Wisconsin Great Lakes Chronicle

2007

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FOREWORD

Governor Jim Doyle

Dear Friend of Wisconsin's Great Lakes:

Here in Wisconsin, our beautiful Great Lakes are not just a part of our heritage. They are a part of who we are. Lakes Michigan and Superior and their coastal resources provide the State with abundant beauty, unique natural and cultural resources, recreational opportunities, a gateway to the world economy and clean drinking water. Helping people enjoy and protect our Great Lakes is one of my top priorities as Governor.

Over the last several years, we have made great strides to help citizens and visitors enjoy our Great Lakes. Earlier this summer, I dedicated Wisconsin's newest state park—Lakeshore State Park—in Milwaukee. This new state park provides yet another reason to visit Milwaukee and greatly benefits Milwaukee residents who no longer have to drive outside the city to experience Wisconsin's natural beauty—instead, it is right in their backyard.

Further north, we permanently protected thousands of acres of beautiful recreational and conservation lands including nearly nine square miles along the Brule River—a Lake Superior tributary famous to people who fish, canoe and kayak—and nearly four miles of the North Country National Trail. Working together with the federal and local governments, the Bayfield Regional Conservancy and the Wisconsin Coastal Management Program, we also protected miles of hiking and ski trails surrounding Bayfield County's Mt. Ashwabay with breathtaking views of the Apostle Islands in Lake Superior.

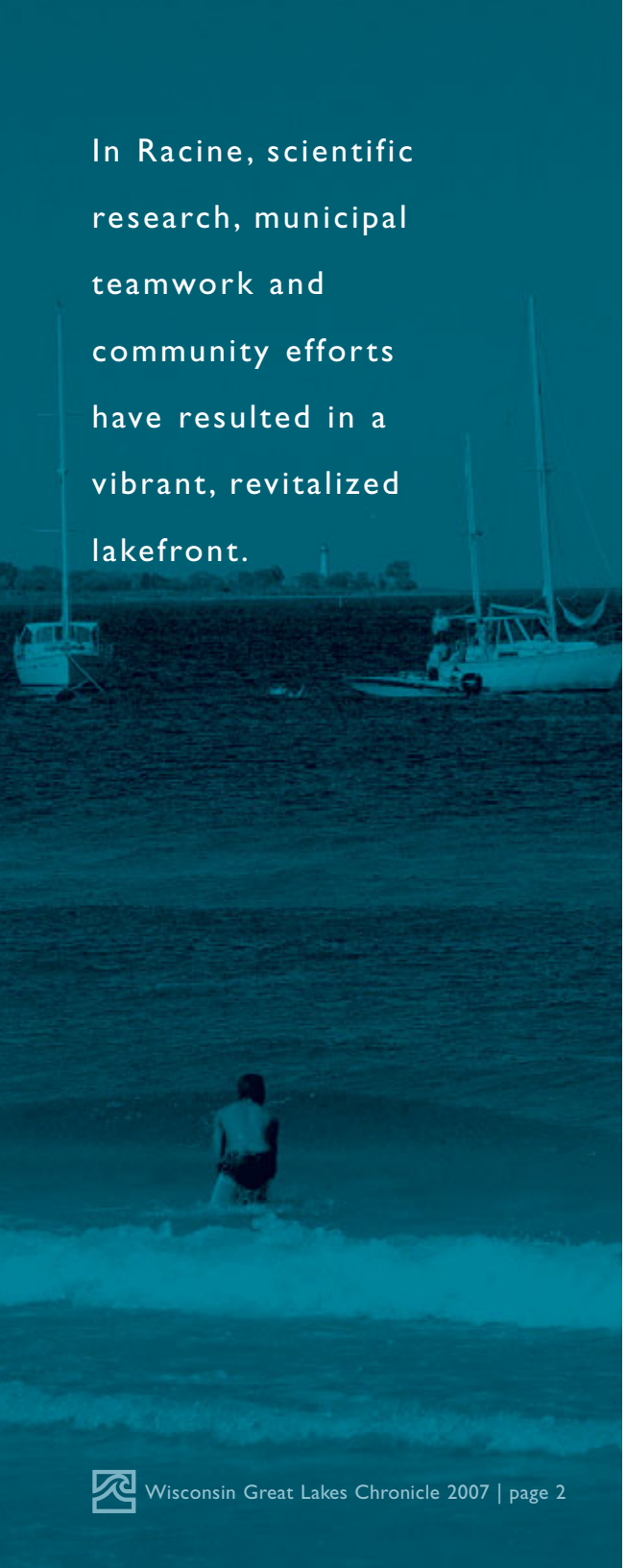
Another initiative—funded in part by a Wisconsin Coastal Management grant—will help people use the power of their computers to see, learn about and plan visits to sites along out Great Lakes coasts. The Great Lakes Circle Tour–Coastal Access Guide follows the Circle Tour driving route and provides visitors with information about and pictures of coastal parks, beaches, lighthouses, shipwrecks and other features along the way. This project and others like it helps make our coastal sites, communities and attractions easier than ever to visit and experience.

As Chair of the Council of Great Lakes Governors, I am working with other state and provincial leaders to protect both the quality and quantity of the Great Lakes. The *Great Lakes–St. Lawrence River Basin Sustainable Water Resources Agreement* commits the ten state and provincial governments to work together to better manage and protect this unique international resource. The *Agreement* includes new protections against water diversions from the Great Lakes, standards for in-basin water consumption, provisions for regional water conservation and an affirmation of Native American treaty rights.

I am also working closely with the Legislature, Tribes, local governments and organizations to enact the *Great Lakes–St. Lawrence River Basin Sustainable Water Resources Agreement* here in Wisconsin. Implementation of this agreement will help the region ensure the quality and long-term protection of the Great Lakes for future generations.

The Great Lakes belong to us all and so does the responsibility to protect them. I ask all Wisconsinites to join me in working toward a healthier Great Lakes system. These are our lakes to enjoy and protect.

In Racine, scientific research, municipal teamwork and community efforts have resulted in a vibrant, revitalized lakefront.



REVITALIZING RACINE'S NORTH BEACH

Dr. Julie Kinzelman

As recently as 2000, Racine's North Beach was posted as unsuitable for swimming for 66 percent of the bathing season. Concerned citizens turned to the City of Racine to return this stretch of Lake Michigan coastline to a valuable community asset.

Identifying Contamination Sources and Initiating Remediation. The Racine Health Department embarked on a five-year course of research initiatives to identify the pollution sources responsible for swimming bans and develop cost-effective solutions to improve recreational water quality.

In one instance, research identified elevated fecal bacterial levels at a storm water outfall that discharged rainwater collected from 400 acres of the city directly at the beach. Rick Jones, Commissioner of Public Works, made reengineering the site a priority.

The new design called for the installation of two primary treatment systems capable of removing street waste and diverting the initial—and dirtiest—surge of stormwater to a series of infiltration basins. The constructed basins are wetland areas planted with over a dozen varieties of native wetland plants such as bulrushes, grasses and sedges. This natural treatment system reduced the median fecal indicator bacteria from 3,000 CFU/100 ml in 2000—the year immediately preceding construction—to 448 CFU/100 ml in 2004.

Sands also contributed to North Beach's contamination problem. Research studies indicated that sands were acting as a reservoir for fecal bacteria deposited by the large resident population of seagulls. Certain conditions—such as surface run off, wave action or groundwater exchange—promoted the delivery of bacteria to near shore waters.

Three major efforts were taken by the Department of Parks, Recreation and Cultural Services (PRCS). First, mechanical beach grooming was altered to promote the drying of the beach sand, demonstrated to significantly reduce fecal indicator bacteria density. Second, the initial re-surfacing of beach sand after removal of snow fencing in the spring was done in a way to promote drainage and prevent the formation of swales that could retain water on the beach. Third, additional waste receptacles with rigid, removable liners were placed on the beach to encourage the proper disposal of litter by beach goers as a deterrent to attracting more seagulls.

Other potential sources of pollution, such as algal blooms and the Root River, likely exist and the City of Racine Departments of Health, Parks and Public Works continue to work cooperatively to investigate and mitigate as necessary.

Research also revealed that water quality may vary suddenly in response to certain environmental conditions. Therefore, better methodologies are needed to more rapidly analyze water samples. The Health Department is currently working on faster ways to detect pollutant loading using real-time DNA-based tests.

Creating Public Awareness. Municipal efforts identifying and mitigating pollution sources must be partnered with public education to realize maximum benefits. Several public awareness campaigns centered on water quality issues are helping citizens become stakeholders and stewards of coastal areas.

In 2007, the PRCS Department and City of Racine will enter into an agreement with UW-Parkside to establish a Center for Community Partnership to improve public awareness of Great Lakes resources and related ecological issues. The City also enacted an ordinance prohibiting the feeding of seagulls (prominently displayed near the concession area at the beach), placed educational signage along the Lake Michigan Pathway and distributed hangtags to numerous homes to inform the public about the relationship between storm water and surface water quality. Keep Our Beaches Open, a local environmental group based out of the River Bend Nature Center, initiated campaigns to flag dog waste left by pet owners, provided bags for pet waste removal and volunteered to stencil city storm drains.

The Spirit of Volunteerism is Alive and Well in Racine. Several volunteer efforts have also been instrumental in improving and maintaining North Beach. Volunteers assisted the City in installing wetland plants in the infiltration basins. Earth Day and Make-A-Difference Day activities have focused on beach clean-ups, the construction of a new walking path bordered by native plants and the formation of vegetated dunes to reduce blowing and drifting of sand near public access points.

Adopt-A-Beach groups—an initiative of the Alliance for the Great Lakes—routinely conduct citizen monitoring and litter removal from designated areas along the shore. In 2003, Make-A-Difference Day volunteers constructed Kid's Cove Playground, a 20,000 square foot play area.

Revitalizing the Lakefront. In 2006, North Beach was open 95 percent or more for two consecutive bathing seasons. Once an under-utilized and lonely stretch of Lake Michigan coastline, North Beach is now buzzing with activity and host to a variety of nationally recognized events including

the Spirit of Racine Triathlon and the Corona Light EVP Volleyball Tour. The Kid's Cove Playground is a year round attraction for children.

The Lake Michigan Pathway, completed in 2006, provides almost ten miles of scenic Lake Michigan views for pedestrians and bikers. The North Beach Oasis provides concessions and live music from Memorial Day to Labor Day. In Racine, scientific research, municipal teamwork and community efforts have resulted in a vibrant, revitalized lakefront that is home to Wisconsin's only Blue Wave beach (certified by the Clean Beaches Council, Washington, D.C.)

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The Niagara Escarpment's shoreline ecosystem is vulnerable to improper land development and resource extraction.

THE NIAGARA ESCARPMENT: A UNIQUE

Angela Pierce

The Niagara Escarpment is generally not a recognized name in Wisconsin. However, most northeast Wisconsin locals are familiar with the feature known commonly as *The Ledge* that runs along Door County's Green Bay shoreline into Brown County. The Niagara Escarpment is a distinguishing natural resource area due to its unique geology, the presence of rare plants and animals, and growing development pressure.

The Niagara Escarpment is a geologic landform that was formed 430 to 450 million years ago when current day North America was near the equator and submersed under a shallow warm sea centered on what is now the State of Michigan. The outer rim of this ancient sea, crossing present state and national borders, now marks the location of the Niagara Escarpment.

The escarpment is a sickle-shaped ridge with a steep face on one side and a gentle slope on the other that begins in south-central Wisconsin, arches east through Michigan and southern Ontario and ends in western New York State. The best-known portion of the Niagara Escarpment is the section of the ledge over which the Niagara River falls to form Niagara Falls. The Niagara Escarpment in Ontario, Canada is a United Nations Educational, Scientific and Cultural Organization (UNESCO) designated World Biosphere Reserve, making it part of a network of more than 400 reserves in 95 countries.

Since the Niagara Escarpment was formed prior to glaciations, glacial ice cover and melt water have dramatically altered it. The Escarpment in Wisconsin varies from prominent rock faces with 150-foot cliffs to a series of ledges, low cliffs and pavement including areas where the escarpment is completely buried—and may only be evident in a quarry. The visible effects of the glaciation seen on the escarpment today were shaped during the most recent stage of glaciation called the "Wisconsin Glaciation."

The Niagara Escarpment is sometimes overlooked as a coastal resource in Wisconsin even though the escarpment is the shoreline of much of the Door Peninsula on the Green Bay side. The Niagara Escarpment in Wisconsin is present almost continuously from the tip of Washington Island to the northeast side of the city of Green Bay. Beyond the city of Green Bay, the Niagara Escarpment becomes intermittent as it is covered with glacial till for several miles in sections and reappears in other sections as it continues into south-central Wisconsin.

WISCONSIN COASTAL RESOURCE

The climate, ecology and geology of the escarpment are significantly influenced by the Great Lakes that surround it, creating unique microenvironments that support a diversity of life including many threatened and endangered resources. The landscape of the Niagara Escarpment supports unique natural relationships and communities that include alvars, oak savannas, communities of threatened dwarf lake iris, and cliff face communities of slow-growing cedars that are over 1,000 years old. Additionally, the Escarpment provides habitat for a number of migratory birds, bats, the endangered glacial Relict land snails and the Hines Emerald dragonfly.

The cultural resources on and along the Niagara Escarpment are numerous as well and include archeological sites, pictographs and petroglyphs, mounds, lighthouses, lime kilns and caves, historic farmsteads and over 500 historic sites, 37 of which are on the National Register of Historic Places.

According to a study completed by the Bay-Lake Regional Planning Commission, *An Inventory and Assessment of the Resources of the Niagara Escarpment in Wisconsin* (March 2001), the Niagara Escarpment area is experiencing steady population growth and development pressure, especially along the coastal Niagara Escarpment area adjacent to Green Bay. This sensitive shoreline ecosystem is vulnerable to misuse from improper land development and resource extraction.

Although much of the Brown and Kewaunee County shoreline along Green Bay is already developed and experiencing second and third tier development, a significant amount of the Green Bay shoreline in Door County along the escarpment remains undeveloped as wooded or agricultural land. Current trends reveal that development will likely continue to consume the escarpment since few land use controls exist to protect it.

The Niagara Escarpment is a special coastal resource in Wisconsin and we are fortunate to have it here. It is important that we all work to ensure that this unique resource will be available in a natural state for future generations to marvel. We should follow the lead of our Ontario neighbors and work at preserving the remaining undeveloped portions of the escarpment before they are lost to us. The time to act is now.

The Niagara Escarpment Resource Network is a great organization to turn to for additional information on the Niagara Escarpment in Wisconsin. The Network is a coalition of federal, state and regional agencies, local and county governments, academia, non-profit organizations, landowners and citizens whose purpose is to provide a common forum for discussion and action promoting balanced land-use decisions and an appreciation for the unique ecology of Wisconsin's Niagara Escarpment. Involvement with the Network is a great way to learn more about the Escarpment. The group meets regularly and always welcomes new members. For more information on the Niagara Escarpment Resource Network, check out its website at http://www.escarpmentnetwork.org/.

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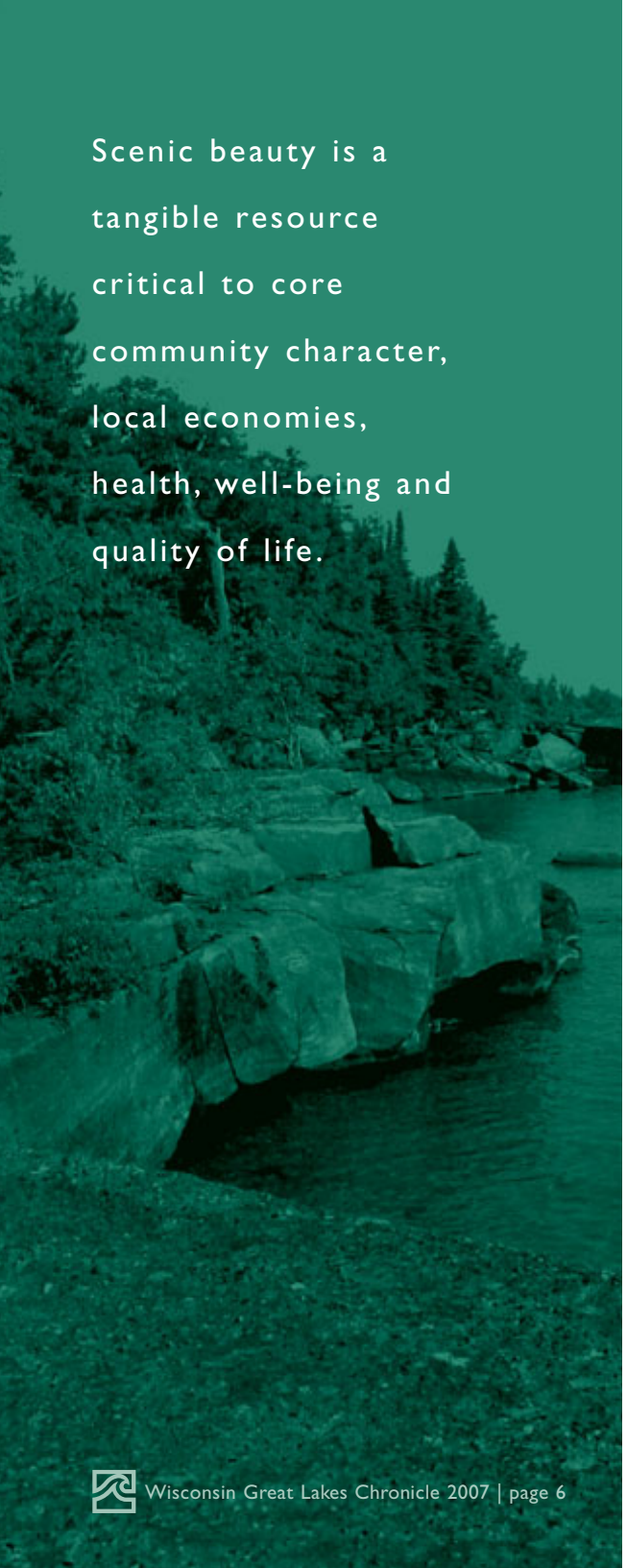

LAKE SUPERIOR COASTAL VISUAL QUALITY

Jason Laumann

In a rapidly developing world, visual resource planning and management are becoming increasingly important as means of preserving fundamental community character. Nowhere is this statement more relevant than along Wisconsin's Lake Superior south shore where natural scenic beauty is among the region's most prized natural assets. It is also one of the most compelling reasons why people choose to live and recreate in the shadow of the great Gitche Gumee.

The south shore coastal environment is rich in visual diversity and character. Unique local landforms, scenic shorelines, rock and cliff formations, vegetation and the land-water interface combine to create a striking visual landscape. The Apostle Islands add visual interest and provide an element of scale to the flat horizontal expanse of Lake Superior. The rugged natural beauty, visually distinctive architecture and historic resources of quaint coastal communities intertwine in a harmonious visual composition.

In recent years, the south shore has come under increasing development pressure that threatens to change the visual landscape. The relative remoteness of the region has not isolated the south shore from development. In fact, it is this very remoteness—and the natural scenic values associated with it—that attracts people and development. Increasingly, communities across the country have begun to recognize scenic beauty as a tangible resource critical to core community character, local economies, health, well-being and quality of life. Along the south shore, the winds of change have also focused increased attention towards the concept of sustainability and maintenance of the unique scenic and ecological values of the region.

The Northwest Regional Planning Commission (NWRPC) recently completed a guide to protecting the visual resources of Wisconsin's Lake Superior south shore, a project funded through a grant from Wisconsin Coastal Management Program. This guide fosters a general understanding of the visual resources of the south shore coastal landscape and provides an overview of tools and techniques for the preservation of natural scenic beauty. This document is intended to assist south shore communities in planning for and protecting natural scenic beauty. It is also meant to serve as a companion document to Wisconsin's growing library of community planning assistance guides. While this guide focuses on the south shore of Lake Superior, its recommendations, tools and methods for visual resource protection could be applied in virtually any community, regardless of geographic context.

The guide provides an overview of the landscape and design elements used to characterize and evaluate scenic beauty. By exploring basic visual quality concepts such as vividness, intactness and

unity along with the foundational landscape characteristics that contribute to scenic beauty, the reader is equipped with a basic knowledge and understanding of how scenic beauty can be defined and measured.

The guide also attempts to dispel the notion that scenic beauty is purely a subjective judgment by illustrating that there are objective, quantitative methods for assessing scenic beauty. Quantitative methods for analyzing visual resources are commonly used by federal and state resource management agencies to evaluate project proposals and management alternatives. By removing the element of subjectivity from the concept of visual quality—and by providing objective, reproducible methods for assessing scenic beauty—a basis is provided for regulating activities that influence visual quality.

The publication provides a range of implementation tools for local government and voluntary building and site design recommendations for private landowners. For communities, an overview of both regulatory and non-regulatory approaches serves as a primer to stimulate local discussion. The guide also strongly advocates the integration of visual resource planning into community comprehensive planning efforts and provides guidance on how this may be accomplished.

A key section of the document explores how subdivision design may influence scenic beauty. The guide uses 3-D visualizations of subdivision design policy alternatives applied to two actual sites along the Lake Superior south shore. These sites were first analyzed to identify existing environmental features such as surface waters, steep slopes and wetlands and then split into lots based on traditional subdivision design and a cluster-type conservation design. Three-dimensional homes were then placed on the lots in both developments.

To achieve the highest level of success, government regulation must work in concert with the voluntary efforts of private landowners who are willing to make a commitment to preserving scenic beauty. Collectively, private landowners can have a tremendous impact on the scenic beauty of the south shore. A step-by-step tutorial guides landowners through site analysis, building site selection and the site plan development process. The guide also examines the use of scenic beauty conservation techniques for structural design, exterior finishing, roofing and exterior lighting.

Education is the first step toward a sustainable future. It is hoped that this guide will foster a better understanding of the importance of scenic beauty and the ways in which it may be preserved. The motto of Scenic America is "change is inevitable, ugliness is not." If coastal communities and individuals are willing to embrace this idea and take action, collectively we can ensure that the scenic beauty of our magnificent south shore will be maintained for future generations to enjoy.

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Wisconsin is affected by climate changes happening in distant parts of the world.

CLIMATE CHANGE COMES TO THE GREAT

Philip Keillor

A regional warming trend that appears to be part of global climate change apparently began to have an effect on Wisconsin around 1970. The evidence includes shortening ice cover seasons on the state's lakes and in lakes around the Northern Hemisphere (Magnuson et al 2000) as well as Lake Superior's warming waters (Austin and Colman 2007). Will continuing changes in our climate require getting used to low lake levels? Lake Superior water levels are now almost as low as the record lowest levels of 1926 and have been below average for nearly a decade. The levels of Lake Michigan have been below average since the end of 1998.

Confidence in the results of global climate models (global atmospheric circulation models) grows, supported by a steady stream of new scientific information as recently reported in Madison by a prominent climate scientist (Trenberth 2007). In sharp contrast to this confidence in global models and alarm at model results is the continuing absence of regional climate models that will realistically translate global model results at the scale of the Great Lakes Basin. There seems to be little awareness among Basin governments and the public that such regional models are needed and therefore little incentive for research managers to make regional climate model development a high priority.

There is a common, but mistaken, perception that climate change is happening somewhere else, but will not happen here. We know that dramatic changes are happening in the Arctic (Hassol 2004). Occasional climatic shifts known as El Nino occur in the southern Pacific Ocean, shift jet stream routes and storm tracks passing through the central United States, and bring warmer and dryer weather to Wisconsin thousands of miles from the South Pacific (Trenberth 2007). Clearly, Wisconsin is affected by climate changes happening in distant parts of the world.

Wisconsin and the Great Lakes Basin could experience sudden climate change as persistent shifts in storm tracks into (or out of) the state and Basin (Trenberth 2007). Such situations have been considered by modelers of Great Lakes water level responses to hypothetical *what if?* scenarios. The effects of such shifts might include dramatic changes in water levels lower (and maybe higher) than the ranges we have become accustomed to in modern times.

I have recently discussed climate change with faculty knowledgeable about erosion and coastal slope stability. If climate change brings warmer, wetter winters (UCS 2007) with sufficient warmth to thaw frozen coastal slopes, more frequent and deep slump failures are likely.

More extreme rainstorms (also predicted) with rain falling on exposed, unfrozen coastal slope soils will bring more shallow land slides and more surface erosion. If climate change brings winters with open water and no ice ridges piling up on Wisconsin's coast, the state's shores will be more exposed to erosion by storm waves previously prevented by ice sheets or blocked by ice ridges. Some of the state's near shore lakebed continues to erode downward making our coasts more vulnerable to increases in storminess (another climate change prediction).

Owners of coastal property can improve the resistance of their property to the erosion impacts of climate changes by controlling surface water flow and groundwater flow that contribute to slope erosion. State and coastal governments and property owners need to identify and monitor sources of information about climate change. Good coastal risk management needs to be put into practice at various levels of government and private property ownership.

This summer, Alan Lulloff (Association of State Floodplain Managers) and I have been writing a new coastal erosion setback methodology for the Wisconsin Coastal Management Program. This report deals with climate change and managing the risks of coastal hazards. We also borrow from earlier work that we did for NOAA in adapting the Association's No Adverse Impacts policy for river floodplains to coastal floodplains (ASFPM 2007).

Right now, Wisconsin needs a good regional climate model so that we can get more specific regional predictions and prepare for climate changes expected to affect Wisconsin over the next few decades.

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Wisconsin's shipbuilders continue a tradition of craftsmanship that is well regarded internationally.

WISCONSIN SHIPBUILDING

Mike Friis

With 1,000 miles of Great Lakes coast, over 15,000 named lakes and 44,000 miles of rivers and streams, water is a big part of Wisconsin. This expansive maritime transportation network has for more than a century fueled a strong and dynamic sector of the Wisconsin manufacturing economy: shipbuilding.

Shipbuilding is big business in Wisconsin and throughout the Great Lakes states. The Shipbuilders Council of America estimated that the commercial shipbuilding industry alone accounted for more than $42 million of economic activity in Wisconsin in 2001. The Great Lakes Commission reports residents of Great Lakes states spent $2.025 billion on new power boats, outboard motors, trailers and accessories in 2003. More than 250 Great Lakes businesses and their 18,500 employees manufactured 182,700 watercraft in 2003.

Hundreds of shipbuilders and manufacturers in Wisconsin's coastal region produce maritime craft and marine products for commercial, recreational and military uses. It is impossible to catalog all such businesses in a single article. However, the following provides a sample of companies engaged in shipbuilding within Wisconsin's Great Lakes counties.

Fraser Shipyards Inc. Established in 1890, Fraser Shipyards resides in Superior and Duluth. The Twin Ports is the largest on the Great Lakes in terms of total cargo volume, and it is an important access point for many agricultural products from the Plains States. Superior/Duluth is a major winter layover port for Great Lakes bulk carriers; in the winter of 2006, eleven vessels wintered there undergoing a variety of repair and maintenance projects.

Fraser Shipyards has an 830' x 80' graving dock where hull damage is repaired, cargo hold steel is renewed and regulatory agencies perform required maritime safety inspections. Fraser also performs work on vessels afloat including piping system renewals, boiler repairs, turbine repairs and other routine maintenance work.

Manitowoc Marine Group. The Manitowoc Marine Group has two Wisconsin-based shipbuilding facilities: Marinette Marine in Marinette and Bay Shipbuilding in Sturgeon Bay.

Marinette Marine (MMC) was founded along the Menominee River in Marinette in 1942. It was started to supply naval materiel during World War II. Since its first contract to build five wooden barges, MMC has built more than 1,300 vessels.

Recent vessels completed by MMC include the famous Staten Island ferries. These diesel powered vessels are each designed to carry 4,400 passengers and 30 vehicles. Each ferry has five passenger cabins on four decks.

MMC also built the new U.S. Coast Guard Cutter *Mackinaw* (WAGB-83). This multi-purpose

ship is designed for maintaining floating aids-to-navigation, icebreaking, search and rescue, marine environmental response, maritime law enforcement, national security and national defense. The *Mackinaw* is 240 ft long, carries a crew of 50 personnel and is able to break 32 inches of level ice at three knots.

Bay Shipbuilding (BSC) has over 100 years of experience in shipbuilding. BSC constructs double hulled vessels, dredges, dredging support equipment and self-unloading bulk carriers.

BSC and its 700 employees specialize in large ship construction projects, vessel conversions, repowering and modernization. In addition to new construction business, BSC also provides repair work that routinely occurs during the winter lay-up season. The shipyard has a schedule to construct seven double hull tank barges and ship repair commitments well into the future.

Cruiser Boats. Founded in 1904 as the Thompson Bros. Boat Manufacturing Co. in Peshtigo, Cruiser Boats later moved to Oconto where it made 14- and 16-foot lap strake boats. Today, Cruisers Yachts produces fifteen models from 28- to 54-feet in its expanded Oconto facility and a new boatbuilding operation in Wilmington, North Carolina. Cruisers' 700 employees in its Oconto and Wilmington plants produce midsize to luxury pleasure yachts for markets around the world.

Palmer Johnson. Palmer Johnson of Sturgeon Bay has a worldwide reputation of excellence in boat design and manufacture. Founded in 1918, Palmer Johnson began as a small boatyard constructing wooden fishing vessels and commercial craft for the Great Lakes. During WWII, it made air-sea rescue boats and 65-foot Army T-boats. It branched out to sailboats in the 1950s.

Employing over 300, Palmer Johnson's sole business now is to build and service its highly styled sport-yachts. The company recently expanded its production facility to meet product demand. Two new construction bays can accommodate 250 footers and a new dedicated paint facility will be operational in the summer of 2007. Additional property adjacent to the existing facility has been purchased for further expansion. The company recently opened a new customer service center in the Mediterranean port of Golf Juan where it assists owners and captains maintain these Wisconsin-built yachts.

Burger Boats. The Burger Boat Company in Manitowoc was founded in 1863. It designs and builds custom motor yachts from 100 to 200 feet in length. The company typically launches two or three yachts per year with up to six projects at various stages of completion at a time. Its vessels are designed to capture the quality of classic yacht building and provide the latest technologies and systems available today.

The Burger Boat Company is considered among the oldest custom yacht builders in America. The company has a worldwide customer base and employs 300 people.

Wisconsin shipbuilders continue a tradition of craftsmanship that is well regarded internationally. Products from Wisconsin builders provide for commerce, personal transportation, recreation, safety and security on waterways around the world.

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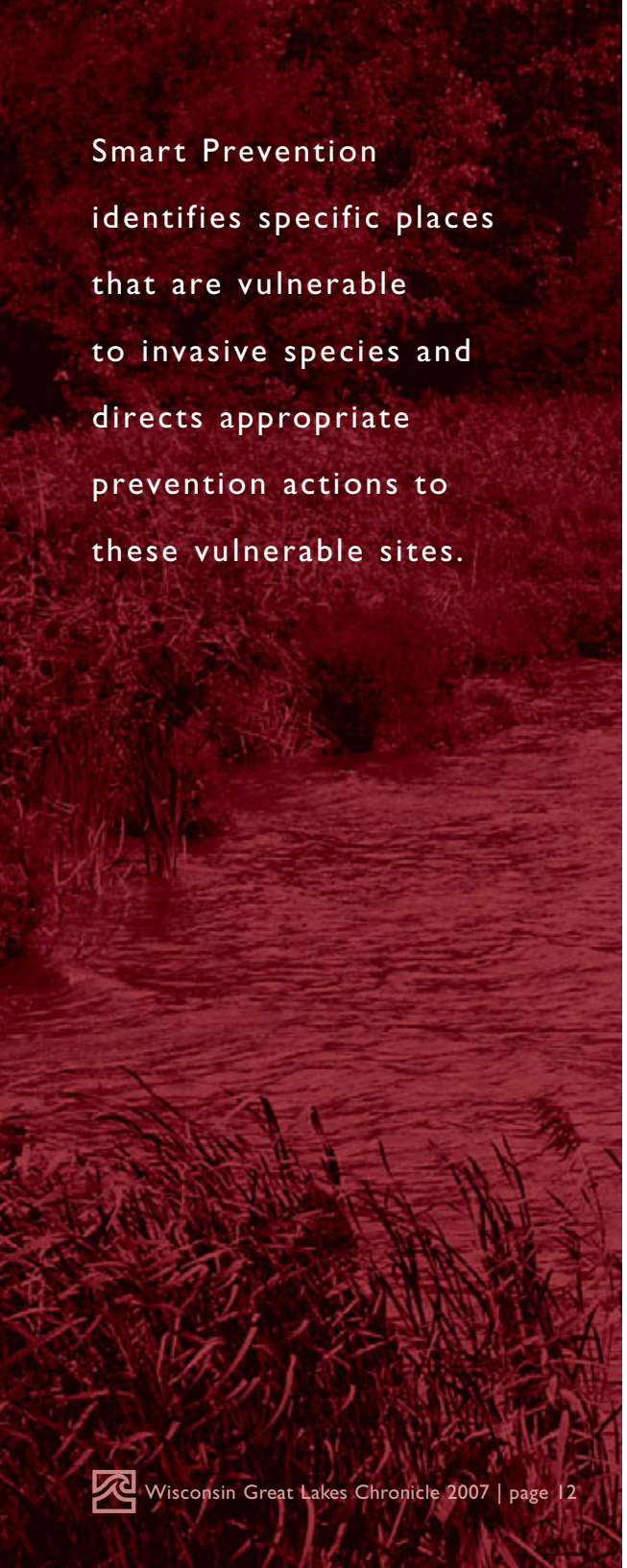

THE SMART PREVENTION APPROACH TO

Jeff Maxted and Jake Vander Zanden

During the past century, the ease in which goods can be moved across the globe has increased dramatically. Every day, cargo ships depart from exotic ports with a host of items bound for sale in the United States. Many of these ships traverse the oceans, navigate the St. Lawrence River and unload at ports throughout the Great Lakes. Unfortunately, some of these cargo ships unload more than we bargained.

Aquatic invasive species are a serious concern in our coastal systems. Once an invader is introduced and establishes a new population, it can cause significant negative effects. For example, the zebra mussel—one of the most notorious invasive species in the Great Lakes—clogs intake pipes for drinking water systems, litters sandy beaches with sharp shells and causes major disruption to the Great Lakes ecosystems. Invasive species are nearly impossible to reverse and exceptionally costly to manage. Millions of dollars are spent in the Great Lakes each year to minimize the impacts of the zebra mussel alone.

Moreover, once aquatic invasive species establish in the Great Lakes, they can easily be transported inland where they threaten Wisconsin's cherished lakes and streams. Seemingly innocuous events—such as dumping leftover live bait into a stream or moving bilge water to another lake—can cause major ecological impacts if hitchhiking aquatic invaders survive in the new aquatic system.

State and federal agencies are working to prevent harmful impacts of invasive species, but it is a momentous challenge to prevent their spread in a region with thousands of lakes and streams. To address this challenge, we and our collaborators at the UW-Madison Center for Limnology are developing the *Smart Prevention* approach for managing invasive species. The goals of Smart Prevention are to identify the specific places that are vulnerable to specific invasive species and direct the appropriate prevention actions to these vulnerable sites—the places where prevention programs will produce the greatest benefit.

The research involves three questions to identify which places are most vulnerable to invasive species:

- Can the invasive species get there?
- Can the invasive species live there?
- Will the invasive species have adverse impacts?

MANAGING INVASIVE SPECIES

To answer these questions, we collect information about invasive species distributions and combine it with lake and stream environmental data. If the answer to all three of the above questions is *yes* for a specific lake or stream, then that lake or stream is considered to be vulnerable to invasion.

For example, zebra mussels need high levels of dissolved calcium to build their shells. In addition, zebra mussels only survive in water with a particular pH level. Using available pH and calcium data for lakes and streams, we can map where zebra mussels are capable of establishing and causing detrimental impacts.

We can use a similar approach with the rainbow smelt, an invasive fish. Rainbow smelt prefer deep, unproductive lakes and can have negative impacts on native fish species such as lake whitefish, lake herring, yellow perch and walleye. We can combine fish survey data with existing information about Wisconsin lakes to determine where rainbow smelt are capable of negative impacts.

For other species, information about lake access, the presence of native species and proximity to the Great Lakes can be used to ask the other Smart Prevention questions. Our research is finding that only a fraction of the lakes and streams in Wisconsin are vulnerable to any particular invasive species. It is our belief that these vulnerable lakes and streams should receive attention from resource management agencies responsible for stopping the spread of aquatic invasive species.

While this research is designed to guide the efforts of state and federal resource agencies, basic invasive species prevention steps need to be practiced by all people in all aquatic ecosystems. By removing plants from boats and trailers, disposing of unused bait in the trash and draining live wells and bilge water, the spread of harmful invasive species can be greatly reduced.

There is an old adage that an ounce or prevention is worth a pound of cure. In the case of invasive species, this is truer than ever. Through application of the Smart Prevention approach, we are developing and implementing ways to make invasive species prevention programs more efficient and effective.

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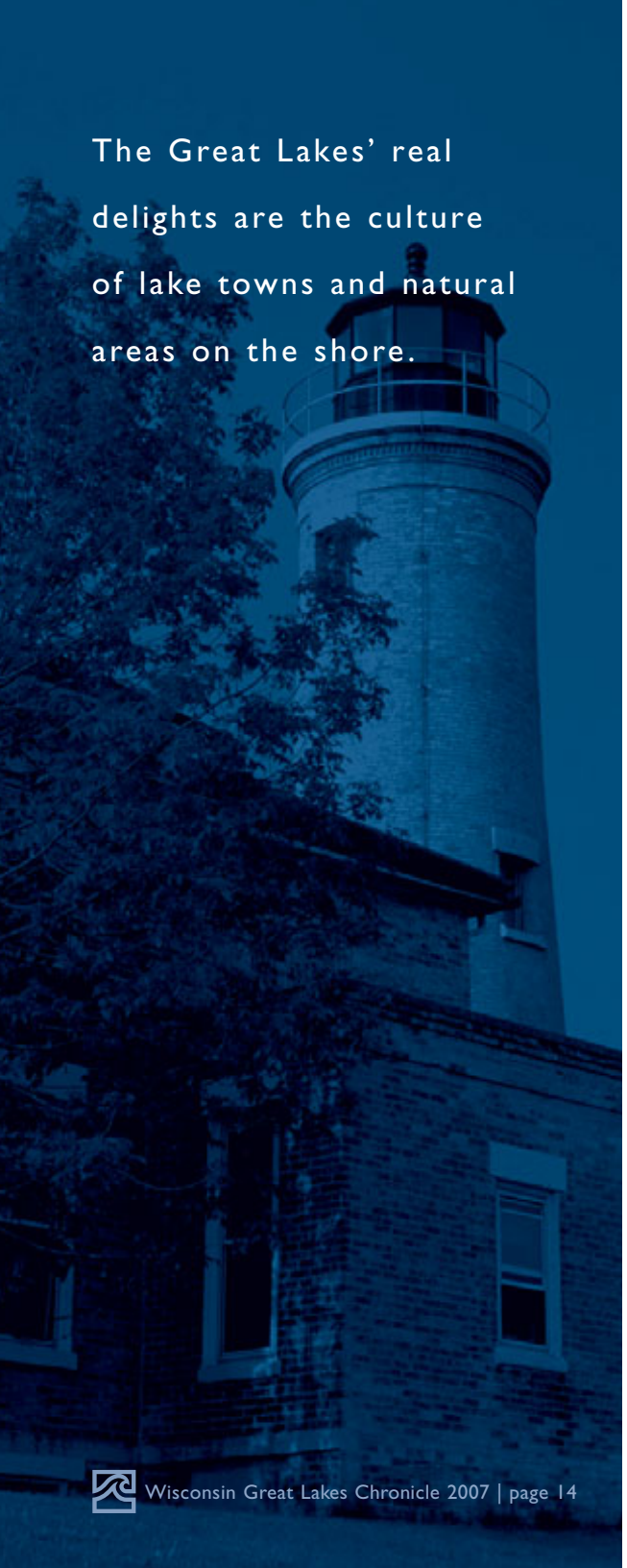


The Great Lakes' real delights are the culture of lake towns and natural areas on the shore.

GREAT LAKES CIRCLE TOUR – COASTAL

David Hart

A vacation on the Great Lakes Circle Tour can be the adventure of a lifetime. But if one only sticks to the highways marked with the distinctive green Circle Tour signs, much of the show will be missed.

In 1996, my father and I took our own Circle Tour trip. We traveled through Ontario on the eastern shore of Lake Huron through the Bruce Peninsula and onto Manitoulin Island. We proceeded around the northern shore of Lake Superior and ended with a ferry ride across Lake Michigan from Manitowoc to Ludington.

The real delights were when we got off the main road and experienced the culture of the lake towns and the natural areas on the shore. My father, a geologist who served the Michigan Department of Transportation for many years, shared his knowledge as we explored the limestone geology of Manitoulin Island. There was the serendipity of discovering the music and ales of a Celtic festival in Goderich, Ontario. Experiences like these rest around each bend of the Lakes and inspired the development of Wisconsin's Great Lakes Circle Tour – Coastal Access Guide (http://www.aqua.wisc.edu/glct/).

The Coastal Access Guide builds upon several Web sites that promote cultural tourism and exploration, such as:

- the Green Map System
  http://www.greenmaps.org/
- the Coastal Access Guide in Connecticut
  http://www.lisrc.uconn.edu/coastalaccess/
- the Oregon Coastal Atlas
  http://www.coastalatlas.net/

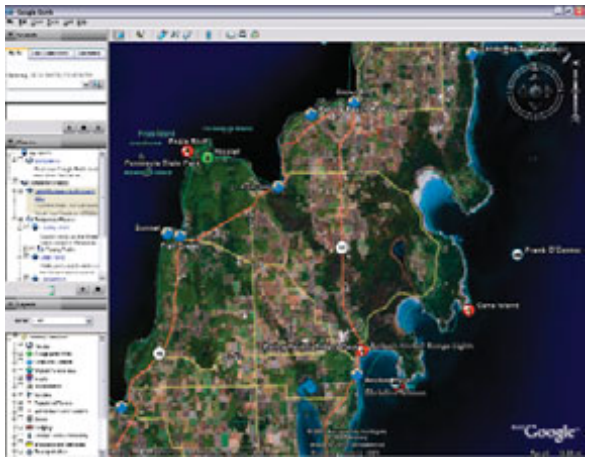
Drawing on these sites and others, we developed a Coastal Access Guide to map the Circle Tour route along with local roads, parks, beaches, lighthouses and shipwrecks on the Great Lakes. Hot links on interactive maps connect to other Web sites offering more information about each attraction.

A favorite feature of the site is the panoramic photo viewer. These photos show locations that provide public access and/or water views. The photos synchronize with a vicinity map that shows the field of view. One can rotate the photo 360 degrees to orient places on the map. Another feature links to webcams so one knows whether to pack a raincoat or bring sunscreen before venturing out.

ACCESS GUIDE

A variety of Web mapping software used to develop the site allowed us to research the benefits and drawbacks of each technology. The main site is developed using the Google™ Maps interface thus making it easy to use with a Web browser like Windows® Internet Explorer or Mozilla Firefox®. Virtual Earth software such as Google™ Earth and NASA World Wind make it possible to integrate different features and simulate flying over the Circle Tour. Open source software such as MapServer, Chameleon and OpenLayers pull in information from other data custodians and share our maps as well. It is our intention to write how-to guides so others in the Great Lakes region and beyond can learn from our example.

The Great Lakes Circle Tour – Coastal Access Guide will be a useful tool for many groups in Wisconsin. It will benefit tourists planning trips on the Circle Tour as it will show where to pull off the busy highway to explore coastal parks and beaches, lighthouses, shipwrecks and other cultural and natural attractions. The panorama photos of parks and scenic vistas could provide a Great Lakes experience to elderly or handicapped people who are unable to travel.



The Coastal Access Guide will be useful in the classroom for students to study the diversity of the Great Lakes shore. The virtual globe applications will add to environmental science and social studies classes. Coastal managers will gain through improved access to Great Lakes coastal data. The panorama photos provide a benchmark to study potential changes to the scenic vistas along the coast. Finally, the project showcases the sizable public investment in coastal land acquisition and access infrastructure made over the years by the Wisconsin Coastal Management Program and Wisconsin Department of Natural Resources.

Several enhancements are planned for the Coastal Access Guide. The Wisconsin Department of Natural Resources recently completed an inventory and Web mapping site for boat and developed shore fishing access sites in the state; the Great Lakes boat ramps will be added to the Coastal Access Guide. Historian Margaret Beattie Bogue finished writing the second edition of *Around the Shores of Lake Superior* providing valuable information about historic sites on the Circle Tour route. David Mickelson, professor emeritus of Geology at the University of Wisconsin-Madison, recently took oblique aerial photos of much of the Great Lakes shore in Wisconsin. These will provide a unique bird's-eye view of the coast.

Portal Wisconsin (http://www.portalwisconsin.org/) —maintained by the Cultural Coalition of Wisconsin—provides a calendar of cultural events in the state. We are exploring techniques to geographically reference this calendar into the site. These updates are just the beginning for creating the definitive Web site for exploring the Great Lakes.

David Hart is the GIS Specialist at the University of Wisconsin Sea Grant Institute. He can be reached at (608) 262-6515 or dhart@aqua.wisc.edu.

2007 WISCONSIN COASTAL MANAGEMENT

Project Name
Grantee
WCMP Award
Project Description

Coastwide

Wetland Identification and Information Tool Kit Distribution and Media Campaign
Department of Natural Resources
$72,650
Provide an information toolkit to property owners, local governments and others to determine if a site contains wetlands and how to deal with wetland issues.
Contact: Ms. Cherie Wieloch, (608) 266-7360

Raising Coastal Communities' Awareness of Coastal Wetland Values, Threats and Protection Strategies
Wisconsin Wetlands Association
$36,960
Launch the results of the Wetlands Threat Analysis to raise awareness about the importance of and threats to coastal wetlands.
Contact: Ms. Becky Abel, (608) 250-9971

Niagara Escarpment Overlay Zoning Guide
Bay-Lake Regional Planning Commission
$29,519
Create a guide for communities to develop Niagara Escarpment zoning overlays focused primarily on the protection of escarpment areas along the Green Bay shoreline and its natural resources and viewsheds.
Contact: Mr. Mark Walter, (920) 448-2820

Wisconsin Great Lakes/WOJB-FM Multimedia Outreach
Lac Courte Oreilles Ojibwa Public Broadcasting (WOJB-FM)
$28,800
Support Lac Courte Oreilles Ojibwa Public Broadcasting to increase public awareness about Wisconsin Great Lakes restoration and protection issues.
Contact: Mr. Eric Schubring, (715) 634-2100

Technical Assistance
Northwest Regional Planning Commission
$20,000
Provide funding for technical support and public outreach in the Lake Superior Region.
Contact: Mr. Jason Laumann, (715) 635-2197

Technical Assistance
Bay-Lake Regional Planning Commission
$20,000
Provide funding for technical assistance, including wetland delineations and zoning variances, and public outreach efforts in the Bay-Lake region.
Contact: Mr. Mark Walter, (920) 448-2820

Technical Assistance
Southeastern Wisconsin Regional Planning Commission
$20,000
Provide funding for technical support and public outreach in the Southeastern Lake Michigan Region.
Contact: Dr. Don Reed, (262) 547-6721

PROGRAM GRANTS

Phragmites (Common Reed) Control on Coastal State Natural Areas
Wisconsin Department of Natural Resources
$20,000
Remove _Phragmites_ from eight shoreline areas totaling 50 acres and an additional 190 acres that were previously treated.
Contact: Mr. Mark Martin, (608) 266-8916

Evaluation of _Phragmites_ Control Measures
Wisconsin Department of Agriculture, Trade & Consumer Protection
$12,000
Evaluate the success of previous efforts to control _Phragmites_ in Green Bay, recommend appropriate control methods for areas with important native species and assess the long-term effectiveness of alternative control measures.
Contact: Ms. Ursula Petersen, (608) 224-4538

Technical Assistance to Local Units of Government
Wisconsin Department of Natural Resources
$370,170
Support four water management specialists who provide technical assistance to local units of government and administer wetland regulations throughout the coastal regions.
Contact: Ms. Lois Simon, (608) 266-8852

Coastal Wetland Inventory
Wisconsin Department of Natural Resources
$88,033
Update the Wisconsin Wetland Inventory for all coastal counties and convert aerial photographs to digital files for Door County.
Contact: Ms. Lois Simon, (608) 266-8852

Mapping and Volunteer Monitoring of Ephemeral Pond Wetlands
Wisconsin Department of Natural Resources
$45,096
Inventory ephemeral ponds in Ozaukee, Racine and Kenosha Counties, develop a citizen monitoring network to expand the inventory to other counties, host a public forum to share the inventory results and provide the inventory data to local partners.
Contact: Mr. Thomas Bernthal, (608) 266-3033

Ashland County

Weed Free Watersheds in Northern Wisconsin
Northwoods Cooperative Weed Management Area (ABDI Land and Water Conservation Dept.)
$7,040
Provide general education on invasive species issues and specific information on impacts and on-the-ground control methods for target invaders that affect coastal habitat.
Contact: Ms. Leah Gibala, (715) 682-7123

Bayfield County

Bayfield County Lake Protection, Phase III
Bayfield County
$27,386
Develop ordinance changes to implement building setback requirements developed by the County. The project includes public education, information sharing, website updates and refining the maintenance and tracking of septic systems.
Contact: Mr. Karl Katrosky, (715) 373-6138

Brown County

Brown County Open Space and Outdoor Recreation Plan Update
Brown County Planning Commission
$29,996
Update the 2001 Brown County Open Space and Outdoor Recreation Plan ensuring that recommendations are consistent with the adopted 2004 Brown County Comprehensive Plan.
Contact: Mr. Aaron Schuette, (920) 448-6486

Brown County Wetland Restoration Inventory
Brown County Land Conservation Department
$21,000
Inventory small wetland restorations in Brown County following the protocol of previous WCMP-funded projects along Lake Michigan.
Contact: Ms. Jill Hapner, (262) 242-7398

Door County

Final Construction Plans for Nonpoint Source Beach Contamination Reduction
Door County Soil and Water Conservation Department
$53,900
Offer a cost share incentive program to municipalities to obtain final construction plans for reducing beach contamination in Door County.
Contact: Ms. Vinni Chomeau, (920) 746-2214

Douglas County

Arrowhead Pier Reconstruction Planning
City of Superior
$32,544
Obtain public input and plan for the replacement of the deteriorating Arrowhead Fishing Pier.
Contact: Ms. Mary Morgan, (715) 395-7279

Lake Superior Wetland and Stream Monitoring Program
University of Wisconsin-Superior
$29,890
Collect water quality data at three estuaries on the Lake Superior south shore. Data will support resource management decisions and outreach about water quality and coastal wetlands by local officials and the public.
Contact: Ms. Sue O'Halloran, (715) 394-8525

Estimating the Effects of Land Use and Land Cover Change on Lake Superior Tributary Streams
University of Wisconsin-Madison
$22,998
Investigate and model the relationship between land use cover, canopy and flows within a watershed.
Contact: Dr. David Mladenoff, (608) 262-1992

Northern Water Trails to the Big Lakes
River Alliance of Wisconsin
$20,000
Develop a guide called *Northern Water Trails to the Big Lakes*.
Contact: Mr. Denny Caneff, (608) 257-2424

Study of the Vascular Plants of Amnicon Falls State Park
University of Wisconsin-Superior
$19,172
Complete a floristic study of Amnicon Falls State Park begun in 2006. The resulting inventory will be a valuable tool to prioritize future preservation and restoration projects in the area.
Contact: Mr. Paul Hlina, (715) 398-5453

Outdoor Classroom in the Superior Municipal Forest
City of Superior
$11,500
Construct an outdoor classroom in the City's Municipal Forest and interpretive signs near existing benches on the existing trail and at significant ecological sites.
Contact: Ms. Kari Jacobson-Hedin, (715) 394-0392

Iron County

Protecting Lake Superior Resources in Iron County
Iron County
$13,500
Identify inconsistencies between the Iron County Comprehensive Plan and the current Iron County zoning ordinance and recommend changes to the zoning ordinance to better protect the county's natural resource areas, water resources and coastal areas.
Contact: Mr. Mike Saari, (715) 561-3375

Kenosha County

Center for Environmental Education, Demonstration and Applied Research
City of Kenosha
$40,000
Establish a Center for Environmental Education, Demonstration and Applied Research at the Kenosha Beach House.
Contact: Mr. Franz (Art) Strong, (262) 653-4080

Trail Restoration at Kenosha Dunes-Chiwaukee SNA
Wisconsin Department of Natural Resources
$9,600
Establish a one-quarter mile walking trail to provide managed access to the Kenosha Dunes unit of the Chiwaukee Prairie State Natural Area.
Contact: Mr. Marty Johnson, (262) 884-2391

Milwaukee County

Milwaukee River and Riverside Park Public Access Trails
Milwaukee County
$150,000
Develop trails along the Milwaukee River and at Milwaukee County's Riverside Park.
Contact: Ms. Sue Black, (414) 257-4590

Emmber Lane River Access and Restoration Demonstration Project
City of Milwaukee
$100,000
Construct a floating dock and debris screen on the Menomonee River to address fisheries habitat, water quality and public access.
Contact: Mr. Ghassan Korban, (414) 286-3304

Action on the Kinnickinnic River: Community Involvement in Planning for Urban Concrete Removal
Sixteenth Street Community Health Center
$72,350
Develop public dialogue on the Milwaukee Metropolitan Sewerage District's planning process for removing 11,000 linear feet of concrete lining within the Kinnickinnic River. The project is an implementation effort of the Action Plan for the Kinnickinnic River Corridor.
Contact: Mr. Peter McAvoy, (414) 672-1315

Film and Educational Package on Great Lakes Diversion Issues
UW-Milwaukee, Great Lakes WATER Institute
$54,636
Develop a movie and educational materials on coastal water availability, Great Lakes water diversion issues, water use and techniques for water conservation and quality preservation.
Contact: Dr. Rebecca Klaper, (414) 382-1713

Southeast Side Comprehensive Area Plan
Redevelopment Authority of the City of Milwaukee
$50,000
Create a Southeast Side Comprehensive Area Plan in the City of Milwaukee.
Contact: Mr. Michael Maierle, (414) 286-5720

Milwaukee River Ecological Restoration
Milwaukee Metropolitan Sewerage District
$30,000
Implement an ecological restoration project that will engage minority high school students, college interns and volunteers in the removal of invasive plant species in the Milwaukee River basin.
Contact: Ms. Kimberly Gleffe, (414) 271-8000

Project Safe Harbor: Historic Photo Digitization
Milwaukee Public Library
$20,000
Consolidate, preserve and digitize photos from the Port of Milwaukee, the Great Lakes Marine Collection and the Milwaukee Public Library Historic Photo Collection to assist researchers locate historic photos.
Ms. Virginia Schwartz, (414) 286-3216

Vanselow Wetland Restoration
Milwaukee Metropolitan Sewerage District
$10,000
Restore 14 acres of farmed wetland to forested wetland and wet prairie habitat. Coastal funds supported acquisition of this parcel in 2006.
Contact: Ms. Sheila Charnon, (414) 225-2134

Protecting the Milwaukee River's Urban Shorelines
Friends of Milwaukee's Rivers
$15,000
Protect threatened reaches of the Milwaukee River using civic engagement and planning tools; work with the City of Milwaukee to develop an overlay district to protect shorelines on the Milwaukee River north of North Avenue.
Contact: Ms. Lynn Broaddus, (414) 287-0207

Great Lakes in My World
Wisconsin Department of Natural Resources
$7,153
Create a 2½ day, 1-credit course for teachers as part of the Sally Ride Academy including educational resources, field experiences and activities to teach students about the Great Lakes.
Contact: Ms. Carrie Morgan, (608) 267-5239

Ozaukee

Lakebed Erosion and Bluff Recession on Lake Michigan Shoreline
University of Wisconsin-Madison
$29,970
Investigate and raise public awareness of the role of lakebed downcutting as it affects long-term bluff recession.
Contact: Dr. Chin Wu, (608) 263-3078

Racine County

Revitalizing the Root River in Racine
River Alliance of Wisconsin
$30,000
Develop a plan to guide redevelopment and revitalization efforts on the Root River in the City of Racine.
Contact: Mr. Denny Caneff, (608) 257-2424

Root River Environmental Education Community Center
University of Wisconsin-Parkside
$29,500
Develop educational programs and opportunities associated with the Great Lakes through a partnership with the City of Racine for the establishment of a new Root River Environmental Education Community Center (REC).
Contact: Dr. Thomas Schnaubelt, (262) 595-3340

ACKNOWLEDGEMENTS

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Photographs

Page, Image, Source

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16, Lake Superior Beach, UW-Extension

20, Bayfield Harbor, Bill Millhouser

21, Oak Island, National Park Service

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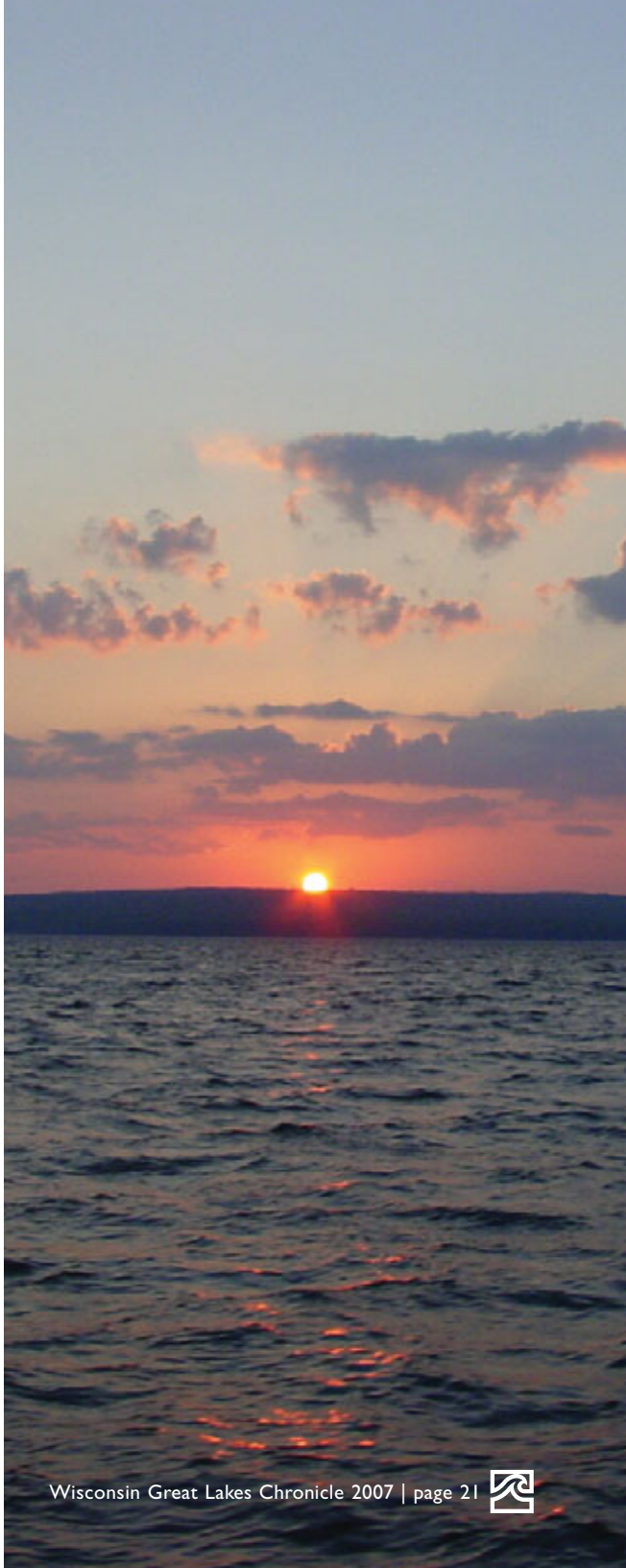
The Wisconsin Coastal Management Program, part of the Wisconsin Department of Administration, was established in 1978 to preserve, protect and manage the resources of the Lake Michigan and Lake Superior coastline for this and future generations.

WISCONSIN COASTAL MANAGEMENT PROGRAM

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