



Mark Dutzik

WISCONSIN'S GREAT LAKES STRATEGY: Restoring and Protecting Our Great Lakes





Governor Jim Doyle
State of Wisconsin

The Great Lakes characterize Wisconsin. Their waters sustain our recreation, our way of life and our economy. From the majestic shores of Lake Michigan to the brutal and beautiful waters of Lake Superior, the Great Lakes are not just part of our heritage, but part of who we are. They have shaped our history, our cities, our industry, and our recreation. Just as they have formed this region, they will continue to help determine our future and our region's economic viability.

The Great Lakes Regional Collaboration developed a plan for the protection and restoration of these valuable resources based on the Council of Great Lakes Governors' Priorities. I have worked with resource professionals, local leaders, Great Lakes stakeholder groups, and concerned citizens to tailor this plan to Wisconsin's unique management needs. The resulting "Wisconsin Great Lakes Protection and Restoration Strategy" is a road map for addressing the many issues facing Lake Michigan and Lake Superior.

We can all use this road map. From legislators considering new bills to local farmers making land use decisions, from those involved in shipping to citizens caring for their homes, lawns and gardens – we can all help protect Wisconsin's Great Lakes.



Kathryn H. Lederhause



Secretary Matt Frank
Wisconsin Department
of Natural Resources

The rivers, streams, lakes and groundwater of the Great Lakes watershed are inextricably linked. The health of the Great Lakes is also directly linked to the regional economies that depend on them. This vast Great Lakes watershed is shared by two countries, eight states, two provinces and thirty nine tribal governments and inter-tribal organizations. We must work collaboratively and creatively at all levels across county, state and national boundaries for the protection and restoration of our Great Lakes.

Together, we can successfully manage and conserve water in the Great Lakes Basin, protect the lakes from aquatic invasive species and restore critical wetland and tributary habitat. We must work to clean up toxic sediments and prevent nonpoint source pollution that causes algal growth, covers spawning sites and fouls our beaches.

We must prevent the introduction of new persistent bio-accumulative toxins (PBTs) from home, yard, health and personal care products. We can improve our data collection and management in order to work more efficiently and effectively. Wisconsin's Great Lakes Protection and Restoration Strategy provides a framework for these critical actions and outlines ways for each of us to be involved in the protection of these valuable resources.



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THE GREAT LAKES: A national treasure



Apostle Islands, Lake Superior

© Dpeini | Dreamstime.com

This is an exciting and hopeful time for the Great Lakes! Earth's largest freshwater system has finally been identified as a national management priority.

One tenth of the population of the U.S. and nearly one third of the population of Canada call the Great Lakes watershed home. Covering more than 94,000 square miles, the Great Lakes watershed is also home to thousands of plant and animal species, some of which are found nowhere else on earth. Managing this vast ecosystem requires an extraordinary effort at international, national, regional,

local, community and individual citizen levels. Representatives of all these groups have come together in an historic effort to develop a single set of national priorities and strategies to address the Great Lakes' most pressing problems.

The resulting plan – the “Great Lakes Regional Collaboration Strategy to Protect and Restore the Great Lakes” – is a call to action. It challenges us to take the necessary steps to protect the Great Lakes and it provides the foundation for seeking essential long-term federal funding.

Lisa Berenschot



Sunrise over Lake Michigan from Milwaukee shore

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RIGHT: Cana Island, Door County



Jarrod Eithe

Fun on the beach, Sheboygan

The Wisconsin DNR and state citizens have worked with Governor Doyle to tailor this regional action plan for Wisconsin. The “Wisconsin Great Lakes Restoration and Protection Strategy” is a road map for state legislators, resource managers, local government officials and Wisconsin’s citizens for the protection of Lake Superior and the restoration of Lake Michigan.

We can all help protect and restore our Great Lakes. We know what needs to be done. We know how to do it. All that is required is the will to make it happen.

“The Great Lakes are one of the natural wonders of the world and it is our responsibility to protect them. They are a place we call home and a resource for us to use and protect – they are the heart of the ecosystems that we rely on for life. They are a gift of nature whose beauty and bounty enrich our lives and identify our region.”

—GREAT LAKES FOREVER WEBSITE

WISCONSIN’S GREAT LAKE PRIORITIES

WATER MANAGEMENT

Ensure the sustainable use of our water resources while confirming that the States retain authority over water use and diversions of Great Lakes waters.

AQUATIC INVASIVE SPECIES

Stop the introduction and spread of non-native aquatic invasive plants and animals.

HABITAT AND SPECIES

Enhance fish and wildlife populations by restoring and protecting wetlands, rivers, streams and associated uplands.

COASTAL HEALTH

Promote programs to protect human health against adverse effects of pollution in the Great Lakes ecosystem.

AREAS OF CONCERN/CONTAMINATED SEDIMENTS

Restore to environmental health the Areas of Concern (AOCs) identified by the International Joint Commission as needing remediation and other contaminated sediment sites in the Great Lakes Basin.

RUNOFF POLLUTION

Control pollution from diffuse sources into water, land and air.

PERSISTENT BIOACCUMULATIVE TOXINS (PBTs)

Continue efforts to eliminate the introduction of PBTs into the Great Lakes ecosystem.

SUSTAINABLE DEVELOPMENT

Adopt sustainable use practices that protect environmental resources and enhance the recreational and commercial value of our Great Lakes.

INFORMATION AND INDICATORS (I&I)

Standardize and improve the methods by which information is collected, recorded and shared within the region.



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WATER MANAGEMENT: Conservation and the Great Lakes Compact



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10 million people rely on Lake Michigan for their drinking water

“All the water that will ever be is right now.”

— NATIONAL GEOGRAPHIC,
OCTOBER 1993

Wisconsin has lots of water, but not an infinite supply and not always where we need it. Demands and stresses on Great Lakes waters continue to increase. About half of the state’s 5.5 million people live in the watersheds that drain into Lake Michigan or Lake Superior. About half of this population resides in the southeastern part of the state, an area that has experienced intense population growth, urbanization and industrialization. A rational water use management strategy is critical to ensure that Wisconsin’s Great Lakes are used sustainably to support current needs and those of future generations. Without careful oversight and management, future uses of these resources could be compromised.

The Great Lakes-St. Lawrence River Basin Water Resources Compact was signed into law on October 3, 2008 and became effective on December 8, 2008. The Compact is a comprehensive management framework for achieving sustainable water use and resource protection in the eight Great Lakes states and two Canadian provinces. After five years of negotiations, these historic protections have become law in ten jurisdictions spanning two countries.

The Compact acknowledges the critical connection between ground and surface water withdrawals. It calls for the collective management of large water withdrawals in the Great Lakes Basin including withdrawals from groundwater, tributary streams, inland lakes and the Great Lakes themselves. Specifically, the Compact prohibits taking water out of the Basin boundaries with a few carefully regulated exceptions for near-by “straddling” communities. To promote sustainable water use, the Compact calls for water conservation, registration and permitting of large water withdrawals in the basin. It also requires water withdrawal monitoring and reporting.





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Sustainable water use supports current needs and those of future generations

Wisconsin's Great Lakes Basin Water Management Program, based on the Compact and state implementing legislation, calls for:

- 1) Water conservation through a tiered program with practices increasing from voluntary to mandatory.
- 2) Registration and reporting for all water withdrawals in the state over 100,000 gallons per day in any 30-day period.
- 3) Water use permitting for all in-basin water withdrawals over the 100,000 gallons per day threshold.
- 4) A statewide requirement for water supply service area planning for all public water systems serving populations over 10,000.
- 5) Publication of a State Water Use Report every five years.
- 6) Environmental review of new and increased water withdrawals in the Basin over one million gallons per day.

For more information about the Great Lakes Compact, visit:
dnr.state.wi.us/org/water/greatlakes/annex2001/

HOW CAN WE HELP?

We all have a responsibility to use our water resources wisely. Here are some ways we can help conserve water:

- Support water conservation efforts in your local community.
- Water lawns only as needed and before 9 am or after 5 pm.
- Garden with native plants – they're suited to Wisconsin's climate and generally need less watering.
- Fix leaky faucets and don't leave the water running.
- Use water-saving shower heads and take shorter showers.
- Run only full loads of dishes and laundry.
- Use a broom instead of the garden hose to clean sidewalks and driveways.
- Use rain barrels to capture water for gardens.

Every Drop Counts

The Milwaukee Metropolitan Sewerage District (MMSD) extols city residents to save money, water and energy and help protect Lake Michigan by making Every Drop Count.

As part of this program, citizens are encouraged to conserve water, especially in times of heavy rain. If each of MMSD's 1.1 million customers used just 10 gallons less on a day with heavy rain, basement backups and sewer overflows would be reduced by 11 million gallons. Conserving water also saves energy and money. The EPA estimates that three percent of national energy consumption is used for drinking water and wastewater.

MMSD's customers are also asked to take steps to reduce polluted runoff, the biggest remaining threat to water quality in the United States. In urban settings, runoff from rooftops, driveways, sidewalks and yards discharges directly into the sewer system. Rain barrels, typically near downspouts, can be used to collect and store rainwater that can later be used to water lawns, trees and flowers. Rain gardens help the ground soak up water.

Property owners can also direct downspouts to lawns and gardens to help divert runoff from the storm sewer. Redirecting downspout water to lawns and garden areas can reduce storm water discharge to the sewer system by up to 12 gallons a minute for each disconnected downspout. (Check with your municipality to make sure you can disconnect your downspouts legally and that you disconnect properly.)

For more information, visit: **v2.mmsd.com/HowToHelp.aspx** .



Frank Koshere

AQUATIC INVASIVE SPECIES: An environmental and economic threat



Pieter Johnson, UW—Center for Limnology

Spiny waterflea

Harmful plants and animals enter the Great Lakes in a variety of ways – ship ballast water, canals and waterways, recreational boating and fishing, aquaculture, and through the aquarium trade.

More than 180 species of plants, plankton, fish, and pathogens from afar have been introduced into Lake Michigan and Lake Superior. Sea-going “salties” (ships that travel from the ocean into the Great Lakes) introduce foreign organisms from as far away as Europe and Asia each time they exchange ballast water. “Lakers” (ships that travel only on the Great Lakes) can spread organisms from lake-to-lake in the same way. Individuals can further spread exotic organisms within the Great Lakes and to inland waters on boat trailers, by dumping bait fish or water from boat bilges and live-wells, or by releasing aquarium pets or plants.



WDNR

Zebra and quagga mussels

Zebra mussel, quagga mussel, round goby and spiny water flea are just a few of the invasive species that have travelled to Wisconsin’s lakes via ship ballast water. While exotic species are often harmless or even beneficial “at home,” they can wreak havoc on our aquatic ecosystems because they have no natural



Merissa Michaels

Asian carp

predators or competitors. Without these natural checks and balances non-native plants and animals can crowd out native species. Invasive species also put a tremendous drain on the economy. Zebra mussels alone cost U.S. taxpayers up to \$5 billion dollars annually. Sea lamprey control costs the U.S. and Canada over \$15 million each year.

Prevention and management of aquatic invasive species requires cooperation at all levels, from international agreements, to national and state legislation, to the actions of the shipping industry, as well as individual boaters, anglers and aquarists. We can all help protect Wisconsin’s Great lakes from aquatic invasive species.

Asian Carp Threaten the Great Lakes

Four species of Asian carp (silver, big head, grass, and black) are in the Mississippi drainage and are headed north. These carp were not brought here in ship ballast; they escaped from aquaculture facilities or were released in the southern U.S. and are now moving up the Mississippi and Illinois Rivers. These species could reach Lake Michigan through the Chicago Sanitary and Ship Canal. If any of these species reach Lake Michigan, the entire



Diane Schauer

Clean Boats, Clean Waters volunteers check boats and trailers

Great Lakes ecosystem and its fisheries could be seriously threatened.

For more information, visit: dnr.wi.gov/invasives/fact/asian_carp.htm .

Clean Boats, Clean Waters Volunteers Work to Protect Wisconsin's Waterways

Citizen volunteers around the state are providing front-line defense against the spread of invasive species in Wisconsin's waters. Through the Clean Boats, Clean Waters Program, volunteers are trained to organize and conduct local boater education programs. Teams of adult and youth volunteers perform boat and trailer checks at landings and distribute educational materials to inform boaters how and where invasive species are most likely to hitch a ride. Volunteers also report any new exotic species infestations.

For more information, visit: uwsp.edu/cnr/uwexlakes/cbcw/

HOW CAN WE HELP?

KEEP THEM OUT:

- Support consistent laws and requirements to prevent the release of invasive species through ballast water.
- Promote on-shore ballast water treatment facilities at all Wisconsin ports of call, and support funding for test facilities. For more information, visit: dnr.state.wi.us/org/water/success/2008/ballast.htm
- Keep aquarium creatures and plants at home. Never release them into lakes or streams.

KEEP THEM FROM SPREADING:

- Clean your boat! Every time you leave a landing inspect your boat and gear. Remove all plants, animals and mud. If possible, rinse your boat or dry for 5 days before moving between waterbodies.
- Drain all water from your boat and dispose of unwanted live bait in the trash.
- Get the word out! Tell others how they can protect Wisconsin's waters from invasive species. Support local and statewide education efforts.
- Become a Clean Boats, Clean Waters volunteer or support local volunteer efforts.

LIMIT THEIR IMPACT:

- Keep an eye out – if you notice changes at your local beach or fishing spot that you think may be due to invasive species, let a natural resources professional know. Early detection of new invasions can make management easier.
- Develop and support exotic mussel, lamprey, and other management efforts to limit the negative effects of these species.
- Participate in and support removal efforts where possible.



Frank Kostiere

Educational materials help boaters prevent spreading exotic species

HABITAT AND SPECIES: Keeping every cog and wheel



Yellow jewelweed

Kathi Klamasz

“To keep every cog and wheel is the first rule of intelligent tinkering.”

—ALDO LEOPOLD

One third of our state drains to the Great Lakes; one half of our population lives in this area. We have often tried to bend nature to meet our needs as we continue to develop our Great Lakes watershed. We have disrupted critical habitat and, in the process, lost or endangered many native plants and animals.



Devil’s River, Manitowoc County

Angie Reich

In urbanized areas we applaud neatness – well mown lawns and drainage systems that rapidly move water away from where we live. A healthy, vibrant ecosystem, however, is generally messy business. Natural diversity, not visual tidiness, is the key to good habitat.

Good quality habitat can be found at scales ranging from a backyard butterfly garden to a 1000 acre wetland. Both are important. We must act at all levels to protect healthy habitat and restore damaged habitat so that Wisconsin’s native species can survive.

The Great Lakes Regional Collaboration identified tributaries and wetlands as priority habitat restoration areas. These are also the key areas for Wisconsin. Wisconsin’s interim goal is to restore 200,000 acres of wetlands. In addition, we will complete restoration projects on 5-6 streams every 5 years. Both goals will require the help of Wisconsin’s property owners.

Wetland target areas include the west shore of Green Bay, coastal wetlands and other priority sites throughout the Lake Superior basin, and the southeastern part of the state. Priority Lake Michigan tributaries include the Milwaukee, Sheboygan, Manitowoc, Twin, Kewaunee, Peshtigo, Oconto and Menominee Rivers. Lake Superior’s priority rivers include the St. Louis-Red-Pokegama, Nemadji, Iron, Bois, Brule, Flag, Cranberry, Sioux, Raspberry, Bark, Fish and Montreal Rivers.

Bringing Back the Sturgeon

Lake sturgeon can live to be more than a hundred years old and grow to over 200 pounds. These ancient giants are native to our waters and used to be abundant in the Great Lakes and their tributaries. Now they are considered rare in most of the U.S. and are on “watch” status in Wisconsin.

Once considered nuisance fish because of their ability to damage commercial fishing nets, sturgeon were caught, stacked like cordwood on shore, and burned. They later became valuable for oil, caviar and air bladders which were used to make isinglass – a gelatinous material used to clarify jams, jellies and glue and for making isinglass windows for carriages. It wasn't long before overfishing dramatically reduced the sturgeon population. In 1885, Wisconsin's annual commercial sturgeon catch was over 200,000 pounds. By 1910, it had decreased to about 2,000 pounds annually.

The long-term survival of lake sturgeon is in doubt for several reasons. First, they are slow to reproduce. Females reach maturity at 24-26 years; males mature at 15 years. While females can produce 50,000 to 700,000 eggs in a season, they only do so every 4-6 years. Their fatty tissue readily accumulates toxins from the environment. But the biggest threat to this great fish is habitat loss. Dams block access to spawning grounds. Changes in temperature, oxygen and stream flow reduce food supplies and interfere with egg hatching.

Wisconsin has small, but self-sustaining populations of lake sturgeon in Green Bay tributaries. Spawning populations also exist on the Menominee, Peshtigo, Fox and Oconto Rivers. Improvements in water quality and habitat are important on all of these rivers.

The DNR has identified Lake Michigan tributaries as Lake Sturgeon Rehabilitation Waters. Thanks to the removal of dams, habitat restoration, and captive rearing and release, the lake sturgeon has returned to the Milwaukee and Manitowoc Rivers. This is a great success, but even more must be done to insure the survival of this magnificent creature.



Volunteers release captive-raised sturgeon

Riveredge Nature Center

HOW CAN WE HELP?

- Plant native trees, shrubs, grasses and flowers.
- Protect stream banks from erosion – leave them undisturbed or plant with native plants.
- Build a rain garden or backyard pond.
- Help prevent or eradicate invasive species.
- Support wetland restoration efforts in your area.



Frank Koshier

Wild rice on the St. Croix River



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RESTORING TOXIC SITES: Creating a healthier future



CH2M Hill

Removing toxic sediment

We tend to think of toxic pollution as something that happens somewhere else, but five high-priority sites or “Areas of Concern” (AOCs) and a number of other toxic sites have been identified right here in Wisconsin’s Great Lakes Basin. These areas face serious problems that limit their use for fishing, swimming or for drinking water. Problems include contaminated sediment, habitat loss or destruction, polluted runoff and beach contamination.

must be developed. Adequate funding and expertise is critical to success.

Contaminated sediment must be cleaned up – and cleaned up carefully – because it can pose a serious threat to environmental and human health. Toxins can have acute effects or may accumulate over time and through the food chain, resulting in long-term effects on fish, birds, humans and other organisms.

We must commit the necessary resources to restore these high-priority sites to fishable, swimmable and drinkable waters. We know how to remove toxic sediments. We have had successes. All that is required is the will and funding to make it happen at all of Wisconsin’s toxic sediment sites.



Xiaochun Zhang

Testing shoreline stability

While these sites have a myriad of problems, the Wisconsin Strategy focuses on contaminated sediment because this problem is common to all sites and because it is usually the most complex and expensive to fix. At each site the extent of contamination must be determined and a clean up plan



Steve Westebroek

RIGHT: Great blue heron in the Kinnickinic River

Kinnickinic River Receives Legacy Funding

The Kinnickinic River, often called the KK River – or “Milwaukee’s forgotten river” – recently received \$14.3 million in federal Great Lakes Legacy Funds for clean up. The State of Wisconsin will contribute \$7.7 million to the restoration effort.

Smallest of the three primary rivers that empty into the Milwaukee River, the KK is also the most urbanized and densely populated. It is part of the Milwaukee River Estuary Area of Concern. Once a place where children could wade and fish, the KK is now often perceived as a network of municipal sewage canals due to its degraded condition.

In spring 2009, the removal of 170,000 cubic yards of sediment contaminated with PCBs (polychlorinated biphenyls) and PAHs (polyaromatic hydrocarbons) will begin. After toxic sediments are removed habitat restoration work will begin. The DNR, with the help of EPA and the efforts of concerned citizens, will work to restore the KK to a fishable, swimmable river, ultimately returning this valuable resource to Milwaukee’s citizens.

For more information, visit:

dnr.wi.gov/org/water/wm/sms/kkriver/



Clean up of the Kinnickinic River began in spring 2009

WDNR



Xiaochun Zhang

HOW CAN WE HELP?

- Adequate resources are critical. Encourage funding of toxic site remediation.
- Support monitoring activities. Monitoring is important for determining when a site is adequately restored.
- Be involved in creative visioning for future uses of toxic sites.
- Participate in shoreland habitat restoration activities.

PERSISTENT BIO-ACCUMULATIVE TOXINS: Keeping chemicals out of our waters



Air emissions contribute to water pollution

Robert Queen

Chemical production dates back more than 5,000 years, but large-scale chemical production didn't occur until the 19th century. During the 19th and 20th centuries technological advances greatly increased the types and amounts of chemicals produced. During this time, pesticides and fertilizers, pharmaceuticals, synthetic dyes and fibers, soap and beauty products, synthetic sweeteners, plastics, film chemicals and celluloid, and artificial rubber became commonly used. Chemicals have improved our quality of life in many ways. Used judiciously, and recycled or properly disposed, chemicals can have great value to our society. But when these products get into our waterways they can quickly become a hazard to environmental and human health.

Chemicals in our lakes, rivers and groundwater come from many sources including industries, businesses, our homes and the air. Many chemicals pass through our treatment plants and into our waterways and groundwater. Others are distributed through the air by coal fired power plants,

vehicle exhaust, smoke stacks and other emissions. Some of these chemicals last a long time in the environment and can cause a wide range of health effects in fish, wildlife, and people when they accumulate in our bodies. Such chemicals are known as Persistent Bio-accumulative Toxins or PBTs.

PBTs are the reason that Wisconsin and other states advise people to limit the number of meals they eat of some fish species. These contaminants enter the lake and are absorbed by plankton and insects, and in turn by the fish, wildlife and humans that eat them. Mercury and PCBs (polychlorinated biphenyls) are the contaminants of greatest concern in Wisconsin's fish. Currently, there are fish advisories for mercury and PCBs for Lake Michigan and Lake Superior and their tributaries.

For more information, visit the [DNR Fish Consumption Advisory: **dnr.wi.gov/fish/consumption/**](http://dnr.wi.gov/fish/consumption/)

"If the Bill of Rights contains no guarantee that a citizen shall be secure against lethal poisons distributed either by private individuals or by public officials, it is surely only because our forefathers, despite their considerable wisdom and foresight, could conceive of no such problem."

—RACHEL CARSON, *SILENT SPRING*



Jo Lemire

PBTs can end up in our drinking water

More and more chemicals are showing up in our rivers, lakes and even our drinking water. Scientists are looking at potential effects of some of these chemicals including flame retardants, pharmaceuticals, and personal care compounds (like anti-bacterial soaps and beauty products) that pass through our wastewater treatment systems. Until we understand the potential effects of these chemicals, we should make every effort to keep them out of our water.

Lake Superior Zero Discharge Program

The Binational Program to Restore and Protect the Lake Superior Basin includes a “zero discharge” demonstration program for nine pollutants. These pollutants were identified because they are very toxic, accumulate through the food chain, and persist in the environment.

Government agencies, organizations and concerned citizens are working together to keep these chemicals out of Lake Superior.

For more information about this important effort, visit:

dnr.state.wi.us/org/water/greatlakes/lspogram.html

HOW CAN WE HELP?

We can all do our part to keep our water supply clean and safe for humans and wildlife. Remember to:

- Use up personal care products when possible.
- Dispose of leftover pharmaceuticals and personal care products properly. Do not flush them or pour them down the drain. Visit **www4.uwm.edu/shwec/** for a *MedDrop* collection schedule.
- Dispose of chemicals, paints, herbicides, pesticides and other toxins at local Clean Sweep collection sites. For more information, visit: **datcp.state.wi.us/arm/agriculture/pest-fert/pesticides/clean-sweep/index.jsp**
- Avoid products that contain mercury. If you must use these products, recycle or dispose of them properly. To learn about products that may contain mercury, visit: **epa.gov/mercury/consumerinfo.htm**
- Limit the use of chemicals, herbicides, pesticides and other toxins. Consider “green” alternatives. See *Rethinking Yard Care fact sheet* link at: **clean-water.uwex.edu/pubs/home.htm**
- Do not use burn barrels. Burning garbage releases dioxins and other toxins into the air.
- Reduce gasoline consumption. Exhaust fumes are a major source of dioxins (and greenhouse gasses). For more information, visit: **dnr.state.wi.us/environmentprotect/pbt/some.htm**



Catherine A. Khalaf

Trout and other fish accumulate PBTs in their tissues



Greg Behling

POLLUTED RUNOFF: Curbing the problem



WDNR - Bureau of Forestry

Erosion of stream bank in the Lake Superior watershed

Nonpoint source pollution, often called “runoff,” occurs when rainwater or melting snow picks up pollutants in the soil or from the pavement and carries them across land to lakes, rivers or even groundwater. Runoff pollution from farms, urban areas, and construction sites collectively represents the leading cause of water quality problems in Wisconsin.

In the Lake Superior Basin the problems are changes in hydrology leading to changes in channel morphology, stream bank erosion, and loss of critical habitat. In the Lake Michigan Basin, soil and nutrients like

phosphorus and nitrogen wash into the streams and eventually into the lake. Excess nutrients can cause algal blooms in both streams and lakes. Decaying algal mats can deplete streams and bays of needed oxygen and result in fish kills. Urban areas produce their own polluted runoff that can include sediment, nutrients, bacteria and other chemicals such as oil and grease.

Limiting the use of lawn fertilizers as well as yard and household chemicals, conserving water, and slowing the flow of water off the land are actions we can all take to prevent nonpoint source pollution.



City of Menasha

Storm drain stencil, Menasha



© Visualife | Dreamstime.com

RIGHT: Runoff from construction sites can end up in streams and lakes

Building Buffers – The Conservation Reserve Enhancement Program (CREP)

Since 2001, more than 1,600 acres of land in Wisconsin's Great Lakes Basin counties have been enrolled in the Conservation Reserve Enhancement Program. Through this program farmers are paid to put aside land that is adjacent to rivers and streams. These "buffers" are planted with thick native vegetation to filter runoff from agricultural fields. Usually the land used for buffers is marginal agricultural land to begin with and farmers receive a financial incentive for enrolling.

The benefits from the program are many. The program is estimated to reduce annual phosphorus and nitrogen loading by 600,000 and 300,000 pounds a year, respectively, and reduce sediment loading to streams by over 330,000 tons a year. Critical northern pike spawning habitat benefits from lower sediment loads to riparian wetlands. The buffers also provide cover for birds and animals.



Robert Queen

Do you know of stream banks that could benefit from buffers? CREP may be able to help.

For more information, visit:
datcp.state.wi.us/arm/agriculture/land-water/conservation/crep/

HOW CAN WE HELP?

LAKE MICHIGAN

- Install stream buffers and grassed water ways to filter agricultural runoff before it gets into streams.
- Support efforts to increase cost share funds for farmers to install buffers.

LAKE SUPERIOR

- Support stream restoration efforts to correct stream bank erosion.
- Keep stream side buffers intact during logging.
- Support wise land use planning.

URBAN AREAS

- Direct downspouts toward lawns and gardens.
For more information, see "Every Drop Counts" at v2.mmsd.com/HowToHelp.aspx
- Install rain gardens on residential, commercial, and public properties.
- Use pervious pavers for sidewalks, driveways, and parking lots to allow water to infiltrate.
- Include "green" roofs in building designs. Visit greenroofs.org
- Minimize the use of fertilizers and other yard care chemicals.
- Conserve water in your home and in your lawn and garden care.
- Mark storm drains with "Drains to Lake" stencils and keep oil and other chemicals out of drains. *For more information, visit: watermonitoring.uwex.edu/wav/stenciling/index.html*



WDNR

Directing storm water to lawns and gardens reduces runoff



Phillip Billings

COASTAL HEALTH: Bringing back the beaches



Summer Matteson

The endangered piping plover depends on healthy beach habitat

Miles of beautiful Great Lakes beaches are a tremendous recreational asset we can all enjoy. Providing natural swimming opportunities to populous Milwaukee or solitary beach walking opportunities at Wisconsin Point in Superior are just two experiences beaches add to Wisconsin’s quality of life. When our beaches are closed due to high bacteria counts or accumulation of algae, we lose access to Lake Michigan and Lake Superior, we lose tourism dollars, and we lose our connection to these inland seas.

dog waste, goose and seagull droppings and human sewage. Beach closures are often – but not always – connected to large rainfall events and each beach has its own set of issues that create pollution. Beach advisories and closures as well as monitoring data are reported to the public through the Beach Health Website: **wibeaches.us**.



Julie Kinzelman, City of Racine Health Department

Rotting algal mats and bird droppings contribute to bacterial contamination

What causes our beaches to be closed? Pollutants from cities, farms, construction sites, and even nearby parking lots are carried by rain and melting snow into Lake Michigan and Lake Superior tributaries and eventually reach the lakes or even discharge directly into the waters adjacent to beaches. Nutrients that wash off the land can lead to the bloom and eventual die-off and decay of algae which can promote bacterial growth. Bacterial contamination can also come more directly from sources of fecal material including

Where do algal blooms come from? Abundant growth of algae in the nearshore area from improved water clarity (due to water filtering by invasive zebra and quagga mussels) and excessive phosphorus in runoff are key parts of the story that result in stinking, decaying algal mats washing up on many Lake Michigan beaches. To confound the problem, mussels present in these algal mats attract waterfowl such as geese and seagulls whose droppings bring an additional source of bacteria to bathing beaches.

Preventing polluted runoff and improving beach management are the keys to bringing back Wisconsin’s beaches.

“ You can tell all you need to about a society from how it treats animals and beaches.”
—FRANK DEFORD, SPORTSWRITER, AUTHOR AND COMMENTATOR

City of Racine Beach Grooming: Keeping our Beaches Clean

The City of Racine is getting to the bottom of high bacteria levels at its two public beaches. Racine's efforts are paying off with national recognition and more days at the beach for swimmers. Health Department officials with the City of Racine, funded in part by the DNR Office of the Great Lakes, embarked on a 5-year research initiative to identify the possible sources of elevated E-coli levels and determine the role sand plays in harboring this indicator bacteria.

Their research demonstrated that past beach grooming methods acted to increase bacterial presence in wet beach sands. Adjustments to their grooming practices, supplementary drainage and infiltration measures, improved storm water management, and better public education have resulted in a reduced number of beach closings. In 2004, North Beach was named one of only two Great Lakes *Blue Wave Certified Clean Beaches* designated by the Clean Beaches Council of Washington D.C. and has retained that status every year since. In 2007, North Beach along with Sister Bay Beach was voted one of 13 national "Beach Buddies" by the National Resource Defense Council. The City of Racine also received a Governor's Award for Excellence in Environmental Performance in 2008.

Similar efforts are underway at other Lake Michigan and Lake Superior beaches. Do you know what is being done to reduce closures at your beach?

HOW CAN WE HELP?

- Conduct or encourage beach sanitary surveys to identify and eliminate sources of bacterial pollution. Common remedial activities can be as simple as redirecting parking lot runoff or cleaning up after pets.
- Support public education to improve sanitation at beaches.
- Support the development of rapid response methods for monitoring beaches to get more timely results on bacteria levels.
- Reduce phosphorus loads to Wisconsin's waterways. (See the Polluted Runoff section for more information.)
- Enlist volunteers for manual removal of algae and garbage or for mechanical methods with appropriate permits.
- Reduce fertilizer use.
- Improve storm water infiltration with rain gardens and pervious pavers.



Julie Kinzelman, City of Racine Health Department

Julie Kinzelman, City of Racine Health Department

Racine beach



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INFORMATION AND INDICATORS: Tracking Great Lakes changes



Paul Peeters

Collecting physical data on
Lake Michigan



Paul Garrison

Analyzing water samples from
Lake Michigan

The five Great Lakes and the St. Lawrence Seaway function as one huge ecosystem. Their waters, watersheds, estuaries, tributaries, wetlands and groundwater are inextricably connected. To be effectively managed, these vast resources must be treated as one ecosystem. Add to this the fact that management of the Great Lakes is shared between eight states, two Canadian provinces, two federal governments, thirty-nine tribal governments and intertribal organizations, and a multitude of local municipalities and organizations, and you can imagine how critical – and how difficult – data collection and management can be.

We must carefully monitor Lake Michigan and Lake Superior to determine management needs and evaluate current management practices. It is also critical to anticipate and monitor the effects of climate change and other emerging issues that threaten the Great Lakes ecosystem in order to plan for future management.

The Great Lakes ecosystem is far too complex to monitor all its parts. State and federal governments must work together to develop plans for tracking indicators – observable parameters that measure change and may give early warning of ecosystem degradation or improvement. They must also track who is collecting data, how, when and where the data is collected, and how it is analyzed, stored and shared.

When it comes to data collection and management, the “left hand must know what the right hand is doing.” The concept may be simple, but the Great Lakes ecosystem is vast and diverse and the management is complicated. Significant funding and cooperative effort are needed to monitor our unique and valuable Great Lakes ecosystem.

“Problems cannot be solved at the same level of awareness that created them.” —ALBERT EINSTEIN

Wisconsin and the National Monitoring Network

Many federal, state, and local agencies are involved in Great Lakes monitoring. Following is an overview of some of these monitoring efforts and the groups involved.

MONITORING LAKE INPUT SOURCES:

Rivers: Great Lakes States collect water quality data on tributaries for nutrients and toxics. The U.S. Geological Survey (USGS) also collects water quality data and works in cooperation with the Milwaukee Metropolitan Sewerage District (MMSD), Fox-Wolf Watershed Alliance, Green Bay Metropolitan Sewerage District, universities, and the Oneida tribe in the watersheds draining into Green Bay.

Atmospheric Deposition: Precipitation samples are collected and analyzed for total and methyl mercury. Sampling is done mainly by state agencies, but federal agencies and universities also participate. One station on the shore of Lake Michigan in Milwaukee and one at the mouth of the Brule River on the shore of Lake Superior are part of the Mercury Deposition Network (MDN) where long term mercury deposition data is collected. Inland locations are also monitored.

For more information, visit: nadp.sws.uiuc.edu/sites/sitemap.asp?net=mdn&state=wi

Groundwater discharge: A groundwater flow model for southeastern Wisconsin provides information on the relationship between groundwater and the Great Lakes. The model was developed under the guidance of the Southeast Regional Planning Commission, the USGS and the Wisconsin Geological and Natural History Survey. Many municipalities were also involved. The USGS Great Lakes Water Availability and Use Pilot Study continues to develop the groundwater flow model for Lake Michigan and the other Great Lakes. The goal of this study is to improve the ability to forecast water availability for future economic and environmental needs.

MONITORING RECEIVING WATERS:

Wetlands: The Great Lakes Consortium is developing a set of indicators and metrics to assess the overall status and trends of Great Lakes coastal wetlands. An inventory and classification system was developed in 2004. Together, these will form the basis of a long-term monitoring plan.

Beaches: The DNR provides grants to coastal counties to monitor bacteria on Lake Michigan and Lake Superior beaches. The Great Lakes Beach Association helps to coordinate monitoring and research efforts conducted at hundreds of locations throughout Lake Michigan.

Nearshore waters: The DNR, in conjunction with the UW-Milwaukee Water Institute, has monitored algae and nutrients in water within one mile of the shore where nuisance algal mats have degraded beaches.

Offshore lake waters: The USGS, EPA, NOAA, and universities conduct monitoring and research in the open waters of the Great Lakes. Under the EPA-Great Lakes National Program Office's offshore water quality surveys, samples are collected from multiple sites in the Lake Michigan basin to ensure that sampling activities are representative of lake conditions. In addition, the Great Lakes Observing System provides wide community access to real-time and historic data on the hydrology, biology, chemistry, geology and cultural resources of the Great Lakes.

Bays and Areas of Concern (AOCs): The DNR and EPA's Great Lakes National Program Office (GLNPO) monitor Great Lakes Areas of Concern to assess the effectiveness of remediation activities.



Frank Kosiere

HOW CAN WE HELP?

- Support funding for Great Lakes monitoring efforts.
- Support local monitoring of Great Lakes streams and wetlands.
- Become a citizen water monitoring volunteer. For more information, visit: <http://watermonitoring.uwex.edu/>
- Watch for and report changes in the Great Lakes ecosystem in your area.

SUSTAINABILITY: Living in harmony with nature



Enjoying a Lake Superior sunset

Jeremy TePaske

People love to be on or near the water. This love translates into rapidly escalating land values for waterfront property for both new development and redevelopment projects, plus conflicting land use pressures for the available land. Given this trend, how do we incorporate the concept of sustainable development practices into current activities?

Sustainability can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their needs.

Sustainable development cuts across many areas in our lives. How we use and develop land, our agriculture and forestry practices, our transportation mechanisms, how our industries make products, how we use water, and the ways we enjoy our natural resources must be considered.

With an increasing population, we simply cannot continue our current land use trends. We must change our habits. With this in mind, Wisconsin's Smart Growth

Initiative was enacted. As the State's first attempt to curb urban sprawl and promote better land use, Smart Growth offers financial incentives to municipalities and counties to develop sustainable land use plans. Since it was enacted in 1998 a number of Wisconsin communities have taken the Initiative to a higher level to become "eco-municipalities." Five of the eleven eco-municipalities – the cities of Washburn, Ashland and Bayfield, the town of Bayfield, and Douglas County – are in the Great Lakes Basin.

Efforts are also underway at the local level to redevelop many Lake Michigan and Lake Superior waterfronts. Such sustainable development has brought economic value to many areas by providing outdoor recreational opportunities such as boating, hiking, biking and wildlife viewing opportunities, as well as decreased nonpoint source runoff which improves water quality.



Pier Wisconsin, Milwaukee

Shelli Pfeiffer

"When my parents were growing up the world's population was under three billion. During my children's lifetime, it is likely to exceed nine billion. You don't need to be an expert to realize that sustainable development is going to become the greatest challenge we face this century." —TONY BLAIR, MARCH 2001

City of Ashland's Waterfront Redevelopment

A waterfront redevelopment project is breathing new life into the remnants of Ashland's grand mining and shipping past. Ashland became a boomtown in the 1890's as it developed into a major shipping port and railway center. Ships and railroads transported wood from the area's sawmills and planemills, iron ore, rock from quarries, brick from the brickyards and goods made in a variety of factories.

As industry declined, the once busy waterfront fell into quiet disrepair. In 1992, the area's wastewater treatment plant joined the waterfront's abandoned buildings. With an emphasis on sustainability, this waterfront area will be transformed into a vibrant lakeshore amenity.

Extending 1200 feet into Lake Superior, the Reiss Coal Dock area is planned to be converted into festival grounds and a perimeter bay-walk. Its deep water port will be upgraded for cruise ships. On the east side of the city's shoreline, the community is engaged in a redevelopment process for the Clarkson Dock area, which has been vacant for 30 years. Clarkson Dock will become a recreational area which will include an RV park and a link to the Bay City Creek Estuary Preserve.

At the heart of Ashland's waterfront, a cooperative effort is underway to clean-up the Ashland Northern States Power Lakefront Superfund Site, restore the natural environment, and redevelop the area into an extended marina including two sailing beaches with supporting facilities for community and education activities.

Closed since 1965, the historic Soo Line Ore Dock is a monolithic concrete and steel structure over 80 feet high and extending 1800 feet into the lake. Once a rail-to-ship transfer station for iron ore, this structure is part of Ashland's rich past and is eligible for listing on the National Register of Historic Places. Working with Canadian National (the property owner who is moving toward demolition of the structure), the City has been engaged in efforts to acquire the dock and utilize adaptive re-use strategies to transform the industrial structure into the *Soo Line Ore Dock Public Heritage Park*. The park would become a tourist destination celebrating Ashland's industrial past and Lake

Courtesy of the Ashland Historical Museum



Superior's international role. The massive base of the dock would allow for a visual interpretive center of the shipping and mining industries

and would be surrounded by a city park/fishing pier. The dock would also provide protected dockage for local, transient and tourism vessels, which would increase the park's use and further the region's heritage tourism goals.

Tying into Ashland's Historic Downtown District, a public plaza is scheduled for construction in 2009, which, adjacent to U.S. Highway 2, will provide connectivity to the historic downtown district and the waterfront through a pedestrian underpass. This public space and a network of trails will provide linkages between Ashland's built environment, and the natural shoreline of Lake Superior.

Ashland's thoughtful redevelopment plan will transform this valuable area into a vibrant, sustainable waterfront.



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HOW CAN WE HELP?

- Support sustainable land use.
- Buy locally-grown food or grow your own produce.
- Save energy and water at home, work and school and when travelling.
- Practice "green" lawn and garden care.

For more information, visit: dnr.wi.gov/air/pubinfo/educ/talladdsup.htm



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Like all parts of the Great Lakes ecosystem, we are linked to this great resource. The Great Lakes sustain our region. They influence our quality of life, our health and our economy. In turn, our activities greatly influence the health of Wisconsin's Great Lakes and of the entire Great Lakes ecosystem – for better or worse. By taking coordinated actions now, we can reverse or arrest negative impacts and ensure that our children's children will be able to enjoy this national treasure.

The Wisconsin Great Lakes Strategy is our road map to protecting Lake Superior and restoring Lake Michigan. From the simplest home and yard care practices, to the most complicated and far-reaching legislation, we can all make a difference for our Great Lakes.

To find out more about the Wisconsin Great Lakes Strategy and how you can be involved, please visit:

WI Great Lakes Strategy:

dnr.wi.gov/org/water/greatlakes/wistrategy/

WI DNR Office of the Great Lakes:

dnr.state.wi.us/org/water/greatlakes/



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