

ECOLOGY: Protecting, Preserving and Restoring the Adaptive Capacity of Natural Ecosystems

Pollution Control and Prevention

One of the biggest assets of the bi-state Calumet region is its Lake Michigan shoreline. Although we don't have figures just for the Calumet region, we know that Illinois and Indiana receive a variety of benefits from Lake Michigan water quality, as shown in Table VIII, and which ties into the tourism opportunities discussed earlier under economic development. We do know that marina development is part of the plan for revitalizing Northwest Indiana and that some hope redevelopment at such sites as U.S. Steel Southworks in Southeast Chicago will capitalize on lake-front access.

Table VIII.

Annual Economic Benefits of Clean Great Lakes Waters Along the Illinois and Indiana Shore

	Indiana	Illinois
1. Sportfishing		
Expenditures	\$404 million	\$1.1 billion
Jobs Generated	15,000	37,000
State Sales Tax	\$20 million	\$72million
State Income Tax	\$7 million	
License Revenues	\$6 million	
Registered Boats	270,000	361,000
2. Commercial Fishing		
Pounds	1.3 million	268,000
Dollars	\$1.7 million	\$330,000
3. Tourism Indiana Dunes National Lakeshore		

Visitors	1.6 million
Revenue	\$26 million
Jobs	906
Michigan City Washington Park Beach Visitors 60,000	
Revenue	\$175,999
Illinois Beach State Park Visitors	2.5 million
Revenue	\$13 million

Source: 1991 National Survey of Fishing, Hunting, and Wildlife Associated Recreation; U.S. Department of the Interior, "Fisheries of the United States 1988"; U.S. Department of Commerce, National Park Service, National Oceanic and Atmospheric Administration; "Testing the Waters IV," Natural Resources Defense Council, 1994. From Coast Alliance, State of the Coasts: A State-by-State Analysis of the Vital Link Between Healthy Coasts and a Healthy Economy, June 1995

The Calumet region's Lake Michigan asset is at risk. When the U.S. Environmental Protection Agency ranked human health and ecological hazards facing the Great Lakes region, it concluded that the most significant sources of environmental contaminants were concentrated around Chicago, Illinois and Gary, Indiana (as well as Detroit, Michigan, Buffalo and Niagara Falls, New York and Cleveland, Ohio). Fish and birds living around Lake Michigan and Ontario also tend to have markedly higher levels of contaminants that those of the other three lakes.⁸⁵

All of the shoreline along Lake Michigan in Illinois and Indiana meets state criteria for safety of drinking water supply, and the vast majority of the shoreline also meets the criteria for safety for swimming. However, much less of the shoreline meets the tougher standards for protecting aquatic life. In Illinois all of the 63 shoreline miles are threatened and in Indiana all of the 43 miles only partly meet the criteria for safety for aquatic life. $\frac{86}{2}$

Nearly all of the shoreline miles fail to meet the criteria for fish consumption. Fish

consumption is the primary means by which humans are exposed to toxins in Lake Michigan.⁸⁷ Contaminants Responsible for Fish Consumption Advisories in Lake Michigan are chlordane, DDT, dieldrin, mercury, PCBs, and toxaphene (Wisconsin advisory).⁸⁸ U. S. EPA's Great Lakes Basin Risk Characteristics Study indicates that human cancer risks related to basin-wide exposure to contaminants in Great Lakes fisheries and ambi ent water are primarily due to PCB exposure.⁸⁹

There are some positive signs for protecting the Calumet region's Lake Michigan asset. All of the states which border Lake Michigan are writing new rules to meet a federal requirement for more consistent water quality standards in the eight Great Lakes states. The process is called the Great Lakes Initiative. The Indiana Department of Environmental Management (IDEM) has been meeting with industry, municipalities, and environmental groups for months about this rule-making. $\frac{90}{2}$

Indiana waterbodies draining into Lake Michigan include the Grand Calumet River and the Little Calumet River. To make way for the steel industry in Gary, the Grand Calumet River was moved half a mile south to flow through a straight cement-lined ditch and carry waste discharges from over 30 outlets to Indiana Harbor and Lake Michigan.⁹¹ One of biggest threats that industrial and shipping activity has created for the South Lake Michigan region is the Grand Calumet River and Indiana Harbor Canal Area of Concern (AOC).⁹² The Grand Calumet River is one of Lake Michigan's most toxic tributaries.

Section 304(1) of the Clean Water Act requires states to identify waterways where water quality is poor despite regulatory efforts. Two of the worst are Grand Calumet River and Indiana Harbor and Ship Canal. There are Lake Michigan Watershed fish health advisories for the Grand Calumet River Area of Concern due to PCBs and chlordane.⁹³ Preliminary data from Indiana Harbor indicate that bottom sediments are among the most toxic Great Lakes sediments ever analyzed. In the Grand Calumet River, surface sediments were also found to be highly toxic.⁹⁴

Problems in the Grand Calumet River and Indiana Harbor Area of Concern include conventional pollutants, heavy metals, and toxic organics (for example, metals, cyanide, PCBs, ammonia, dissolved oxygen, mercury, lead, copper, cadmium, and arsenic),

resulting in contaminated sediments, dredging restrictions⁹⁵, restrictions on fish consumption, degradation of fish populations, fish tumors, and biota impacts. The sources are municipal facilities, industry runoff, combined sewer overflows and especially pollut ants already in place from past activity.

Other problematic tributaries include Pigeon Creek (ammonia, dissolved oxygen) and Little Calumet (cyanide, ammonia, and dissolved oxygen).

There are several positive signs for these polluted waterways. U.S. EPA and the states have undertaken major enforcement actions against industrial dischargers (including USX Corporation's steel-making facility in Gary, Indiana, Inland Steel, LTV, Bethlehem Steel Corporation, Atlantic Richfield Corporation, East Chicago Sanitary District) which resulted in clean ups and pollution prevention programs, and undertaken programs to eliminate combined sewer overflows of untreated sewer water.

Residents of the Calumet area in Indiana have worked with public officials to develop a Grand Calumet Master Plan to restore water quality to their river and harbor. The Grand Calumet Task Force has convened stakeholders willing to partner on a project to study the present and future uses of the Grand Calumet River Corridor (the property and lands adjacent to the Grand Calumet River and Indiana Harbor Ship Canal in the cities of East Chicago, Gary, and Hammond.) Now that clean up projects are finally underway, government and industry are proposing to dredge up tons of contaminated muck from the Grad Calumet and store it in large secure landfill type facilities along the river bank. This is at best a short-term solution. The hope is that some day technologies can be developed to treat and recover usable elements, reduce the disposal volume, and neutralize contaminants.⁹⁶

Pollution prevention has become a key part of efforts in the Calumet region to stop the recurrence of pollution, and this means a focus on steel, chemicals, and refining. In 1989, the vast majority of the volume of wastes discharged directly into Lake Michigan and tributaries originated from the iron and steel industries, followed by the paper and allied products industry, chemical manufacturing industry, and the petroleum refining industry.⁹⁷ In Indiana, the main dischargers are petroleum refining, primary metals, chemicals and allied products, transportation equipment, machinery and equipment, and food and kindred products.⁹⁸ Contributors include two electric utility plants in Illinois and four in Indiana. There are 10 petroleum refineries that are contributors in Indiana and none in Illinois.

While government agencies are playing a key role in pollution prevention in the region, so are environmental organizations. Clean sites has already brought together oil companies to voluntarily improve environmental management. It is now beginning an initiative to hold a basin-wide dialog on pollution prevention in primary metals industries. Citizens for a Better Environment (CBE) has an engineer on staff who can observe plant operations and make recommendations for pollution prevention. CBE works as a consultant in "Good neighbor" negotiations between communities and polluting facilities. I is preparing a list of facilities where both the community and the facility could benefit from such a process, including LTV Steel at 116th and Burley and Safety Kleen in Dolton.

Targeted pollution prevention efforts are especially important because a few sources account for such a large share of pollution. In Illinois, LTV Steel alone accounts for about one third of Cook County's water discharges. Lake County, Indiana's contribution

to water discharges of toxic chemicals is almost entirely accounted for by Inland Steel, USX Gary Works, and American Maize Products. Lake County's discharges of toxic chemicals into the public sewage system are almost entirely accounted for by Ferro Corp. Keil Division and Qaunex La Salle Steel.

Ten sources accounted for over 96 percent of all of the releases of reported Toxic Release Inventory chemicals in Northwest Indiana in 1990, including most of those listed above plus Bethlehem Steel, Amoco Oil Company, Teldyne Casting, American National, Avery Decorative, and Teldyne Casting. Inland Steel alone accounted for 52,982,076 pounds per year out of a total 79,328,377. The types of wastes discharged by these facilities include waste heat from cooling operations, toxic organics such as PCBs and dioxin, toxic metals such as lead and mercury, oxygen demanding materials (measured by BOD and COD), ammonia and phosphorus, and suspended or dissolved solid matter.⁹⁹

As of now, there has been no comprehensive study of the quantities of chemicals used and disposed of in the Calumet region each year. Several inventories are now being created which may help. Some will be available in a year or less time. One estimate is that, in Southeast Chicago, there are 699 facilities which generate, treat, store, dispose, transport, or transfer waste, including 46 facilities which release reportable quantities of toxins under TRI.¹⁰⁰ In Southeast Chicago, there are 47 sites which have been on CERCLIS.¹⁰¹ Forty-four other hazardous waste disposal sites have been identified by a historical geographer.¹⁰²

Southeast Chicago Environmental Injustice

Altgeld Gardens is a public housing project on the far southeast side of Chicago. Local activists call it the Toxic Doughnut. To the west of the housing complex are steel mills. To the south are two landfills. To the north, a sewage treatment plant. And to the east, a paint factory, two chemical plants, and a chemical incinerator. There are 52 abandoned landfills documented in the area. $\frac{103}{100}$

There is groundwater in a shallow aquifer beneath the surface of Southeast Chicago. Because it flows through waste material including slag, dredged sediments, industrial waste and demolition debris, it is contaminated. The most common contaminants are toxic heavy metals. Even though most of the organic contamination appears to be local, inorganic contamination including metals and minerals is throughout the aquifer. The groundwater is discharging into local lakes, rivers, wetlands, and ditches. It may be that contaminants discharged into the Calumet lake and river system are transported by the Calumet River into Lake Michigan, or the groundwater may discharge directly into Lake Michigan, both under relatively low flow conditions and flood conditions.¹⁰⁴

Although there is evidence that contaminated groundwater from the Calumet region

may discharge into Lake Michigan, no one has determined for sure that contaminants which reach Lake Michigan pose a significant health threat. Clarifying the extend of the threat and finding that is substantial could help focus clean up resources on the region. Even if the contamination is not a threat to Lake Michigan, people living in Southeast Chicago are exposed to contaminants which originate in the shallow aquifer when it accumulates in basements and low-lying areas or when they grow food or eat fish caught in local waterways. $\frac{105}{100}$

The nature of groundwater contamination in Southeast Chicago makes finding solutions difficult. Possibilities include bioremediation and piping oxygen-rich water from a local aeration plant to 250 acres of wetlands (also suggested by George Roadcap, Illinois DNR). $\frac{106}{2}$

There has been other progress in environmental protection in the Calumet region in the past ten years. In Illinois, some landfill expansion has been stopped. Repeal of the Illinois Retail Rate law means that it is unlikely that most of eight incinerators which would have formed a ring around the southwestern tip of the Great lakes ecosystem will be built. Air quality has improved in Southeast Chicago. Water quality is better and waterways are cleaner. Environmental fines which can be used for community projects have created opportunities to protect natural areas.

In May 1996, U.S. EPA negotiated a settlement with 11 nonprofit organizations represented by Chicago Legal Clinic. It agreed to perform a multimedia analysis of all mobile, point and area sources in Cook County, IL and Lake County, Indiana, with the goal of creating the first replicable model to define cumulative risk in a complex urban setting. In the next 2 years, U.S. EPA will (1) develop an environmental loading profile to determine potential exposures, (2) develop a cumulative risk matrix, (3) develop pollution prevention strategies targeted at the sectors because of cumulative risk, (4) establish a community-regulator dialog to determine how to incorporate cumulative risk into permitting and other decisions, and (5) design and implement remedial activities and conduct community education/outreach to address the findings.¹⁰⁷

In Northwest Indiana, because of the U.S. EPA's Geographical Enforcement Initiative, businesses in Northwest Indiana are incorporating environmental management in ways they did not before. With the large fines imposed, it does not pay to pollute. IDEM Northwest Indiana's regional office is stronger than in the past and Northwest Indiana is a priority. Air quality is cleaner. The Gary Works are now visible. Water quality is improving. Some coking batteries at the steel mills have closed. Pickle liquor disposal via deep well injection has been stopped, as has slag fill in Lake Michigan.

The Grand Calumet River is much improved, and thousands more regional residents are aware of the river's problems and are committed to clean up and restoration. Clean up projects are before the public that could have major portions of the Grand Calumet River dredged of contaminated sediments by the year 2000. The Grand Calumet Corridor Planning/River Visioning Initiative is building momentum for river improvements. Lakeside Planning by NOAA (coastal zone management planning) is moving along. The Remedial Action Plan (RAP) project is helping to clarify what needs to be done to improve the ecosystem. RAP Stage 3 Implementation for Indiana Harbor Area of Concern is proceeding.

Unfortunately, the remaining problems are daunting. Improving life in the "toxic donut" around Altgelt Gardens is an overwhelming effort, in spite of success at attracting regulator attention and some research and clean up dollars.

Even though much landfill expansion has been blocked, Waste Management is negotiating with MWRD to site a landfill in the at O'Brian Lock Marsh, an area categorized as 2-3 in the SAMP and in City Space as a high priority preserve. If the landfill moratorium is lifted, Waste Management will also want to fill in the access road next to its land. However, on January 14, 1997, the Chicago City Council voted to extend the City's landfill moratorium for another year.

And, while public involvement in clean up efforts has greatly increased, residents feel government agencies still need to go beyond meetings and hearings. They also are concerned that some local leaders see a conflict between environmental improvement and economic rebirth.

Ecological Conditions

The Calumet Region has some of the most valuable natural areas in Illinois and Indiana. There is huge and significant biodiversity in the Calumet region and a great variety of

endangered and threatened species of plants and animals.¹⁰⁸ Perhaps even more important, there is an opportunity in the Calumet region for learning how to co-exist with other species because of the natural remnants which exist along side of densely populated and industrial areas.

The bi-state Calumet region is part of the Chicago/Calumet Lacustrine Plain ecological region which extends 112 kilometers from Winnetka, Illinois, to 13 miles northeast of the state line of Michigan in a crescent shape. Many of this region's historical habitats are preserved in the Indiana Dunes National Lakeshore, a natural shore of narrow beaches and high dunes. All of the remaining shoreline along the Chicago/Calumet Lacustrine Plain has been altered by coastal development.

In Indiana, about half of the 45 miles of shoreline is publicly owned local, state and national parks for recreation, about one-third is occupied by industry, and the remainder is used for private homes.¹⁰⁹ In Lake County, industry occupies most of the shoreline. In Porter County, the shoreline includes four residential communities, two major steel mills, a commercial harbor, a power plant, and the Indiana Dunes National Lakeshore. In LaPorte County, at Michigan City, a coal-burning power plant stands between a

national park and a recreational harbor and public beach.¹¹⁰

Southern Lake Michigan has two remarkable shoreline features, the dunes and the lakeplain.

Sand dunes: These occur where onshore winds combine with the transport of sandy sediments in the lake to deposit sediments on the shore. There is a long expanse of sand dunes along the eastern shore of Lake Michigan. Most of the dunes on Lake Michigan's eastern shore are largely intact.¹¹¹

The Indiana Dunes National Lakeshore

The Indiana Dunes National Lakeshore is third among all national parks in biodiversity, after the Great Smokey Mountains and Grand Canyon, even though its acreage totals less than 3 percent of either of the to two.¹¹² This national park protects 13,945 acres on Lake Michigan's southern shore. The Dunes stretch along the southern edge of Lake Michigan almost as far east as Gary and as far west as Michigan City. Within its beach, bog, marsh, forest, and prairie habitats, there are over 1300 species of plants. The Dunes provide an unusual opportunity to preserve biological resources in an urban area in close proximity to industrial development.¹¹³

Lakeplains: Lake Michigan's lakeplain is where the ancestral Great Lakes once occupied a larger basin than today. The lake plain is characterized by low topography (linear sandy beach ridges), clay soils and a high water table. It can support prairies and savannas, sand barrens, meadows, swamps, and coastal plain ponds. The Lake Michigan lake plain played an important historical role in floodwater retention and as an ecological backstop during high lake levels.¹¹⁴ For the Great Lakes overall, the Nature Conservancy estimates that 22% of unique biodiversity elements found in Great Lakes habitats are in the lakeplain.¹¹⁵

Flooding in the South Lake Michigan region has been exacerbated by drainage of this area. Failure to protect floodplains from development has resulted in high costs for flood damage, flood insurance, flood-prone property acquisition, flood-proofing of buildings, and construction and maintenance of flood control structures. A 1988 study revealed a \$2.8 billion backlog in flood and stormwater management projects in northeastern Illinois.¹¹⁶ There are flooding problems along the Little Calumet River, an d a \$90 million project to alleviate flooding involves dredging, levees, and preservation of wetlands.¹¹⁷ The lakeplain is a significant source of fine materials that erode to the lakes in tributary floods.

What is best known about the lake plain within the Calumet region is its wetlands. Part of what attracted development to the Lake Calumet area was the wetlands and lakes

which provided convenient disposal options for the mills, refineries, and manufacturing plants.¹¹⁸ The Lake Calumet area has the distinction of being a "combination landfill and nature area."¹¹⁹

It is estimated that approximately 25,000 acres of wetlands once existed in the Lake Calumet region prior to European settlement. Only about 600 acres remain. So little remains of these areas-- and so much of it is in fragmented patches -- because industry has filled and eliminated large expanses. Developers filled marshland with dredge spoil from the rivers to enable industrial development.

The occurrences of wetlands in this area is the result of low topography and underlying clay strata in the soil which lead to poor drainage conditions. Most of the wetlands are open water characterized by permanent standing water. Many are emergent wetlands, i. e. freshwater marshes dominated by grasses and grass-like plants.¹²⁰

In the Lake Calumet Area, most of the existing wetlands are clustered along the eastern shore of Lake Calumet and along the Little Calumet and Grand Calumet Rivers. Some wetland complexes also occur adjacent to Wolf Lake and Powderhorn lake. There are also a large number of small isolated patches of wetland through the region. $\frac{121}{2}$

Landfills, hazardous waste sites and pollution are a continuing threat to the remaining wetlands.¹²² The surface and ground waters of the remaining wetlands have been polluted, so that plant diversity and wetlands functions are lowered. There are some s mall tracts that are intact of forested wetlands in public woods and wet prairies associated with the sandy lake ridges and swales.¹²³ However, it is hard to survive with 51 hazardous waste disposal sites in the area including sanitary landfills, on-site settling ponds, and general refuse dumps.

Although what is best known about the Calumet region is its wetlands, the Calumet region also has lake-plain prairie remnants, savanna, and dune swales. The complex of wetlands, prairie/savanna sites, and woodlands in the Lake Calumet area may be the most important bird stopover point in the Chicago metro area.¹²⁴

The mix of high-quality and highly degraded natural areas in this region serves as a staging area for migrants using the Lake Michigan shore for their migration. 125 There are about twenty-eight hundred acres of wetlands and open water in the Calumet re gion providing nesting grounds for thousands of birds, and stopovers for many more thousands of migratory birds in spite of intense pollution. There are 20 species of threatened or endangered birds observed in the area and nine plant species, all of which are associated with wetlands and aquatic systems. These birds are found in Lake Calumet, Wolf Lake, Lake George and nearby marshes, such as the Big Marsh which supports a large colony of nesting Black-crowned Night-herons.

In the meantime, the remaining natural areas have little or no protection from industrial development and expanding landfills, and there are a variety of threats. Many natural areas are not actively managed as ecological sites because they are privately owned, abandoned or owned by quasi-public authorities which don't have an open space mission. Many businesses don't see how they will benefit from restoration. Corporations in the midst of settlements for remediation may reserve their natural areas so they can negotiate protection as part of their settlements. In the meantime, it is hard to interest landowners in landscape improvement even when there is likely to be a big payoff in land values. Railroads are interested in developing their property, not preserving open space.

The Sanitary District, for example, is conservative in its support of open land because it may need its land in the future for sludge disposal. This is important because the District owns a lot of land in Southeast Chicago and a growing quantity of sludge which it must dispose of. The Port Authority also does not have a strong thrust for open space preservation, and it has large natural resources in Southeast Chicago.

Many properties in the region could be acquired, but no one is pursuing them yet and there is not enough money for acquisition, especially when there are hazardous waste problems. There has not been much local government support for setting aside open space (but this could change if someone helps bring local governments together to attract grant funding, portion out responsibility, piece together parcels, and integrate trails and corridors with economic development. The Openlands project may increasingly play this role.

Even though his agency staff-members are supportive, Mayor Daley himself has not focused on the region or open space preservation in it. This is particularly important because Daley appoints 5 of 9 Port board members, could exert influence over the Sanitary district, and will determine whether the City Space support of wetland preservation in the Calumet region is acted upon.

The Diverse ownership patterns -- a mix of industrial, state and local public lands -currently stands in the way of an integrated management strategy for the natural areas in the region. $\frac{126}{126}$ The dispersed nature of natural sites in the region also discourages public agencies. It is also hard to sort out who holds what land in the region and gain title to properties which have been sub-divided and have multiple ownership.

There is no unified preservation and restoration strategy for the significant natural areas of the Lake Calumet region in the context of industrial redevelopment, although the Chicago Department of Environment has a proposed \$200,000 initiative for an integrated planning effort aimed at environmental and economic revitalization of the Lake Calumet region.

And many people are hurting for jobs too much to think about other needs or new paths

The Calumet Region - Ecology

to attracting new economic development.

Still, there has been progress in improving ecological capacity in the past decade in the Calumet region. One sign of progress is the growing recognition of the valuable assets in the region. In Illinois, all Chicago environmental organizations have developed an interest in the region. As a result of 1000s of field trips, many more residents of the metropolitan area know where the Calumet region is and know that there are valuable resources there. Most high value areas are well documented and promoted. The City Space Plan, a project of the Chicago Department of Planning and Development, says that Calumet Lake wetlands are important to preserve and this might help lead to a special district to protect them.¹²⁷ The Cook County Forest Preserve says Lake Calumet is an opportunity area. The Chicago Park District also says it is an important area.

When Southeast Chicago Development Commission asked 39 firms if additional resources for cooperative maintenance of open spaces in the Calumet Industrial Corridor would benefit the Corridor, 50% strongly agreed and 25% agreed. Eight percent disagreed and only 3% strongly disagreed.¹²⁸ Ford Motor Company undertook a major landscaping project at 130th and Torrence.

There are also concrete improvement projects. Some natural areas have been declared hands off. A few contaminated sites have been cleaned up and some are in the process of being cleaned up. The Burnham Greenway represents the first time in many years that a large greenway (all the way from the Skyway down to the Calumet River) has moved forward. The Illinois State Water Survey is trying to identify ways to improve the capacity of Calumet area wetlands. The Chicago Department of Transportation is pursuing trail extensions.

Calumet Ecological Park Association (CEPA) and the Lake Calumet Study Committee have been urging the creation of a Calumet Ecological National Park for some time, including the Lake Calumet Area, with links by rivershed and lake corridors to the Indiana National Lakeshore and the Cal-Sag Channel to the Illinois and Michigan Canal. At the behest of Congressman Jerry Weller, Congress has approved legislation for the Secretary of Interior to do a feasibility study exploring the extension of the I & M Canal Corridor through the Calumet region and the creation of the Calumet Ecological Park.¹²⁹ The Openlands Project, along with other organizations, is creating a Preliminary Land Use and Biodiversity Linkage Opportunity Map of the Lake Calumet area, including a base map of natural area remnants and open space parcels throughout the Lake Calumet area and interspersed properties which might be candidates for acquisition and management.¹³⁰ One barrier facing this project is that the political climate at the federal level is not good for adding land to the public domain. Even if the National Park Service rejects the idea of a national park, it may make other proposals which benefit natural areas in the region.

Until twenty years ago, natural areas in Northwest Indiana were written off. Now there

are five nature preserves, and environmental agencies and some companies see the need to move beyond saving specific sites to dealing with the ecological health of the region. Residents now recognize the biodiversity in the region more. Habitat protection and restoration efforts include Clark and Pine, Ivanhoe Cluster, Gibson Woods, and the Hoosier Prairie.

The attention which U.S. EPA has paid to Northwest Indiana through its Geographic Enforcement Initiative has produced broad-ranging results. Planning has progressed to restore wetlands along the Little Calumet River using federal money for flood control through the Conservation Service. There have also been fisheries enhancement efforts, particularly the small mouth bass in harbors, and efforts to stem the reduction in yellow perch.

Back to The Calumet Region - Table of Contents