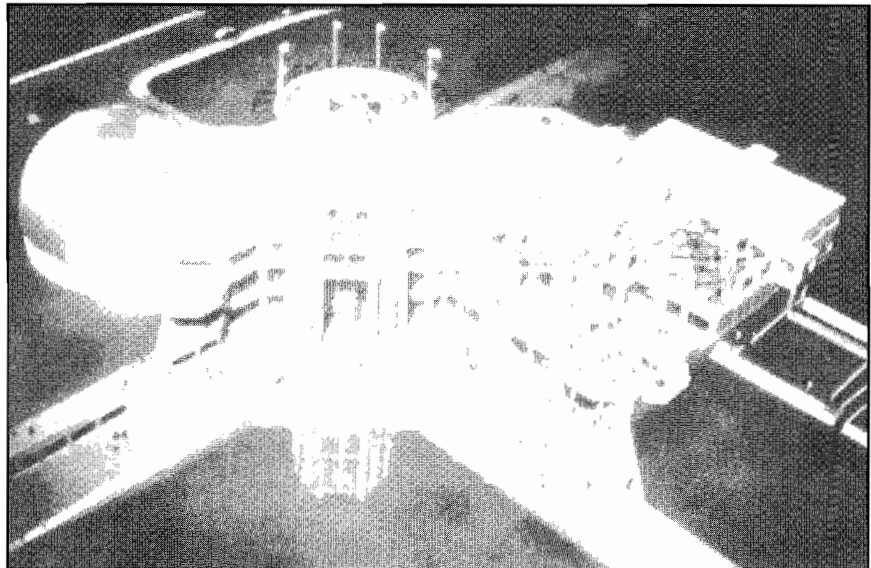
Rendering of the proposed Rock and Roll Hall of Fame to be constructed within Cleveland's North Coast Harbor development. Courtesy of North Coast Harbor, Inc.

Museum; the Great Lakes Museum of Science, Environment and Technology; the Rock and Roll Hall of Fame and Museum; and the Cleveland Aquarium.

The first phase of the North Coast Harbor was completed in 1988, and resulted in a 7.6 acre harbor, 20 acre festival park, landscaped promenade, and mooring locations for transient docking. The \$11 million renovation was made possible through contributions from the State of Ohio, City of Cleveland, the federal government, and local foundations and corporations.

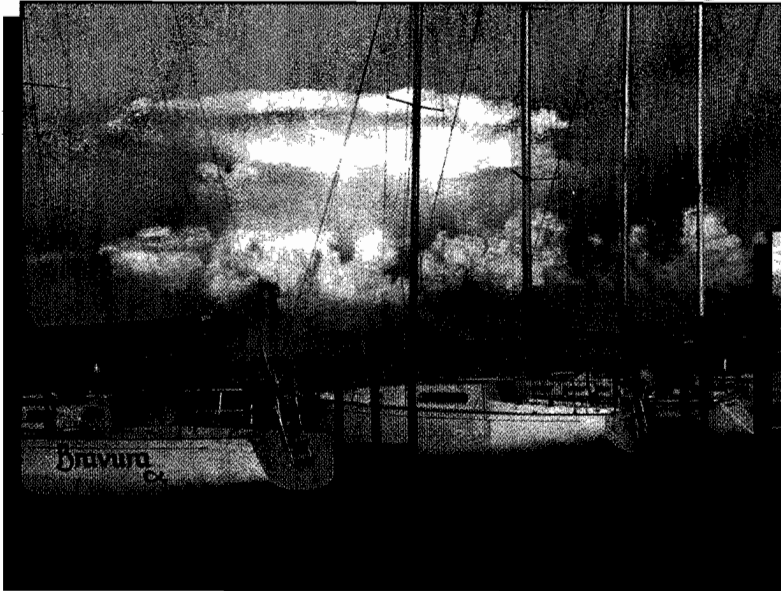
The second phase of the project includes the four permanent facilities. The Str. William G. Mather Museum is currently stationed at the East Ninth Street Pier. The first attraction to be established, it has been in place since May 1991. The Rock and Roll Hall of Fame will be located at the southeast corner of the harbor, with completion anticipated by mid-1995. The third facility, the Great Lakes Museum of Science, Environment, and Technology, is to be built on the southwest corner of the harbor. Officials estimate that the museum will be completed by 1996, Cleveland's bicentennial. Design of the Cleveland Aquarium has only recently begun, therefore, the date of commencement and completion has not been determined.

Ohio and her north coast cities continue to be committed to our greatest natural resource — Lake Erie. This waterfront development project is proof that Ohioans intend to utilize the Lake, as well as the shorelines, as a resource for education and entertainment.

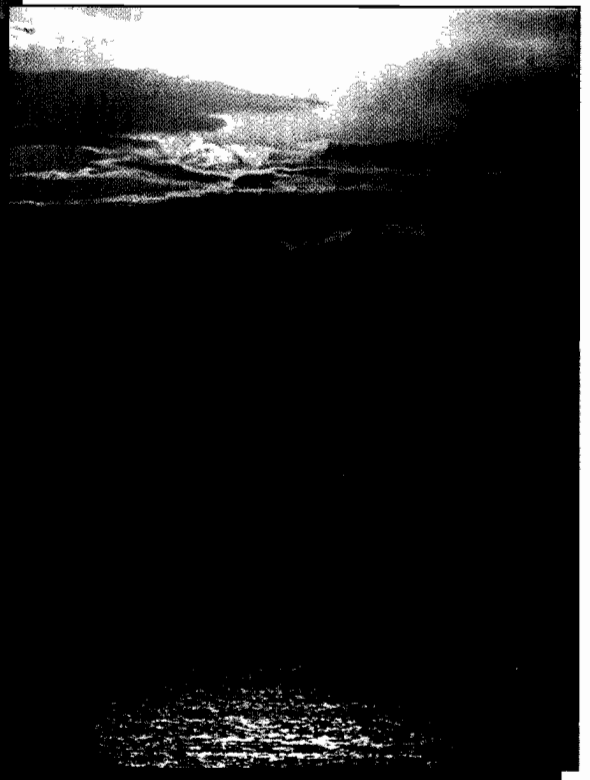


The proposed Great Lakes Museum of Science, Environment, and Technology is also planned for Cleveland's North Coast Harbor. The Museum will feature hundreds of exhibits, an Omnimax theater, a NASA Challenger center, and a three-story interactive water machine. Courtesy of North Coast Harbor, Inc.

Recreation and Education



Arnold W. Ehram



Rob Wetzler



Mary Elizabeth Durbin



Recreation and education are integral parts of life on Lake Erie, whether it's Coastweeks, a nationwide celebration of America's shorelines, or a Sea Grant program. Lake Erie is a 9,910 square mile classroom for students, educators, and researchers throughout the state, nation, and world. The Lake even boasts the oldest biological field station in the U.S., The Ohio State University - Franz Theodore Stone Laboratory.

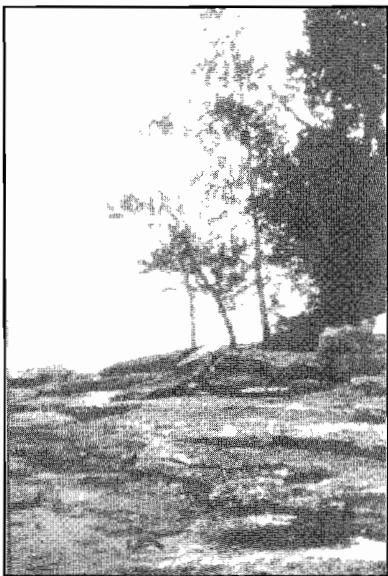
Through a myriad of campgrounds, marinas, and state parks located in the vicinity of Lake Erie, most everyone can find something about the Lake to enjoy. Fishing, boating, sport diving, and sailing are just a few of the many activities Lake Erie provides.

The future holds many possibilities for tourism growth in the Lake Erie region. New businesses opening in the area create not only additional activities for guests, but additional jobs for local residents. The Ohio Department of Development will continue to be a partner in this thriving segment of Ohio's economy.

Donald E. Jakeway, Director, Ohio Department of Development

Ohio Coastweeks '92

Ohio is proud to renew its participation in the nationwide Coastweeks program. Coastweeks is an annual celebration of our nation's waters and shorelines. For the past ten years, some 29 states have participated each fall in this program to help preserve our nation's coasts through educational and environmental activities. Ohio's Coastweeks is aimed at increasing awareness of the value and fragility of its largest natural resource - Lake Erie and its shoreline. This year's celebration also marked the 20th anniversary of the enactment of the Clean Water Act, wherein Governor George V. Voinovich declared 1992 the "Year of Clean Water."



The Marblehead Peninsula as depicted in the Coastweeks '92 commemorative poster.

With a mandate to educate the citizens of Ohio about Lake Erie, the Ohio Lake Erie Commission organized Ohio's participation through its staff, the Ohio Lake Erie Office and funding through the Ohio Environmental Education Fund. The Ohio Lake Erie Office helped to organize 17 successful Coastweeks '92 events along Lake Erie's shoreline. These events included beach, wetland, and underwater cleanups, nature walks, canoe and beach tours, "Life on Lake Erie" photography contest, a cruise of the Lake Erie Islands, the Ohio Lake Erie Conference, and opening ceremonies at Old Woman Creek National Estuarine Research Reserve. All told, over 5,000 people participated in Ohio's Coastweeks '92.

Among the highlights was the first-ever Lake Erie Underwater Cleanup at Put-in-Bay, Ohio. A cold and breezy day failed to dampen

the spirits of over 180 SCUBA and shoreside volunteers. Over a ton of debris was pulled from the public boat harbor including, bicycles, lawn chairs, charcoal grills, shopping carts, tires, and nearly every type of aluminum can and bottle produced in the United States and Canada.

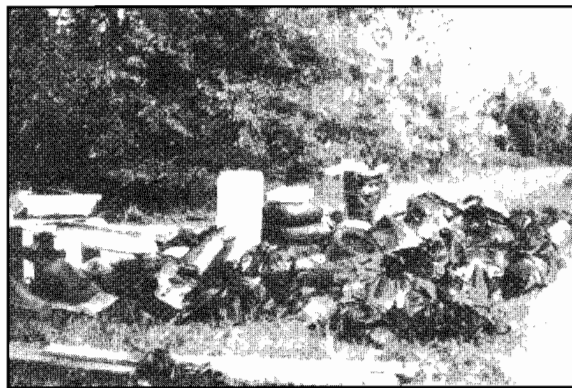
The "Life on Lake Erie" photography contest was a tremendous success, with amateur photographers submitting their interpretations of enjoying the Lake. Four grand prize winners and eight honorable mentions were chosen, and they will be proudly published in the first Lake Erie Calender as a culmination of the Coastweeks '92 celebration. These winning entries are also being seen throughout this publication.

The Ohio Lake Erie Conference, held at Maumee Bay State Park, was attended by 165 people. Under the theme of "Twenty Years of the Clean Water Act in Ohio," the sessions centered on the successes and remaining needs concerning Lake Erie water quality and coastal management in Ohio. Governor Voinovich was present to award the first cycle of Lake Erie Protection Fund research grants totaling over \$450,000. The Governor and Senator Betty Montgomery unveiled the new "Lake Erie License Plate." Funds from the sale of this plate will help to continue research and education along our shoreline through the Lake Erie Protection Fund.

Coastweeks has been and will continue in future years to be a valuable mechanism for bringing together the entire Lake Erie community in Ohio. This includes government, interest groups, stakeholders, and the citizens of Ohio. The Ohio Lake Erie Office plans to continue Coastweeks as an annual event in Ohio. Plans are currently underway to include more people and events for the 1993 celebration.



Participants in the underwater cleanup.



Debris collected by collegiate volunteers at Manhattan Marsh in Toledo.



Barbara Fegan, founder of Coastweeks and a native of the Massachusetts shoreline, began her coastal campaign in 1982. By using her first Social Security check, she coordinated efforts to help provide a way for average citizens to get involved and make a difference in their world.

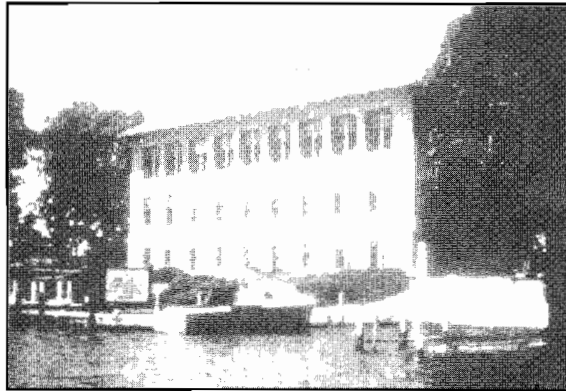
"Let the people know, make the people care...then the people will act" says Barbara. This statement has served as a credo for the Coastweeks program by increasing public awareness of the importance of our nation's waters and coastlines; then focusing their attention on preservation. From modest beginnings, Coastweeks has expanded to three weeks every fall, featuring cleanups, beachsweeps, and a variety of environmental, and educational activities in their coastal communities

This godmother of the Coastweeks program is happy to see Ohio join in the nationwide celebration. "Coastweeks should be whatever you want it to be," she states. "It should be a vehicle to give people a chance to create what the celebration means to them, whether by nature walks, conferences, or simply removing litter from your backyard beaches and streams."

Franz Theodore Stone Laboratory

Franz Theodore Stone Laboratory, operated by The Ohio State University, is Ohio's biological field station and the oldest field station in the country. Located on 6.5 acre Gibraltar Island in the harbor at Put-in-Bay, the laboratory has operated continuously since 1895.

Each summer, 12 to 16 undergraduate and graduate courses are offered



Ohio Sea Grant

at the laboratory. All courses emphasize a "hands-on" approach to learning. In 1990, a program was initiated that allowed superior high school students to enroll and receive college credit while still in high school.

The University offers an extensive workshop program for middle schools, high schools, and colleges during the spring and fall. The workshop program has grown from 35 workshops with 1,122 participants in 1986 to over 70 workshops with over 2,600 participants in 1990 and 1991.

Research goes on year-round. In 1992, 24 different research projects were conducted using the laboratory's facilities. The principal investigators on these projects were from seven universities in four states and Canada, two federal agencies, one state agency, two city water departments, and the California Academy of Science. These projects included research on zebra mussels and other nonindigenous species, lake ecology, contaminant uptake and transfer, genetic studies, and fisheries.

Research at Stone Laboratory also blends well with the academic program and enhances educational opportunities for students in the regular courses. Enrollment in the summer curriculum at the laboratory has been increasing dramatically, from an average of 55 to 60 students per year during the 1980s to 209 in 1992. In 1992, these students were from 20 colleges and universities in Ohio and four out-of-state schools. The special introductory science program for superior high school students attracted students from 57 Ohio high schools in 1992. Since 1990, students from 101 different Ohio high schools have attended Stone Laboratory.

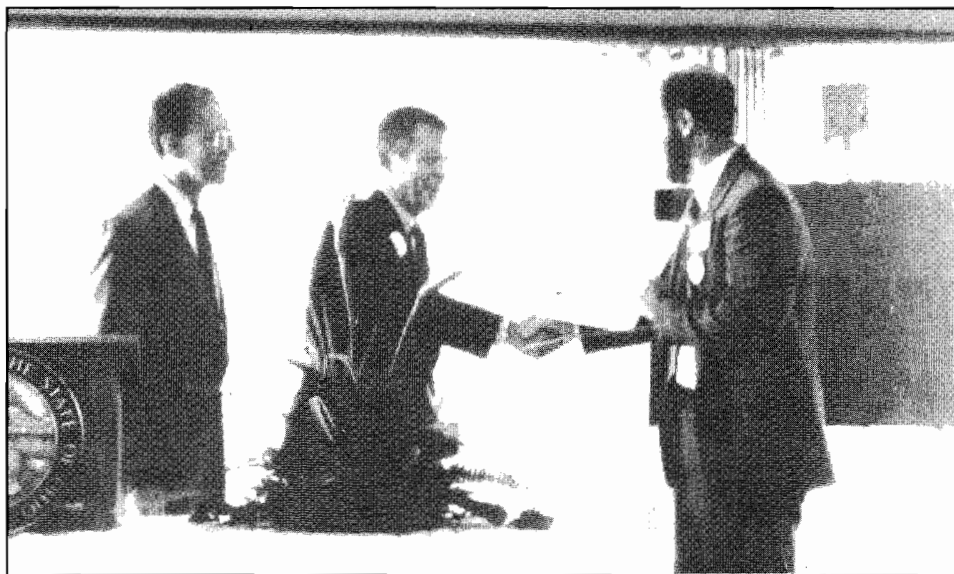
Lake Erie Protection Fund

In 1990, the Ohio General Assembly enacted legislation establishing the Lake Erie Protection Fund (LEPF). Its intention was to accelerate the pace of research and development on Lake Erie in order to maximize Ohio's ability to protect and utilize this magnificent resource.

To this point, the Fund has received all of its revenues from proceeds of the Great Lakes Protection Fund (GLPF). The GLPF, established in 1989, is a unique cooperative effort of the eight Great Lakes states. The states have pledged \$100 million to establish a revolving trust fund. Ohio's commitment to the fund is \$14 million, \$9.4 million of which has been paid. The remaining \$4.6 million, which was due this year, was delayed because of budgetary shortfalls. However, the State has reaffirmed its commitment to completing its contribution.

Two-thirds of the annual earnings of the GLPF are awarded as grants from the Fund's administrative office in Chicago. These grants are aimed at projects that will benefit the entire Great Lakes Basin. The other one-third of the earnings is given back to the states to be spent at their discretion.

With the establishment of the Ohio Lake Erie Office, as administrator of the Fund, the LEPF has undergone some significant changes. The Fund published its first request for proposals throughout the State and received 47 pre-proposals. Also, a peer review committee of many of the finest scientists and resource managers in the State was established to provide funding recommendations to the Ohio Lake Erie Commission.



Governor Voinovich and OEPA Director, Donald Schregardus, present Dr. Jeffrey Johansen of John Carroll University his LEPF grant check.

During the 1992 funding cycle, the Commission awarded seven grants totaling \$457,683 for the following projects:

- ✿ The Lake Erie Tributary Loading Program (Dr. David Baker, Heidelberg College).
- ✿ Assessment of Tumor Frequency and Liver Pathology in Black River Bullhead (Dr. Paul Baumann, U.S. Fish & Wildlife Service)
- ✿ Determination of Toxic Substances in Lake Erie Fish (Kenneth Paxton, Ohio Department of Natural Resources)
- ✿ Proposed Modifications to a Wetland in Order to Restore Habitat for Selected Rare Plant Species (James S. McCormac, Ohio Department of Natural Resources)
- ✿ Ecology and Assessment of the Algae of Four Lake Erie Estuaries (Dr. Jeffrey Johansen, John Carroll University)
- ✿ An Integrated Spatial-Process Model for Determining Agricultural Impacts on Lake Erie (Dr. Dale A. White, The Ohio State University)
- ✿ Maumee Bay Watershed Project (Kurt Erichsen, Toledo Metropolitan Area Council of Governments)

The Ohio Lake Erie Commission is looking at ways to increase the revenues going into the LEPF. The first initiative was to establish a Lake Erie license plate. Sponsored by Senator Betty Montgomery and supported by Governor George V. Voinovich, the Ohio General Assembly passed legislation authorizing the special plate in late 1992. The plate features a drawing of the



Senator Betty Montgomery unveils the Lake Erie license plate at the Ohio Lake Erie Conference.

Marblehead lighthouse by Ohio artist Ben Richmond, of Marblehead, and the slogan, "Erie ... Our Great Lake."

A \$25.00 purchase of the Lake Erie license plate will result in a \$15.00 donation to the Lake Erie Protection Fund. It is the hope of the Ohio Lake Erie Commission that this program will dramatically increase the revenues of the LEPF and widen the scope of its uses. The Ohio Lake Erie Commission would like to direct funding toward capitalization projects throughout the shoreline and the implementation of ongoing State initiatives, such as the Remedial Action Plans and the Coastal Management Plan.

Lake Erie Protection Fund Statement of Income and Expenditures

(State of Ohio Central Accounting System)

	Fiscal year 1991 <u>7/1/91 - 6/30/92</u>	Fiscal year 1992 (*to date) <u>7/1/92 - 12/24/92</u>
Opening Balance	\$117,674.54	\$265,478.31
Accounts Payable	\$ 110.00	\$ 0.00
Revenues	\$195,201.00	\$ 98,246.00
Expenditures	\$ 47,287.23	\$ 36,236.92
Closing Balance	\$265,478.31	\$327,487.39
Future obligations:		
Grants		
12/92 - 12/93		\$264,685.00
01/94 - 12/94		\$193,000.00
Administration		
01/93 - 12/93		\$ 30,000.00



The Ohio Sea Grant College Program is one of 29 Sea Grant Programs in the National Sea Grant College Program, National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce. Every coastal state and every Great Lakes state except Pennsylvania has a Sea Grant Program. Sea Grant was patterned after the Land Grant System and was designed to increase utilization, development, and wise management of this country's coastal resources. This goal is accomplished through research, education, and technology transfer, or advisory service programs.

In Ohio, Sea Grant is administered by The Ohio State University and has programs covering the entire State. The focus of the program's research component is developed through close contact with the private sector and District Extension Specialists located in Toledo, Port Clinton, Elyria, and Painesville, and their private sector, volunteer advisory committees. Research proposals are solicited every two years from investigators at every college and university in the State. These proposals go through an extensive national review and are funded based on their ranking as determined in the review process.

The education component of Ohio Sea Grant is considered to be one of the best in the country. The three private sector advisory committees are the best in the country. Research projects on many problems are underway, and the program is leading the nation in research on zebra mussels, underwater welding, economic evaluations of the coastal economy, sediment resuspension, development and operation of coastal prediction systems, and the biological uptake and transfer of toxic substances.

In 1992, the core program received a 17 percent increase in federal funding, the second largest increase in the country. This support, with additional funding from the State Legislature and the Ohio Board of Regents, allowed Ohio Sea Grant to hire a new Associate Agent for the Maumee Bay area, continue support of the education and communication programs, and fund 11 new research projects at Heidelberg College, Kent State University, and The Ohio State University. In an extensive national competition, six new multi-year projects on zebra mussels were funded by Sea Grant at Bowling

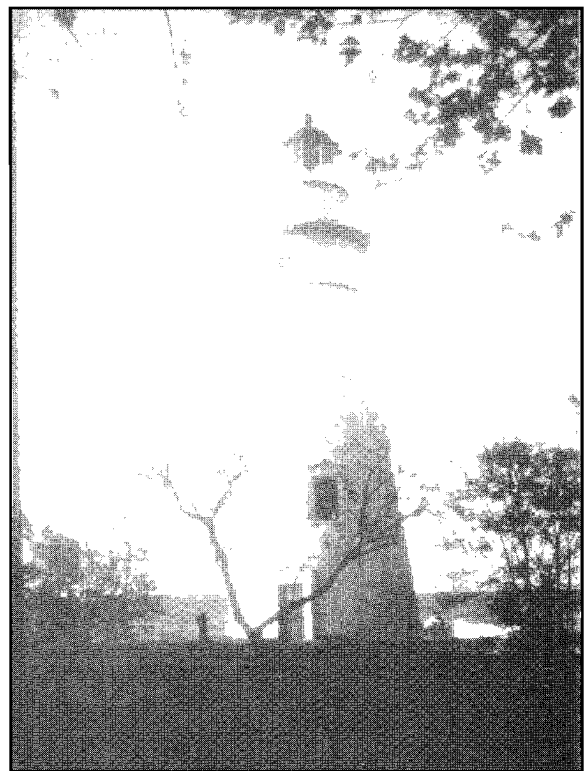
Green State University, Kent State University, Miami University, The Ohio State University, and The University of Toledo. Since 1988, Sea Grant has supported over 30 research projects on zebra mussels and other nonindigenous species. These projects have brought over \$3.5 million of federal support to Ohio.

Lake Erie is considered by many the gateway to tourism in Ohio. Much of the State's popularity, as a tourist destination, stems from the variety of activities available and the sense of escape that the Lake offers.

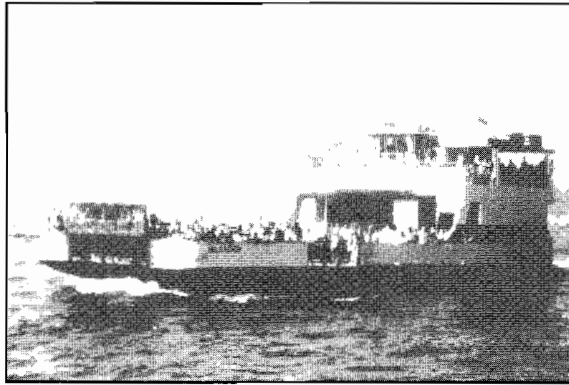
There is little doubt that Lake Erie is a vital factor in the overall economic development in Ohio. However, it also provides the ingredients that generate valuable tourism dollars that translate into jobs for Ohioans via its beautiful shorelines, sandy beaches, natural harbors, and parks. Year-round, the Lake attracts visitors to the region that, in significant measure, fuel the economic growth of a thriving travel industry in the State.

Tourism accounts for \$8.5 billion a year in travel generated revenue in Ohio, and more than 152,080 Ohioans are employed by the Ohio travel industry. Lake Erie tourism, whether it's fishing, shopping, sightseeing, or enjoying amusement parks, contributes mightily to the till. In fact, many of the rural counties bordering the Lake depend on visitors to feed their economies. The Division of Travel and Tourism, a part of the Ohio Department of Development, assists in the continuation of that number's growth.

It is estimated that the lakeshore counties of Erie, Lorain, and Ottawa attract from six to eight million visitors annually during the prime tourism period from May to September, and contribute more than \$200 million in travel revenue to the economy. As an example of this area's prominence as a destination, American Demographics magazine (May 1990) rated Sandusky as one of the top 10 small cities in America.



Doreen Kirk



John E. Rees

The Governor's personal commitment to tourism is a big part of this success. Last summer, in a remarkable show of support, Governor Voinovich, accompanied by First Lady Janet Voinovich, led a nationally prominent group of travel journalists on the first of nine "See Ohio First" weekend familiarization tours that he has committed to during his term. The initial trip showcased Northwest

Ohio travel attractions and featured several stops along the Lake and a visit to the Lake Erie Islands. As a result, the Governor's strong commitment to tourism and the importance of Lake Erie as a tourism entity was clearly displayed and has been documented in newspapers and magazines throughout the region and the nation.

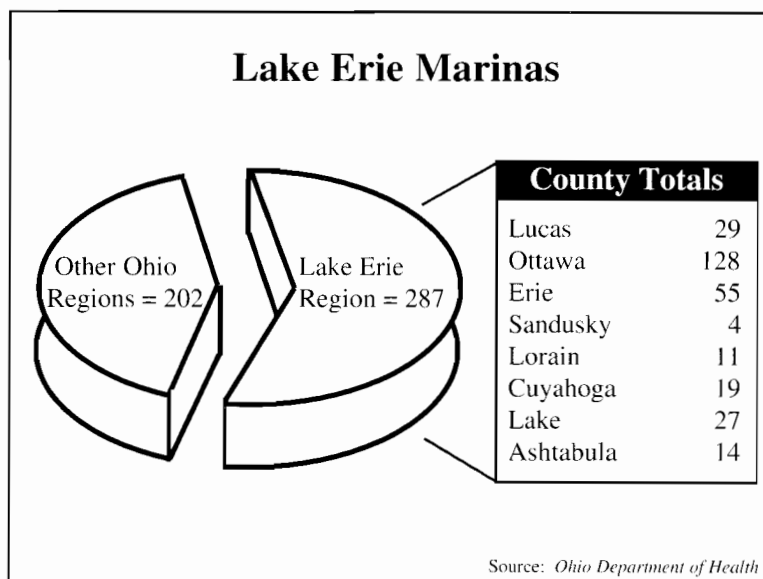
Lake Erie continues to grow as a prime getaway destination. With notable attractions and destinations along its shores, such as the Lake Erie Islands, the Flats, world-renowned museums and nationally-known theme parks, the Lake should continue to flourish and contribute significantly to Ohio's tourism prowess.

Editorial: Lake Erie's Tourism Potential

Ohio's Lakefront! Ohio's North Coast!! In recent years for many Ohioans and out-of-state visitors, these words have become synonymous with

many of Lake Erie's exceptional recreational activities. Since the early 1980s, improvements in water quality and increased lakeside development have caused people to return to the shores of Lake Erie to enjoy boating, fishing, swimming, and other activities.

The comeback of Ohio's waterfront has also seen an increased number of boating, camping, and vacation resort facilities. These have become a necessity to accom-



moderate the demand by the flux of visitors to the Basin. This is evident by the nearly 30 percent increase in the number of marinas in the Lake Erie Basin since 1986. This resurgence in boating has been tempered, however, by the slow economy. In fact, the number of boats registered in Ohio with Lake Erie designated as primary source of usage, declined to 63,583 in 1991. This is a decrease of over 20,000 boats in the past five years. According to the Ohio Department of Natural Resources' Division of Watercraft, there are less registered boats; but, the number of trips per year taken on those boats is increasing.

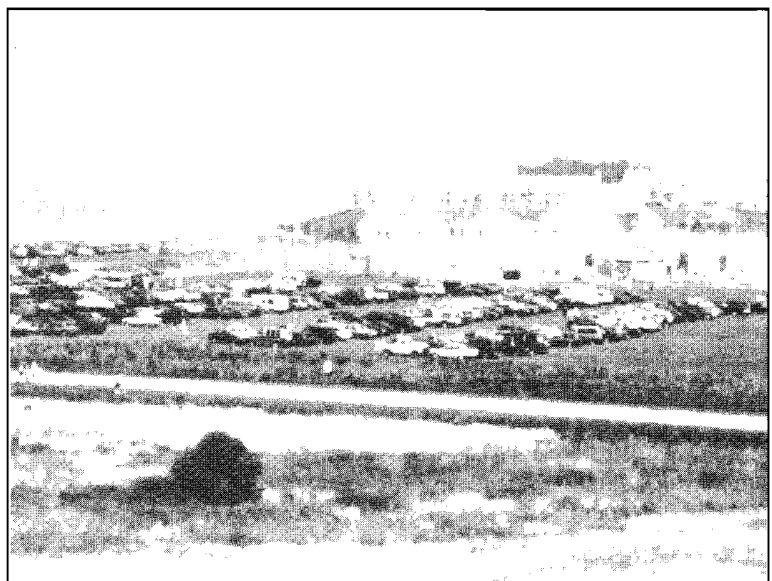
With the increased popularity of Ohio's north coast, many people are enjoying all that the Lake has to offer in the numerous seasonal and year-round camping resorts and manufactured housing communities now a common sight along the southern Lake Erie shoreline.

The Lake Erie coastal area provides great opportunities for the outdoor recreational pursuits of Ohioans, visitors and tourists. Shorelands of the coastal area contain recreational areas that range from specially managed wildlife areas and nature preserves to developed parklands managed for multiple recreational uses.

The State of Ohio's recreational emphasis in the coastal area is on satisfying statewide and regional recreation needs beyond the scope of local governments and the private sector. As the leading agency in the provision of outdoor recreation services, ODNR administers many programs to help meet the recreational needs of Ohioans and visitors to Lake Erie.

State Parks and Public Beaches

Maumee Bay State Park near Toledo is a full service resort facility that includes a lodge, cabins, 18-hole Scottish-style golf course, camping areas, trails, beach, bicycle trail, and amphitheater. Visitors can enjoy incomparable views of Lake Erie from the lodge or hike through marshes and swamp forest on boardwalk trails. A modern interpretive center opened in 1992. As a result of efforts by the Bell Telephone Pioneers of America, the



Maumee Bay State Park has quickly become a popular recreational destination for nearby residents and vacationers throughout Ohio.



facility will provide views of wetlands and wildlife inhabitants from remote video cameras. Also, cooperation between the ODNR's Division of Parks and Recreation and Ohio Sea Grant provides for a continuing program of research and environmental education related to coastal wetlands. Clearly, Maumee Bay is much more than a recreational facility.

The most visible and popular public areas on Lake Erie are state parks. Camping at East Harbor, Kelleys Island, and South Bass Island brings the visitor right to the shores of Lake Erie. Catawba, another Lake Erie Islands park, provides boating access, picnicking, and fishing. Boating, fishing, and swimming are enjoyed at Headlands Beach, Geneva, and Cleveland Lakefront. Geneva provides an important refuge harbor in Ohio's eastern Lake Erie area.

The urban setting of Cleveland Lakefront is unique among Ohio's state parks. The park is being expanded and developed through implementation of a long range waterfront plan. The acquisition of an additional 43 acres of shoreland between Euclid Beach and Wildwood creates the Villa Angela unit, which will enable the State to increase public access to Lake Erie, expand a public swimming beach, develop bicycle trails, and provide additional public open space for lakeside recreation. Bicycle trails will ultimately link park units

and other facilities all along the Cleveland waterfront. Future park expansion will result from the careful reclamation of dredged material disposal areas in Cleveland Harbor.

Crane Creek State Park, on the western shore between Toledo and Port Clinton, stands in stark contrast to the urban environment of Cleveland Lakefront. It is nestled among coastal marshes managed by ODNR's Division of Wildlife and the U.S. Fish and Wildlife Service. Waterfowl and wildlife abound, and this park is a favorite of those who enjoy hiking, bird watching, and nature study.

Wildlife Areas and Nature Preserves

The Ohio Division of Wildlife manages many areas and facilities within the coastal area. These include Magee Marsh, Metzger Marsh, Portage River, Toussaint Creek and Willow



Magee Marsh Bird Trail allows Ohio citizens to view native, as well as rare wildlife in their natural setting.

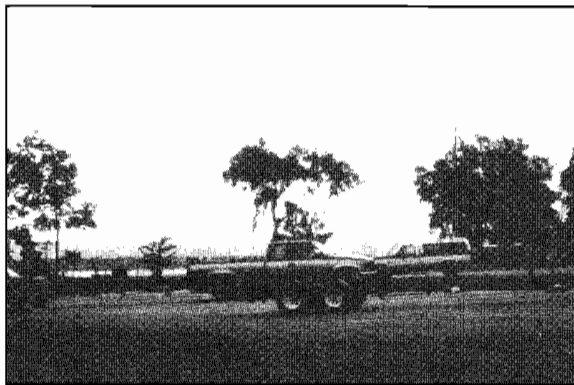
Point, Pickerel Creek and Pipe Creek State Wildlife Areas, the Dempsey and Mazurik Lake Erie Access Areas, and the Put-In-Bay Hatchery Aquatic Resource Education Center.

Public recreation benefits from the Division's wetlands restoration activities in the coastal area. On public and private lands, the Division is restoring or participating in the cooperative restoration of valuable wetlands with many partners. There have been 3,800 acres of wetlands protected, restored, or enhanced from 1988 to 1991 under the guidelines of the North American Waterfowl Management Plan. These efforts not only restore the beneficial functions of wetlands, also enhance outdoor recreation in areas extending beyond the wetlands themselves.

Nature preserves in the coastal area offer opportunities to enjoy unique environmental settings and coastal resources. The Ohio Division of Natural Areas and Preserves manages the following coastal preserves: Sheldon Marsh, Dupont Marsh, Mentor Marsh, Headlands Dunes, Lakeside Daisy, and the Old Woman Creek National Estuarine Research Reserve.

Mentor Marsh, near Fairport Harbor, benefits from partnership in land stewardship and the provision of recreational opportunities. It contains areas owned by the State, Lake County, and the Cleveland Museum of Natural History. The Ohio Division of Natural Areas and Preserves is responsible for upkeep and maintenance of the nature preserve including a handicapped accessible marsh overlook. The Mentor Marsh Board of Management, under the Museum, directs nature interpretation.

The Old Woman Creek Nature Preserve and National Estuarine Research Reserve, near Huron, provide for compatible public uses, such as hiking and nature observation, in a setting where important scientific research and education is conducted on the only such dedicated area in the Great Lakes. Old Woman Creek is a premier facility with a visitor center housing research labs and classrooms. It is a showcase of our effective state-federal partnership in coastal area management.



Mazurik Access is one of the ODNR's many efforts to increase public boating access to Lake Erie.



Harvey Busch, of Gates Mills, has been sailing Lake Erie and Ohio's inland lakes for over sixty years. Harvey sails and maintains the Nan-Too, a 34 foot Tartan sailboat out of Cleveland's Edgewater Yacht Club.

Having been involved in the Lake Erie sailing community for so long, Harvey has witnessed the explosion in growth of boating along Ohio's north coast. This explosion however, has been a mixed blessing. On one hand, Harvey says "the number and quality of yacht clubs, marinas, and public docks has greatly improved over the years. Cruising on the Lake has never been safer and more enjoyable."

On the other hand, Harvey agrees with many in saying, "There are too many boats on the Lake. In some areas, like Cleveland and the Islands, some days are like a highway traffic jam. Also, many people don't have enough experience to handle the storms that Lake Erie can dish out."



Mary Elizabeth Durbin

Public Access

Sport fishing opportunities have been increased through the development of the Dempsey and Mazurik boat launch facilities on the Marblehead Peninsula, where breakwaters are constructed as handicapped-accessible fishing piers.

Of course, municipalities, counties, townships, park districts, and other political subdivisions provide public recreation and Lake Erie access facilities important to coastal area residents

and other users. ODNR often provides assistance with planning, research, and administration of financial and technical assistance programs to local governments and the private sector. Since the mid-1980s, ODNR's Lake Erie Access Program and Waterways Safety Fund Program have provided assistance for new launch ramps, launch ramp expansions and renovations, and fishing piers at many communities in the coastal area. The private sector also provides marinas, boat launch sites, beaches, and other facilities available to the general public which helps meet recreational needs.

Special mention should be made regarding the role of independent organizations in providing recreational opportunities on Lake Erie. Historic preservation organizations such as the Great Lakes Historical Society and local groups provide recreational opportunities on vessels that serve as floating museums and at historic sites along our shorelands. Land trust and conservation organizations such as The Nature Conservancy, Trust for Public Lands, Ducks Unlimited and others have provided vital assistance in securing areas for recreation and public access on Lake Erie.

A Coastal Management Assistance Program will provide state and federal matching money for future recreation and public access projects sponsored by local governments and nonprofit organizations in the coastal area. Public/private partnership efforts will continue to be important, as well as state/local/federal cooperation, to meet recreational demands and needs in the coastal area.



Linda Ballas

☀ *An Average Day on Ohio's North Coast* ☀

3,052,300,000 gallons of water are used

\$23,287,671 are generated by the tourism industry

12,447 walleye and yellow perch are caught by sport boat fisheries

24,789 tons of cargo are shipped to and from Ohio ports

1/2 acre of submerged land is leased for private use

59,216 people visit Lake Erie state parks

1,764 gallons of wine are produced

3,836 square feet of Ohio's shoreline is eroded

2.6 acres of wetlands are protected, restored or enhanced

1,133,450 acres are being farmed using conservation tillage methods

4,795 tons of sediment are dredged to maintain navigable waterways

and a whole bunch of water is filtered by zebra mussels!!!

For more information on materials discussed within this report, contact:

Ohio Environmental Protection Agency	(614) 644-3020
Ohio Department of Natural Resources	(614) 265-7005
Ohio Department of Development	(614) 466-2480
Ohio Department of Health	(614) 466-3543
Ohio Department of Transportation	(614) 466-7170
Ohio Department of Agriculture	(614) 466-2732
Ohio Lake Erie Office	(419) 245-2514

George V. Voinovich, Governor

