

Wisconsin Great Lakes Chronicle  
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## On the Cover

Newport State Park in Door County features eleven miles of Lake Michigan shoreline.



# FOREWORD

*Governor Scott McCallum*

Water is an integral part of the lives of Wisconsinites. Our history, culture, ecology and economy are rooted in our lakes, rivers and streams. No water bodies are more significant to our well-being than the Great Lakes.

Welcome to the inaugural *Wisconsin Great Lakes Chronicle*. This and future editions are intended to promote public awareness of Wisconsin Great Lakes issues, provide a vehicle for experts to educate public policy and opinion leaders, and create a historical record of Great Lakes events and perspectives.



The importance of the Great Lakes cannot be overstated. They are diverse ecosystems that provide habitat for aquatic animals and clean water for millions of persons. They connect Wisconsin farmers and manufacturers with global markets, and citizens and visitors alike with unique recreational opportunities.

It is for these reasons that I place a high priority on protecting the Great Lakes for this and succeeding generations. I am pleased to report that we are making significant progress on several fronts.

In May 2001, I signed into law a landmark wetland protection bill. Wisconsin was the first state to respond to a United States Supreme Court decision that narrowed the water and wetland areas subject to federal regulation. Today, Wisconsin protects precious isolated wetlands – including many in coastal areas – from being dredged or filled.

In June 2001, I added my signature to the Great Lakes Charter Annex. This agreement between Great Lakes states and provinces strengthens our ability to manage water resources and sets a framework for water diversion standards.

In August 2001, I signed legislation banning oil and gas drilling on the Great Lakes. While adequate energy resources are crucial, we must not pursue opportunities at the expense of the largest surface fresh water source in the world.

Invasive plants and aquatic animals pose a significant risk to the Great Lakes and our inland waters. For that reason, I appointed Lt. Gov. Margaret Farrow to lead a Governor's Advisory Task Force on Invasive Species. It evaluated the severity of invasives in Wisconsin and developed a plan to combat the introduction and spread of non-indigenous species.

In March 2002, my administration provided local and state agencies with nearly \$7 million of federal coastal management funds to protect our Great Lakes shoreline.

I invite all Wisconsinites to join me in pressing forward with a full Great Lakes agenda. Together, we will restore fragile coastal areas, enhance water quality, improve the environmental and economic well-being of the coasts and meet future challenges to the prosperity of the Great Lakes.

Enjoy *Wisconsin Great Lakes Chronicle*, and thank you for your commitment to the Great Lakes and Wisconsin.

Coastal management fosters balance between development and natural resource protection.

## WHY COASTAL MANAGEMENT?

*James M. Langdon*

Coastal communities attract complex concentrations of commerce and foreign trade, inter-modal transportation systems and population. They are home to sensitive and diverse terrestrial and aquatic ecosystems and marine centered recreation. In addition, their special place exposes these communities to shoreline and maritime hazards not typically found inland.

The federal government recognized these unique characteristics when it established the Coastal Zone Management Act of 1972 (CZMA). Congress declared it was in the national interest to preserve, protect, develop, and where possible, to restore or enhance, the resources of the nation's coastal zone for this and succeeding generations.<sup>1</sup>

The National Oceanic and Atmospheric Administration (NOAA) supports state coastal management programs through financial assistance, technical services and information. This unique state-federal partnership leaves day-to-day management decisions to the 33 states and territories with federally approved programs.

### Coastal Management in Wisconsin

Wisconsin established its Coastal Management Program (WCMP) in 1978. The program leverages the abilities of state agencies, regional planners, universities and local governments for the management of resources along the state's 820 miles of Lake Michigan and Lake Superior shoreline.

The fifteen Wisconsin counties along Lakes Superior and Michigan comprise 19% of the state's total area and 37% of its population.<sup>2</sup> If left unmanaged, pressures from coastal population growth would degrade water quality and wetlands, reduce sensitive habitats and limit opportunities for access to public waters. Coastal management fosters balance between development and natural resource protection through various means.

**Financial Assistance.** Coastal management grants encourage the protection and wise use of shoreline resources and increase the public's opportunity to enjoy the Great Lakes. The program emphasizes wetland protection and habitat restoration, nonpoint source pollution control and coastal land acquisition. It also promotes education, public access, historic preservation and community planning.

Wisconsin's coastal communities received a significant boost in 2001 when Congress provided \$5.7 million on a one-time basis for restoration initiatives. Looking ahead to 2003 and beyond, the WCMP expects to allocate \$1.3 million annually for local projects in the coastal zone.

**Regulation.** The CZMA provides state coastal management programs with authority to review proposed federal government activities in the coastal zone. These reviews ensure federal actions along Wisconsin's coasts take place in harmony with state law and policies. The program also



develops a sound base of information used by state and local officials to guide resource management decisions.

**Research.** The University of Wisconsin System is a national leader in the study of critical coastal issues. Recent research addressed shoreline erosion, invasive species, coastal restoration and water quality. Coastal management connects local government with academic research to improve the Great Lakes environment.

**Education.** Great Lakes protection and preservation require the involvement of an enlightened citizenry. Coastal management informs the public of coastal issues and increases opportunities for citizen participation in decisions affecting Lakes Superior and Michigan.

**Coastal Network.** As a networked program in the Wisconsin Department of Administration, the WCMP acts as a facilitator among state agencies, local governments, regional planning commissions and others in the management of shoreline resources. This method of organization maximizes

CZMA dollars for project work – not administrative overhead – and ensures the program balances environmental and economic development objectives.

**Performance Indicators.** In 2001, NOAA selected the WCMP as one of five state programs to develop recommended performance indicators for CZMA programs nationwide. Aided by this experience, the WCMP will monitor the health of Wisconsin's coastal zone by tracking wetland acreage, slope recession rates and other critical measures.

### Diverse Coastal Leadership

A multidisciplinary council representing local governments, the Legislature, academia, state agencies, Indian tribes and the public plays an active role in coastal management issues. The Wisconsin Coastal Management Council (WCMC) – a governor-appointed body – sets WCMP policies and direction, establishes annual funding priorities and recommends grants to state and local projects. The WCMC provides coastal stakeholders a forum for discussion of emerging and critical issues.

### Outlook

The need for effective coastal management continues. Nationally, some large coastal metropolitan areas are consuming land ten times as fast as they are adding new residents. If today's land consumption trends continue, more than one quarter of the coast's acreage will be developed by 2025 – up from 14 percent in 1997.<sup>3</sup>

Policy leaders are paying close attention to such projections. Congress is poised to reauthorize the CZMA in 2002, thus reaffirming its commitment to the nation's coastal resources. In addition, the U.S. Commission on Ocean Policy will recommend a national policy on oceanic and coastal issues by 2003.

Wisconsin must blend the expertise of state and local stakeholders with federal funding and technical assistance to maintain equilibrium between ecosystem protection and anticipated development. Coastal management will continue to play an important role in preserving the resources of our Great Lakes.

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1 Coastal Zone Management Act of 1972.

2 Demographic Services Center, Wisconsin Department of Administration. 2001. 2001 Official Population Estimates.

3 Beach, D. 2002. Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States. Pew Oceans Commission, Arlington, Virginia.



Reducing economic and environmental losses from variable lake levels must involve improved local land use planning to minimize erosion risks to lakeshore development.

## COASTAL HAZARDS

*Alberto Vargas, Ph.D. and David Hart, Ph.D.*

People are strongly attracted to the coast as a place to work, relax and live. Coastal areas were historically settled because of their role in the transportation of goods, military protection and the production of food and energy. In recent decades, coastal areas have attracted development for their aesthetic characteristics – as a scenic location to live and recreate. Unfortunately, development along the coast is also subject to a variety of natural hazards. The major natural hazards associated with Wisconsin's Great Lakes shoreline are erosion and flooding.

### Coastal Erosion

Coastal erosion occurs naturally when land is lost due to wave action and surface runoff. As waves strike the shore and return to the lake, they carry sediment along the shore in a process known as littoral drift. High water levels and strong winds and waves expose new land surfaces to wave action and erosion. Erosion at the toe of vulnerable slopes destabilizes them and results in massive slumps of soil farther up the slope.

Surface and ground water flow resulting from heavy rainfall and the freezing and thawing of ice also cause slope erosion. In general, the erodible sections of the Lake Michigan shore occur from the Illinois state line to the Sturgeon Bay Canal, northeastern Brown County and smaller segments of bays and clay banks. On Lake Superior, erosive high clay bluffs stretch from Bark Point in

Bayfield County to Wisconsin Point in Douglas County and from the eastern border of Iron County to the White River in Ashland County.<sup>1</sup>

### Lake Levels

Coastal flooding along low-lying sections of the Great Lakes results from long-term increases in water levels or short-term storm surges and wind set-up. Water levels in the Great Lakes fluctuate on both a seasonal and long-term basis. Seasonally, the lowest levels occur during the winter – following evaporative losses in the fall and winter – when much of the precipitation is held on land as snow and ice. The highest seasonal levels are usually during the summer.

Long-term variation of lake levels depends on precipitation and evaporation trends in the Great Lakes watershed. The water volume of the Great Lakes is large and outflow from natural outlets is limited. Flow regulation structures exist at the outlets from Lakes Ontario and Superior. However, structure size and the need to regulate water levels for multiple interests, including shipping, limit their influence.

Recent periods of high lake levels on Lake Michigan include 1972-76, 1983-87 and 1996-98. Since 1999, water levels on Lakes Michigan and Superior have been low. Areas on Lake Michigan vulnerable to coastal flooding include southern Kenosha County, northern Ozaukee and southern Sheboygan Counties, the western shore



of Green Bay, and low-lying river mouths in urban areas. Vulnerable Lake Superior areas include sections of the City of Superior and coastal estuaries. Shoreland and riverine power, sewage treatment, water pumping and industrial plants, grain elevators, communication tunnels, storm sewer outlets and other infrastructure are also vulnerable when lake levels exceed the levels for which these facilities were designed.

### Impact of Coastal Erosion

Coastal erosion and flooding cause millions of dollars of damage to coastal property and structures. Storms and high lake levels in 1987 resulted in \$16 million of documented damage to public facilities alone. Experts speculate, however, that future damage may be even higher due to increased coastal development.

Most of the highly assessed land in Door County is along the coast. The assessed value of land and improvements that intersect the 1000-foot

shoreland zoning jurisdiction of Lake Michigan in Door County totaled over \$1.9 billion in 1999.<sup>3</sup> In addition, smaller homes along the coast are being replaced with much larger homes.

Finally, urban infrastructure may be vulnerable to damage from high lake levels. Public works facilities and industrial plants sited many years ago incorporated design standards that are no longer adequate. Another illustration of the vulnerability of public infrastructure to bluff erosion is County Trunk Highway LS in northern Sheboygan County (see photo). A one-mile stretch of the highway is in jeopardy of being lost, and one segment is only six feet from the edge of the bluff.



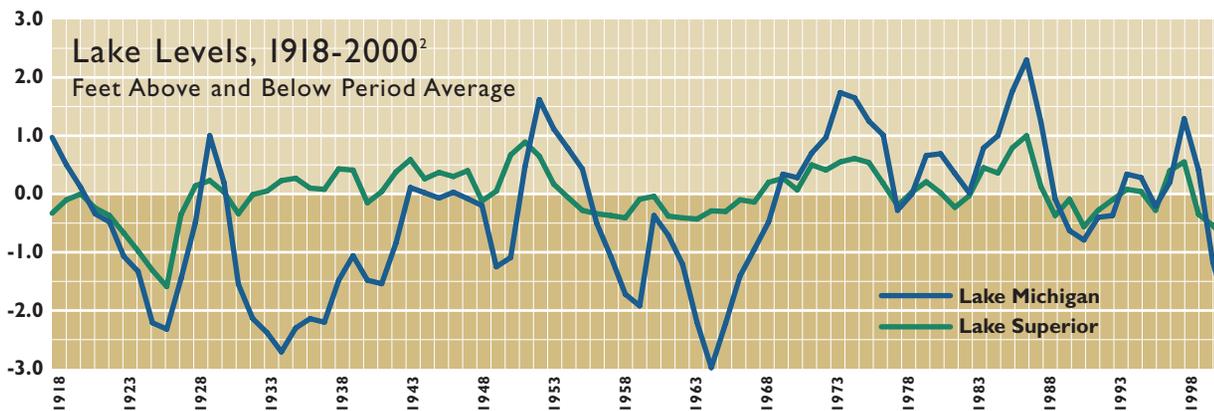
(WDNR) and Wisconsin Emergency Management (WEM) formed a Coastal Hazards Work Group to provide technical assistance and coordinate state resources.

### Managing for Hazards

Managing for hazards is a priority of many coastal stakeholders. The Wisconsin Coastal Management Program (WCMP), University of Wisconsin Sea Grant Institute, State Cartographer's Office, Wisconsin Department of Natural Resources

The Work Group determined that improved information was the most important factor in managing for coastal hazards. To that end, a multi-year strategy is being implemented to assist in developing the coastal hazards policy:

- Update and integrate information and methods in a geographic information system (GIS) compatible format.
- Develop a comprehensive education program regarding erosion rates and flood-prone areas directed at the public, government officials and the private sector.
- Develop an institutional framework to improve regulatory mechanisms and local mitigation efforts.



Since the mid-1970s, the WCMP and its partners have sought ways to address the issue of coastal hazards. An important legacy of this early work is the publication of a model ordinance and a state plan to deal with coastal erosion. About half of Wisconsin's coastal counties and a handful of municipalities have adopted some type of provision to regulate construction near the shoreline.

The official state policy for all shoreline development in Wisconsin specifies a 75-foot setback from the ordinary high water mark set primarily for environmental and scenic beauty protection. However, this setback is not always appropriate to prevent damage from coastal erosion in the Great Lakes. One priority for the Work Group is to assist coastal municipalities and regional planning commissions to agree upon appropriate shoreline development provisions that minimize potential damages due to coastal erosion.

## Hazards Mitigation

The Work Group also contributed to the inclusion of coastal hazards in the State Hazards Mitigation Plan, coordinated by WEM. This plan, which is in the process of receiving Federal Emergency Management Agency (FEMA) approval, sets the framework for the development and implementation of mitigation measures aimed at preventing – rather

than responding to – natural hazards in the state. The WCMP and its partners are doing their part to support local mitigation plans that include coastal hazards as an important element.

In addition, a long-term project to assess the economic impact of fluctuating water levels in the Great Lakes is being coordinated by the Army Corps of Engineers, Detroit District. In cooperation with the University of Wisconsin, WCMP, WDNR, private consultants and State of Michigan agencies, the Corps has organized the Lake Michigan Potential Damages Study (LMPDS).

The objective of the LMPDS is to create a modeling procedure and engineering-management tool for estimating economic effects of lake level changes and related social, environmental and cultural impacts. The LMPDS modeling approaches are expected to be the framework for economic assessments for each of the other Great Lakes. It is also intended to be a forum for concerted information system development between international, federal, state and local governance about the resource base that is commonly shared.<sup>4</sup>

Several state and local benefits should result from the LMPDS project, including better tools to predict lakeshore erosion and improved availability of erosion data. Nature has the greatest role in

determining lake levels, although regulation of outflows at Superior and Ontario has some influence. However, reducing economic and environmental losses from variable lake levels must involve improved local land use planning to minimize erosion risks to lakeshore development.

Wisconsin's Great Lakes coast is a privileged area of extreme natural beauty that ought to be protected for the enjoyment of this and future generations.

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- 1 Springman, Roger, and Stephen M. Born. 1979. *Wisconsin's Shore Erosion Plan: An Appraisal of Options and Strategies*. Madison, WI: Wisconsin Geological and Natural History Survey. Pp. 6-11.
- 2 The graph of lake levels fluctuation was built using data from the U.S. Army Corps of Engineers, Detroit District (<http://huron.lre.usace.army.mil/levels/hmpglv.html>)
- 3 Hart, David. 2000. *Building a Horizontally and Vertically Integrated Coastal GIS Using Local Governmental Spatial Data: The Case of Coastal Erosion Hazards on the Lake Michigan Coast of Wisconsin*. PhD Dissertation. University of Wisconsin-Madison.
- 4 U.S. Army Corps of Engineers, Detroit District; (<http://huron.lre.usace.army.mil/coastal/LMPDS/index.html>)

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Waterborne transportation is the safest and most environmentally friendly means of transporting cargo.

## WISCONSIN COMMERCIAL PORTS

*Dean R. Haen*

Wisconsin accesses world markets through 15 commercial ports located along Lake Superior, Lake Michigan and the Mississippi River. The ports of Wisconsin transport over 40 million metric tons of cargo annually. The cargo consists of coal, grain, cement, steel, iron ore, liquid asphalt, limestone, pig iron, salt, fuel oil, wood pulp and many other important commodities that are valued at over \$7 billion dollars each year. The larger ports of Superior, Milwaukee and Green Bay have an annual economic impact of over \$200 million dollars within their local economies.

Wisconsin ports are critical to our state's transportation system and serve as multi-modal links that move cargo throughout the state. Wisconsin as a whole benefits from the port industry. Commodities moved through ports are essential for our state's power plants, paper mills, manufacturers, farmers, governments and consumers.

Waterborne transportation is the safest and most environmentally friendly means of transporting cargo. Fuel consumption and emissions are substantially reduced when cargoes are transported by ship rather than rail or truck. A modal shift from water to trucks or railcars would alter our quality of life in Wisconsin.



For example, at least 16 million tons of coal per year are loaded onto ships at Superior for transport to eastern Great Lakes ports. This avoids many trainloads of coal destined for Detroit Edison facilities that would otherwise travel rail routes through Wisconsin. Transporting via water avoids the consumption of an estimated 32 million gallons of fuel and the release of 5,120 tons of exhaust emissions annually. Additionally, waterborne transportation reduces the number of at-grade railroad crossing events with cars and trucks.

Even though ports support an economical and environmentally responsible mode of transportation, there is an immediate need for long-range sustainability planning. Land use surrounding existing ports has shifted from predominately industrial and commercial uses to conflicting residential and recreational uses that threaten or impede the operation of port facilities. As a result, many coastal communities no longer serve as operating commercial ports.

The overall loss of commercial ports increases Wisconsin's dependency on our remaining ports. These ports must be commercially active if our state is to maintain its economic stability.

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Despite major success in cleaning and restoring the Great lakes over the past few decades, there remains the need for continuing attention and care.

## GREAT LAKES CHALLENGES

*Secretary Darrell Bazzell*

Many homeowners are following a trend of installing backyard ponds to enjoy the benefits of water. As they care for their ponds, they soon learn the importance of maintaining the mini-ecosystem they have created. If a particular element of the system gets out of balance, it affects everything from water quality to the survival of plants and fish. The job of managing the system is one that never ends.

The same lessons apply to the Great Lakes ecosystems. Despite major success in cleaning and restoring the Great Lakes over the past few decades, there remains the need for continuing attention and care. Remediation of contaminated sediment and the problems associated with invasive species represent two major areas of current effort.

### Contaminated Sediments

Contaminated sediment is part of the legacy of past discharges that deposited harmful chemicals such as polychlorinated biphenyls (PCBs) in the Great Lakes and their tributaries. Of the 42 Great Lakes Areas of Concern, 40 areas – including the Fox, Sheboygan, Menominee, St. Louis and Milwaukee Rivers in Wisconsin – have problems associated with contaminated sediment. Wisconsin has seen tremendous improvements in water quality by eliminating pollution sources.

However, contaminated bottom sediments continue to release harmful chemicals, and fish consumption advisories are still issued for portions of the Great Lakes and some tributaries.

The State of Wisconsin has made it a priority to clean up contaminated sediments. Several actions from completing cleanup plans to active remediation are underway along Wisconsin's coasts. Experience tells us that the job of cleanup is costly, difficult and more expensive than prevention measures. Progress is being made and we are confident of further improvement to the Great Lakes as more implementation occurs.

### Invasive Species

Since 1810, more than 140 species of fish, plants, invertebrates, algae and pathogens have been introduced into the Great Lakes. The spread and impacts of invasive species – especially aquatic exotics – pose a second challenge to the Great Lakes.

Many exotic species threaten the diversity or abundance of native species, the ecological stability of aquatic habitats and recreational activities. Invaders take over new waters because their natural predators are not present, and native species are not able to hide from them, compete with them or fight back. Once in Lakes Michigan and Superior, many of these species can be inadvertently transported into Wisconsin's inland waters.

Several aquatic invasive species were initially introduced to the Great Lakes through the ballast water of ships and by migrating from the ocean via man-made canals. Additionally, recreational boating, sport fish stocking and accidental releases associated with the aquaculture industry, aquarium trade, bait businesses and horticultural practices continue the introduction and spread of aquatic exotics.

Once aquatic invasive species become established in a water body, they are difficult to manage and nearly impossible to eliminate. For these reasons, the Wisconsin Department of Natural Resources focuses on teaching people to prevent the spread of exotic species. The goal is to change boaters' behavior by educating them on their role in maintaining clean waters. The Department's message is "Clean Boats, Clean Waters."

There are many reasons to care about aquatic exotics and support efforts to stop their spread. Even the smallest aquatic invasive species can have big economic impacts. Zebra mussels attach to virtually any available surface – including boats – and have been known to clog water intake pipes. Large water users in the Great Lakes, including municipalities and industries, spent about \$120 million from 1989 to 1994 to combat the spread of zebra mussels. As this species continues to spread, the cost to raw water users will continue to

increase. Zebra mussels also illustrate the ecological impacts of aquatic exotics. These invaders reproduce and spread rapidly, consume microscopic plants and animals, affect the food web and decimate native clam/mussel populations.

Aquatic exotics can also affect the recreational uses of a water body. Eurasian water milfoil displaces native aquatic plants and forms thick mats that interfere with boating, swimming and fishing.

In response to problems caused by aquatic invasive species, Governor McCallum established a Task Force on Invasive Species in July 2001 to address the invasive species problem in Wisconsin and create guidelines for future efforts. In its final report to the Governor in January 2002, the Task Force recommended:

- The statutory creation of a statewide invasive species program to combat the introduction and spread of invasive species.
- The creation of an Invasive Species Council to oversee the state program and communicate and coordinate activities among state agencies.
- The establishment of a program director that would serve as Wisconsin's point person on invasive species.
- The implementation of regional ballast water regulations and promotion of a Great Lakes regional invasive species strategy.

The Wisconsin Legislature enacted regulations aimed at reducing their spread. These new rules – which took effect in May 2002 – prohibit launching a boat, trailer or boating equipment in navigable waters if aquatic plants are attached or if a law enforcement officer has reason to believe that zebra mussels are attached. The Department received \$300,000 funding from the state for initiatives including a watercraft inspection program and a campaign to inform boaters of the new regulations and instruct them on how to clean their boats properly.



As part of the next budget cycle, the Department seeks additional funding to implement the recommendations of the Governor's Task Force. For more information on aquatic invasive species, contact Ron Martin at (608) 266-9270 or Mandy Beall at (608) 267-3531.

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The Bad River Tribe  
has made great strides  
in protecting resources  
for today and seven  
generations hence.

## MANAGING THE BAD RIVER OF LAKE SUPERIOR

*Rae Ann Maday*

The Treaty of September 30, 1854 between the United States Government and the Bad River Band of Lake Superior Chippewa Indians established the original boundaries of the Bad River Indian Reservation. The 125,000-acre Reservation is located in parts of Ashland and Iron Counties in northern Wisconsin.

Approximately 77% of the Reservation is forested, 11% consists of wetlands and sloughs, and the remainder is covered by farmland, residential communities and roads.

The Reservation has approximately 40 miles of Lake Superior shoreline and over 100 miles of navigable rivers and streams flowing into Lake Superior via the Bad, White, Marengo and Kakagon Rivers. Approximately 200 acres of Reservation land are on Madeline Island, the only Apostle Island not included in the Apostle Islands National Lakeshore. At the mouth of the Kakagon and Bad Rivers is the most extensive, least disturbed, fully functioning estuary on the south shore of Lake Superior. The Kakagon and Bad River Sloughs are hosts to the largest wild rice beds in the state, long considered an asset by the tribe.

The Bad River Band has a Natural Resources Department that consists of 16 fulltime and 15 seasonal employees. The fulltime staff includes a Natural Resources Manager, Fisheries Specialist, Lake Superior Fishery Specialist, Wildlife Specialist, Forestry Technician, Watershed Coordinator, Air

Quality Specialist, Wetlands Specialist, Water Resources Specialist, Water Resources Technician, GIS Specialist and two Conservation Wardens. The Department staff are involved in many projects within their respective disciplines.

### Water Resources

The Water Resources Office is responsible for developing the qualitative and quantitative standards for water resources on the Reservation. Once these projects are complete, the Bad River Tribe will have a complete picture of the water resources on the Reservation. The following projects are an example of the type of research necessary to accomplish this goal.

- Baseline water quality monitoring began in 1997 with the five-year baseline completed in July, 2002. Sampling is done at 22 different sites on Reservation waters. The parameters monitored in the field are temperature, dissolved oxygen, conductivity and pH. Additional tests are conducted in the tribal water lab to determine hardness, dissolved solids, total solids, turbidity, phosphate, nitrate, fecal coliform and E.coli. Although the preliminary results show fairly clean water, there is concern about elevated levels of fecal coliform.
- Macroinvertebrate monitoring was begun in 1998. Analytical metrics used include Hilsenhoff Biotic Index (HBI), taxa richness,



Ephemeroptera/Plecoptera/Tricoptera (EPT) richness, percent EPT, percent dominance and percent chironomids. The five-year baseline of invertebrate data will be reached in 2003. The indicator species so far suggest that the waters on the Reservation are healthy.

- A wetland nutrient investigation just completed the first year of a five-year study.
- A five-year sloughs flow study began in 2000. No results are yet available.

## Fish Hatchery

The Bad River Tribe owns and operates a fish hatchery established in 1975. The fishery is a highly valued resource to tribal members for cultural, social, subsistence and recreational purposes. Although Reservation waters are hosts to many species of fish, the walleye is the one most valued by the membership. Therefore, the fish hatchery focuses on raising walleye for restocking into the Kakagon and Bad Rivers.

In 2001, the fish hatchery received a grant to replace worn and outdated equipment. The grant also allowed for the purchase and installation of 40 solar panels and a wind generator. The improvements greatly enhance the economic efficiency of the hatchery, and will help to replenish a resource used heavily by both members and nonmembers.

Another fish that is significant to the Bad River is the lake sturgeon. Only three rivers in United States waters of Lake Superior support a self-sustaining population of lake sturgeon. In 2001, an intense monitoring program was begun to estimate the population of this species.

## Integrated Resources Management Plan

In April 2001, the Bad River Tribal Council formally adopted an Integrated Resources Management Plan (IRMP). The goal of the IRMP is to maintain a diversity of forest types within the Reservation while protecting and improving water quality. The management principles promote sustainability of the resource while establishing a buffer along riparian areas. Timber harvesting has a long history on the reservation and has promoted extensive aspen regeneration. In order to maintain biodiversity on the Reservation, the Tribe has made a priority of promoting old growth and reseeded of white pines in areas that have recently been harvested.



A number of wildlife resources are monitored annually on the Bad River Reservation, and many are related to coastal issues. Presently monitored are wetland and riparian raptors – bald eagle, merlin and northern harriers. Also monitored are many other wetland and riparian avian species including colonial birds (e.g., great blue herons, black tern), piping plover, trumpeter swan and other waterfowl.

Important near shore mammals related to the aquatic food chain or those that exhibit aquatic-terrestrial food chain linkages – such as river otter, mink, beaver and muskrat – are monitored on a periodic basis. Many of the Tribe's monitoring programs were initiated through Wisconsin Coastal Management Program funding.

## Air Quality

The latest program added to the Natural Resources Department is the Air Quality Program. Initiated in November 2000, monitoring is done on an arduous six-day schedule using a PM10 monitor. A five-year baseline study will be completed in 2005.

The Bad River Tribe has made great strides in protecting resources for today and seven generations hence.

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Door County is home to the greatest number of rare plants and animals in Wisconsin.

## PROTECTING COASTAL WETLANDS ON THE DOOR PENINSULA

*Cate Harrington*

Caressed by the waters of Lake Michigan to the east and Green Bay to the west, the Door Peninsula is a slender piece of land that juts 80 miles into Lake Michigan. Its nearly 250 miles of shoreline, sheltered bays, sand beaches, towering bluffs and inland lakes attract thousands of visitors each year.

The Nature Conservancy was drawn to the peninsula 40 years ago to protect the natural features of this special place that is home to the greatest number of rare plants and animals in Wisconsin.

Stand on Toft Point and one can see or hear nine different warblers singing. In the deep shade of the white cedars, one will find wild orchids – with names like ram’s head, showy lady, dragon mouth and Hooker’s – growing in sunlit patches. The dwarf lake iris and dune thistle are found only in the Great Lakes area. Moreover, the world’s largest remaining population of the endangered Hine’s emerald dragonfly depends on marshes and sedge meadows fed by the calcium-rich waters of the peninsula.

### Focus on Coastal Wetlands

In 1962, the Conservancy made a loan to The Ridges Sanctuary to preserve a critical parcel of coastal wetland. Today, we continue work with multiple partners and communities to protect this special place. As a result of planning in April 2000 by Conservancy staff, other conservation organizations, the academic community and state

and federal agencies, we focus the majority of our time and resources on protecting wetlands along the Lake Michigan coast.

The places where the Conservancy works include the Mink River Estuary on Rowley’s Bay, the area around Mud Lake, The Ridges Sanctuary and North Bay, the north end of Kangaroo Lake, and the diverse complex of wetlands between Cave Point and the Sturgeon Bay ship canal.

### Unique Geology Affects Water Flow

Because of the peninsula’s unique geology, it is a fragile place and wetlands are particularly vulnerable. The Door Peninsula is underlain by a portion of the Niagara Escarpment, a rock formation that arcs around the northern shores of Lakes Michigan and Huron from West Union, Iowa, to Albany, New York.

Much of the escarpment is underground, but rises above the surface at certain locations including very prominently along the Green Bay side of the peninsula. Because this side of the peninsula tends to be higher than the Lake Michigan side, surface water also tends to drain from the peninsula toward the lakeside. The rock that forms the escarpment is dolomite – it is hard, brittle and very porous due to the many holes and cracks within the rock.

When snow melts or rain hits the ground on the peninsula, some of the water runs off the surface



and into nearby streams to be carried to the lake. Another portion of the water is captured by soil and vegetation. Where soils are thin, as they are in northern Door County, more of the water travels through the soil and down into bedrock. Because the rock tends to be porous, water travels quickly to the lake or into wetlands via springs.

### Effect of Pollution on Wetlands

Where water goes, pollution follows. Oil, salt and other chemicals on roads, driveways and other impervious surfaces end up in the water. Water is at risk from pesticides, herbicides and fertilizers applied to lawns, golf courses and roadsides. Acid pollutants in the air from automobiles and manufacturing plants and waste from failed septic systems threaten water. That water flows into streams, the bedrock, underground aquifers, wetlands and the lake.

Migratory birds that use the wetlands as stopover feeding sites during migration are impacted by pollution, as are frogs, turtles and fish that feed and breed there. Additional nutrients added to the wetlands can change the type of vegetation found there. What was once a wetland dominated by sedges and bulrushes may eventually become a cattail marsh, a plant community not unique to the area. While we know that the federally endangered Hine's emerald dragonfly uses the wetlands unique to the Door Peninsula, we do not know how it will respond if those wetlands change.

### Strength in Numbers

Many conservation organizations and public agencies are working to conserve the wetlands and other natural features of the Door Peninsula. Groups including The Nature Conservancy, the Door County Land Trust (DCLT), The Ridges Sanctuary, Door County, the U.S. Fish & Wildlife Service and the Wisconsin Department of Natural Resources (WDNR) collaborate to address threats to the peninsula's wetlands and other natural features. Land acquisition, conservation easements, education and outreach, and research are some of the methods employed.

Together and separately, The Nature Conservancy, DCLT, The Ridges Sanctuary and the WDNR have received a North American Wetlands Conservation Act grant and four Coastal Wetlands Planning, Protection and Restoration Act grants from the federal government totaling \$2.62 million. The partners will use this money and match raised through private fundraising to buy and protect wetlands along the Lake Michigan shoreline of Door County and in the Grand Traverse Islands located at the end of the peninsula.

Wisconsin Coastal Management Program grants fund other partner efforts to 1) communicate the importance of protecting wetlands in Door County to local government officials and private landowners and 2) address threats that non-native invasive plants like purple loosestrife pose to wetlands and other native plant communities on the peninsula.

To maintain the health and diversity of the peninsula's wetlands and restore those that have been degraded, more information is needed. The Conservancy is funding a research study by a University of Wisconsin-Green Bay graduate student at the Shivering Sands Preserve east of Sturgeon Bay that will provide vital information.



When the study is completed in December 2003, we plan to make this information available to Door County conservation and planning departments, local township governments, the WDNR and other interested parties. The Ridges Sanctuary also conducts studies to gather baseline information about water flow at the sanctuary.

*Cate Harrington is Director of Communications & Outreach for The Nature Conservancy-Wisconsin Chapter. She can be reached at (608) 251-8140 or [charrington@tnc.org](mailto:charrington@tnc.org).*

The Southeastern Lake Michigan region remains the most significant driver of population trends in Wisconsin's coastal counties.

# WISCONSIN COASTAL POPULATION TRENDS

*Donald R. Harrier*

The rates of population growth in Wisconsin coastal counties varied by location since 1970. This article examines population trends in Wisconsin's coastal zone during the preceding three decades and factors that led to growth and contraction.

## Most Coastal Counties Gain

Between 1970 and 2000, Wisconsin's total population grew by 945,854 persons, or 21.4 percent. The 15 Wisconsin coastal counties collectively gained 78,000 persons, or 4.1 percent, from 1970 to 2000.

Ozaukee County grew fastest during the period at 51.1 percent. Brown County added the most population with 68,000 new residents. Milwaukee County both declined most rapidly (10.8 percent) and lost the most residents (114,000). Only Milwaukee and Douglas Counties lost population during the thirty-year period.

The Bay-Lake counties (Marinette, Oconto, Brown, Door, Kewaunee, Manitowoc and Sheboygan) grew fastest from 1970-2000 at 112,000 persons and 25.6 percent. Lake Superior counties (Douglas, Bayfield, Ashland and Iron) grew at a modest 3.0 percent and 2,400 residents. The Southeastern counties (Ozaukee, Milwaukee, Racine and Kenosha) declined by 2.6 percent and 37,000 persons.

Milwaukee County's experience tends to skew overall coastal population trends. Coastal counties exclusive of Milwaukee grew by 192,000 persons, or 22.3 percent, over the thirty-year period. That rate of growth outpaced the statewide trend.

## Mixed Migration Trends During 1970s

During the 1970s, Wisconsin experienced a population increase of 6.51 percent. Natural increase (births minus deaths) during this decade was 277,693 persons and net in-migration was only 10,128 persons. In addition, Wisconsin followed a national trend called the "rural renaissance" when growth in smaller communities outpaced more urban areas.

Wisconsin's coastal counties' decreased by nearly 33,000 persons or 1.71 percent during the same period. Milwaukee County led the decline with a migration loss of nearly 155,000 persons. The remaining coastal counties experienced net in-migration of about 7,000 persons.

The seventies saw population change vary widely between the three coastal areas (Table 1). The Lake Superior region showed an increase of 2.69 percent. The population of the Bay-Lake region outpaced the state average with a 7.85 percent increase. These were in contrast to a decline of 4.95 percent in the Southeastern region.

Table 1 – Population Rates During the 1970s

Region	Natural Increase (%)	Net Migration (%)	Total Change (%)
Lake Superior	1.98	0.71	2.69
Bay-Lake	6.46	1.39	7.85
Southeastern	6.12	-11.07	-4.95
Coastal Counties	6.02	-7.73	-1.71
Wisconsin	6.29	0.23	6.51

## Out-Migration in Much of the 1980s

During the 1980s, state population grew by only 3.96 percent. Although natural increase was 313,123, net migration showed a loss of nearly 127,000 persons. Most of the state's out-migration occurred during the deep recession of the early and mid 1980s.

Milwaukee County alone experienced net out-migration of over 75,000 for the period. Only three of the 15 coastal counties (Brown, Marinette and Ozaukee) experienced net in-migration during the eighties. However, natural increase was significant enough that the coastal counties gained nearly 26,000 persons during the decade.

Again, population change differed among the three regions (Table 2). The Lake Superior region lost 4.32 percent of its population from 1980-1990, while the Bay-Lake region increased by 4.72 percent. The Southeastern region experienced only a marginal gain of 0.53 percent. Each region experienced natural increase and out-migration.

Table 2 – Population Rates During the 1980s

Region	Natural Increase (%)	Net Migration (%)	Total Change (%)
Lake Superior	2.76	-7.07	-4.32
Bay-Lake	6.45	-1.73	4.72
Southeastern	7.27	-6.74	0.53
Coastal Counties	6.87	-5.5	1.37
Wisconsin	6.65	-2.7	3.96

## Rebound of Migration in the 1990s

During the 1990s, Wisconsin's population increased by a robust 9.65 percent. The decade experienced the smallest natural increase of the 30-year period because of fewer births and a larger number of deaths. However, the most significant trend during the 1990s was a turnaround in migration with 228,219 more people moving into the state than moving out.

The impact of natural increase and positive net migration yielded the greatest increase of the three decades. In fact, the 1990s were the second fastest growing decade in the state's history, only trailing the 1950s.

All three regions experienced population growth during the decade (Table 3). The Bay-Lake region set the pace at 11.18 percent, the Lake Superior region increased by 4.86 percent and the Southeastern region grew at a modest 1.91 percent in spite of a nearly 9 percent decline in Milwaukee County population.

Table 3 – Population Rates During the 1990s

Region	Natural Increase (%)	Net Migration (%)	Total Change (%)
Lake Superior	0.05	4.81	4.86
Bay-Lake	4.27	6.91	11.18
Southeastern	6.63	-4.72	1.91
Coastal Counties	5.75	-1.32	4.44
Wisconsin	4.98	4.67	9.65

Although population growth was slower in the coastal counties than for the state, the increase was still significant. The coastal counties added nearly 85,000 persons or 4.44 percent during the nineties. They collectively suffered out-migration of more than 25,000 persons, again led by Milwaukee County.

## Conclusion

Wisconsin's population increased by 21.4 percent between 1970 and 2000, but Wisconsin's coastal counties increased by only 4.1 percent. Slower growth in the coastal counties reduced their share of the state's total population from 43.3 percent in 1970 to just over 37 percent in 2000.

Much of the lower population increase of the coastal area resulted from the decline of Milwaukee County's population during 30-year period. Without Milwaukee County's figures, Wisconsin's coastal counties grew by a more robust 22.3 percent from 1970 to 2000.

Today, over two-thirds of Wisconsin's coastal counties' population reside in the Southeastern region, 28 percent in the Bay-Lake region and just 4 percent in the Lake Superior region. The Southeastern region, and Milwaukee County in particular, remains the most significant driver of population trends in Wisconsin's coastal counties.

*Donald R. Harrier is Section Chief of the Demographic Services Center, Wisconsin Department of Administration. He can be reached at (608) 267-2705 or don.harrier@doa.state.wi.us.*

# 2002 WISCONSIN COASTAL MANAGEMENT PROGRAM GRANTS

## *Editors Note*

Now in its twenty-fifth year, the Wisconsin Coastal Management Program (WCMP) brings together citizens and public officials to address the special opportunities and challenges found at the shores of our two Great Lakes. The WCMP coordinates and magnifies the energy of coastal citizens through education, issue analysis, policy development and targeted financial assistance. The list that follows identifies projects that received WCMP funding support of \$6.6 million in 2002.

Stroll, drive, sail or bike even a short distance along the shore of Lake Michigan or Lake Superior and you will see an accomplishment of the WCMP. That lovely water-side walkway, convenient access point, recreational harbor, secluded glen or thriving marsh probably benefited from a study, land purchase or guideline supported by the WCMP.

The WCMP promotes sound management of our coastal waters and adjoining natural and community resources. In turn, the program helps establish conditions that attract people, support new businesses and enhance the quality of life.

This publication highlights just a few of today's coastal issues and management efforts of importance to Wisconsin. We hope to bring more to your attention in future *Wisconsin Great Lakes Chronicles*.

## *Project Name*

## *Grantee*

## *WCMP Award*

## *Project Type*

### **Ashland County**

St. Claire Avenue Storm Sewer

City of Ashland

\$112,462

Stormwater Controls

Ballou Creek Streambank and Trout Habitat

Town of Morse

\$37,275

Stormwater Controls

Comprehensive Plan Update

City of Ashland

\$20,000

Land Use & Community Planning

Madeline Island Geographic Information System

Madeline Island Wilderness Preserve, Inc.

\$12,280

Land Use & Community Planning

### **Bayfield County**

Fluvial Geomorphic Assessment

Trout Unlimited

\$97,000

Nonpoint Source Pollution

Sioux/Onion River Coastal Wetland Initiative

Inland Sea Society

\$20,000

Wetland Protection



Recession Rate Outreach  
Bayfield County  
\$11,590  
Land Use & Community Planning

Waterfront Plan  
City of Bayfield  
\$4,000  
Land Use & Community Planning

### **Brown County**

Riverfront Redevelopment  
Village of Ashwaubenon  
\$78,080  
Public Access

### **Door County**

Removal of Deteriorating Solid Structures  
Wisconsin Department of Natural Resources  
\$125,000  
Habitat Restoration

Aquatic Plant Management Program  
City of Sturgeon Bay  
\$99,100  
Nonpoint Source Pollution

Shore Sites for Waterweed Operation  
City of Sturgeon Bay Park & Recreation Dept.  
\$31,000  
Public Access

Sunset Park Walkway  
City of Sturgeon Bay  
\$20,000  
Public Access

2020 Comprehensive Plan  
Town of Gibraltar  
\$18,950  
Land Use & Community Planning

Invasive Species Strategic Plan Partnership  
Door County Soil & Water Conservation Dept.  
\$13,500  
Education

Fish Creek Watershed Study Program  
Town of Gibraltar  
\$5,000  
Nonpoint Source Pollution

### **Douglas County**

Newton Creek Sediment Remediation  
Wisconsin Department of Natural Resources  
\$300,000  
Contaminated Site

South Superior Wet Detention Pond  
City of Superior Public Works  
\$150,000  
Stormwater Controls

Oliver Marsh  
Douglas County Forestry Department  
\$90,000  
Acquisition

Billings Park Launch/Riverfront Trail  
City of Superior Parks & Recreation Dept.  
\$25,000  
Public Access

### **Kewaunee County**

Zoning Ordinance Rewrite  
Town of Pierce  
\$2,000  
Land Use & Community Planning

### **Kenosha County**

Chiwaukee Prairie State Natural Area  
Wisconsin Department of Natural Resources  
\$100,000  
Acquisition

### **Manitowoc County**

Point Creek Watershed Initiative  
Manitowoc County  
\$800,000  
Acquisition

### **Marinette County**

Boom Landing  
City of Marinette  
\$91,708  
Public Access

Stephenson Island Access and Parking Lot  
City of Marinette  
\$64,200  
Public Access

Marinette County Coastal Resource Identification  
Bay-Lake Regional Planning Commission  
\$16,100  
Land Use & Community Planning

## Milwaukee County

Kilbourn Landing  
City of Milwaukee  
\$1,168,016  
Contaminated Site

Coastal Vision-Restoration Plan  
Port of Milwaukee  
\$300,000  
Stormwater Controls

Fitzsimmons Road Woods  
City of Franklin  
\$155,000  
Acquisition

Milwaukee River Watershed Corridor Plan  
Friends of Milwaukee's Rivers  
\$69,880  
Land Use & Community Planning

Oak Creek Wetlands  
MMSD/City of Oak Creek  
\$63,895  
Acquisition

Milwaukee River Riverwalk  
Historic Third Ward Association  
\$40,000  
Public Access

Menomonee River Valley Sustainable Design  
Sixteenth Street Community Health Center  
\$25,000  
Land Use & Community Planning

Lake Michigan Beach Water Quality  
City of Milwaukee Health Department  
\$20,800  
Education

Milwaukee Rivers Outreach Program  
Milwaukee Metropolitan Sewerage District  
\$10,000  
Education

## Ozaukee County

Lion's Den Gorge Natural Area  
Ozaukee County Land & Water Conservation  
\$404,000  
Acquisition

Huiras Lake Wetland Restoration  
Wisconsin Department of Natural Resources  
\$127,830  
Acquisition

## Racine County

Pike River Restoration Planting  
Mount Pleasant Stormwater Utility District  
\$387,375  
Habitat Restoration

Pike River Mapping  
Mount Pleasant Storm Water Utility District  
\$25,000  
Land Use & Community Planning

## Sheboygan County

Reiss Coal Site  
City of Sheboygan  
\$101,250  
Contaminated Site

Milwaukee River Basin Wetland and Springhead  
Wisconsin Department of Natural Resources  
\$80,000  
Acquisition

## Coastwide

Technical Assistance to Local Governments  
Wisconsin Department of Natural Resources  
\$207,179

Technical Assistance and Outreach

Coastal Wetland Inventory  
Wisconsin Department of Natural Resources  
\$52,111

Technical Assistance and Outreach

Information to Restore Coastal Resources  
Wisconsin Department of Natural Resources  
\$38,000  
Education

Purple Loosestrife Bio-Control Program Expansion  
Wisconsin Wetlands Association  
\$33,845  
Wetland Protection

Cruise Wisconsin's Harbor Towns  
Wisconsin Harbor Towns Association, Inc.  
\$26,000  
Public Access

Coastal County Buffer Initiative Project  
Great Lakes Nonpoint Abatement Coalition  
\$20,000  
Nonpoint Source Pollution

Future of Wisconsin's North Coast  
Wisconsin Department of Natural Resources  
\$18,172  
Education

Managing Runoff from Homes & Small Businesses  
Wisconsin Department of Natural Resources  
\$17,900  
Education

Managing Runoff Changes  
Wisconsin Department of Natural Resources  
\$17,362  
Education

## Multiple Counties

West Shore Habitat Protection and Restoration in  
Marinette, Oconto and Brown Counties  
Wisconsin Department of Natural Resources  
\$501,493  
Acquisition

State Natural Area Wetland Restoration in Bayfield,  
Door, Kenosha, Ozaukee and Sheboygan Counties  
Wisconsin Department of Natural Resources  
\$202,404  
Habitat Restoration

## Lake Superior Region

Lake Superior South Shore Fish and Wildlife Area  
Wisconsin Department of Natural Resources  
\$200,000  
Acquisition

Lake Superior Basin Subwatersheds Analysis  
ABDI Land Conservation Dept.  
\$50,957  
Nonpoint Source Pollution

Lake Superior NEMO Program  
University of Wisconsin-Superior  
\$24,775  
Education

Building Partnerships for the Lake Superior Basin  
ABDI Land Conservation Dept.  
\$18,333  
Nonpoint Source Pollution

Chequamegon Bay NERR Designation  
UW-Extension  
\$18,121  
Wetland Protection

Staff Assistance  
Northwest Regional Planning Commission  
\$10,000  
Technical Assistance and Outreach

## Bay-Lake Region

Technical Assistance for Coastal Restoration  
Wisconsin Department of Natural Resources  
\$26,000  
Wetland Protection

Assistance to Local Government  
Bay-Lake Regional Planning Commission  
\$25,000  
Technical Assistance and Outreach

Harbor Study Update  
Bay-Lake Regional Planning Commission  
\$25,000  
Land Use & Community Planning

Northern Lake Michigan Basin Conservation  
Gathering Waters Conservancy  
\$24,500  
Land Use & Community Planning

Technical Assistance  
Bay-Lake Regional Planning Commission  
\$10,500  
Technical Assistance and Outreach

## Southeast Region

Technical Assistance  
Southeast Wisconsin Regional Planning Commission  
\$13,000  
Technical Assistance and Outreach

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