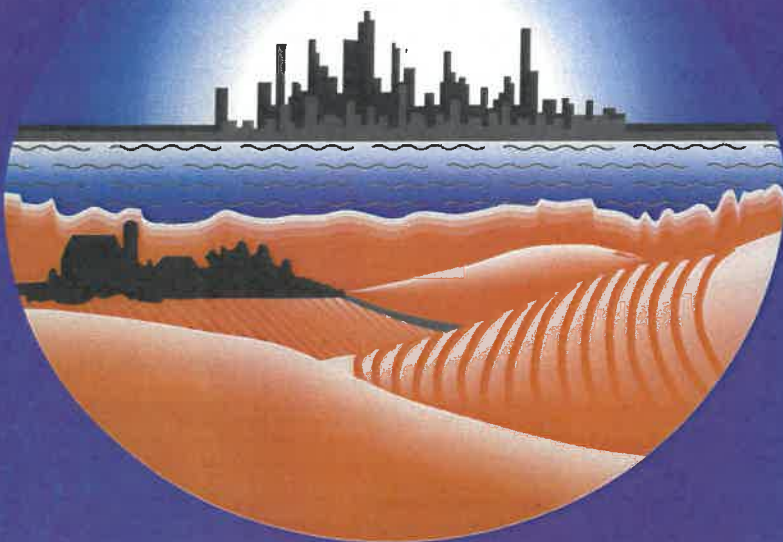


# KEEPING IT ON THE LAND!

Improving Great Lakes  
Water Quality  
by Controlling Soil Erosion  
and Sedimentation



## To the Reader

*Soil erosion and sedimentation contribute to Great Lakes pollution and compromise the Basin's environmental health, economic productivity and quality of life. These problems originate in both rural and urban areas and their impacts are pervasive. Responsible land-use management is critical to improving and protecting Great Lakes water quality. Every sector of society and every individual must participate in these stewardship efforts.*

*This brochure highlights soil erosion and sedimentation problems in the Great Lakes Basin; examines the environmental and economic implications; reviews current programs; and identifies agencies and organizations that can provide advice and assistance. It will be of interest to farmers, shoreline property owners, developers, resource managers, local officials and all citizens concerned with protecting the Basin's precious water and land resources.*

*In offering this information to you, we hope that it will not only inform and educate, but foster and promote action as well. Protecting water quality through proper land-use is everyone's responsibility and your help is needed!*

— Great Lakes Commission

## PROTECTING A VALUABLE RESOURCE

The water and land resources in the binational Great Lakes Basin are a valuable environmental and economic resource to not only the Great Lakes region, but all of North America. These resources support a multi-billion dollar recreation/tourism industry; supply 40 million people with drinking water; provide habitat for thousands of fish and wildlife species; offer various transportation opportunities and support diverse agricultural production - a major contributor to the region's economy. The Basin serves as home to 15 percent of the U.S. population and 60 percent of the Canadian population.

Soil erosion and sedimentation pose a risk to the environmental and economic assets of the Great Lakes. Erosion, caused by detachment of soil particles by rain, wind and other forces, robs land of its productivity. Sedimentation occurs when the eroded soil is deposited by runoff into rivers, harbors and lakes. Sediment deposition not only degrades water quality, but also compromises the resource's environmental value, limits its uses and incurs significant infrastructure costs. Some of these costs are related to increased dredging, additional water treatment and the maintenance of stream channels and roadside ditches.

Soil erosion and sedimentation are natural processes, but can be accelerated or slowed by how humans use the land. When rural and urban land-use and development activities in the Great Lakes Basin are not pursued responsibly, the processes can be greatly accelerated. Intensive agricultural production, timber harvesting, mining, construction and other land disturbing activities greatly increase the impact of erosion and sedimentation on Great Lakes waters.

The physical impact of soil erosion and sedimentation is further magnified when rural and urban land runoff carries with it other contaminants such as oxygen demanding organic waste, phosphorus and nitrogen, toxic chemicals from manufacturing and industrial processes, pesticide and herbicide residues and heavy metals. Many of these pollutants are transported by sediment to the Great Lakes, their tributaries and other bodies of water in the Basin.



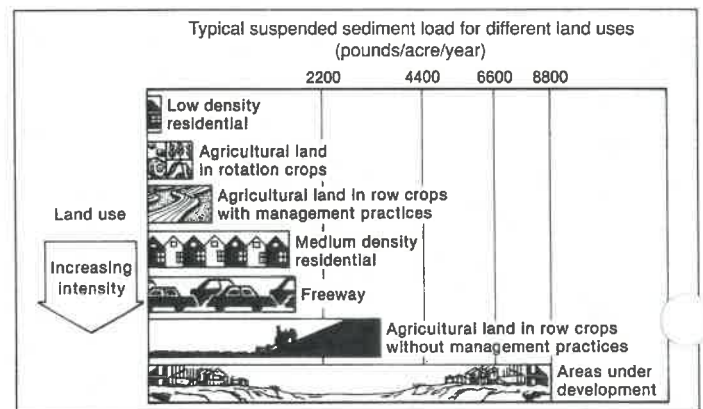
Sediment plume in Sandusky Bay, Ohio. Credit: Heidelberg College

Soil erosion and sedimentation are major sources of nonpoint source pollution, which is classified as pollution of diffuse origin. Examples include contaminated groundwater, polluted runoff and contaminated sediments deposited in harbors.

Erosion and sedimentation must be reduced to protect the environmental and economic assets of the Great Lakes. This can be accomplished by the adoption of responsible land-use practices in both rural and urban areas of the Basin. Some of these practices include conservation tillage, vegetative and woodland cover in erosion-prone areas, filter strips, sediment detention ponds and erosion control measures on construction sites.



Agricultural runoff. Credit: Wisconsin DNR



Typical sediment load. Credit: Wisconsin DNR



## WHO'S AT RISK? WHAT'S AT RISK?

We're all at risk when the quality of our water and productivity of our land are compromised by excessive soil erosion and sedimentation. For example, if you are a farmer, soil erosion washes away valuable topsoil and nutrients. If you are a port director, sediment in harbors incurs high dredging and associated disposal costs. If you are a shoreline property owner, erosion and sedimentation cause property damage, flooding expenses and costly drainage system problems. *Our entire ecosystem is at risk!*

### Environmental Impacts of Soil Erosion and Sedimentation

- Water quality is degraded by increased levels of sediments and nutrients that drain into the Great Lakes. These conditions can cause prolific weed growth, decreased oxygen levels, changes in species of aquatic plants and animals and even fish kills.

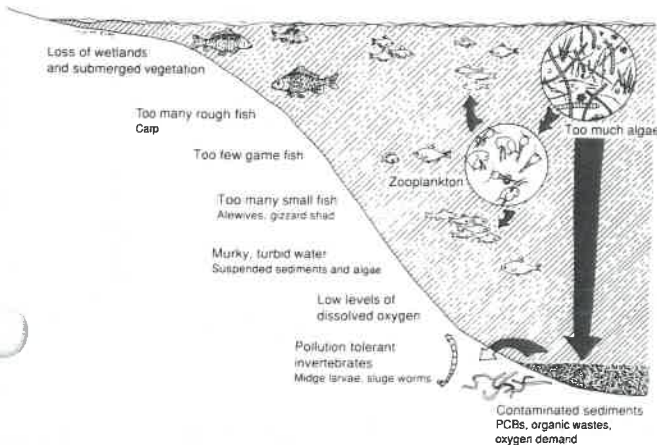
#### OHIO

##### Sediment and Phosphorus Loading into Lake Erie

Lake Erie is subject to the most intensive agricultural land-use in the Great Lakes Basin. Erosion from Ohio's row crop fields has historically been a rich source of sediments and nutrients to the shallow waters of Lake Erie. The water quality impacts have been severe, including extensive algae blooms, accumulation of organic debris, reduced oxygen levels, loss of fish and wildlife habitat and introduction of toxic chemicals into the ecosystem.

Erosion control and fertilizer management programs have made a difference! Water quality studies show significant reductions in sediment and phosphorus loading into major Lake Erie tributaries. Further control of soil erosion and phosphorus loading in Lake Erie Basin is a good investment in improving the lake's water quality.

- Streambank vegetation is uprooted and streambanks collapse when the runoff increases in



Habitat degradation. Credit: Jim McEvoy, Wisconsin DNR



Tributary of Fox River impacted by cattle grazing and accelerated erosion. Credit: Brown County Land Conservation District (WI)

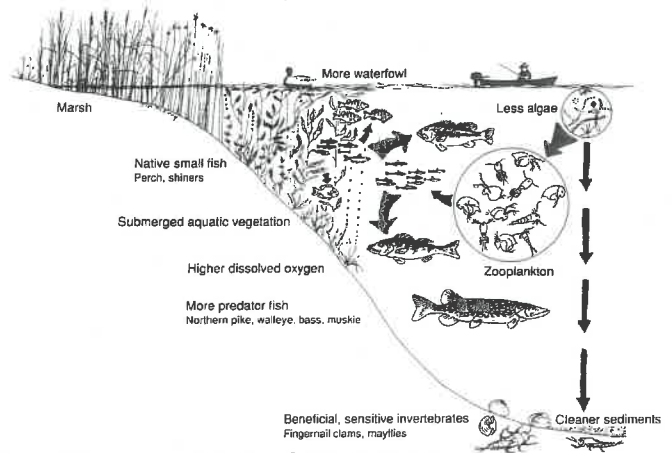
#### WISCONSIN

##### Streambank Erosion Degrades the Water Quality of Fox River and Green Bay

When pasturing cattle remove vegetative cover from the streambanks, natural erosion takes an accelerated pace. This impact is illustrated by a tributary of the Fox River which delivers 400 tons of sediment into Green Bay each year. Now the river is 75 feet in width, where 5-10 years ago a local landowner recalls jumping across the stream – an indication of how erosive forces have changed the stream profile over the years.

volume and velocity due to erosion and sedimentation problems.

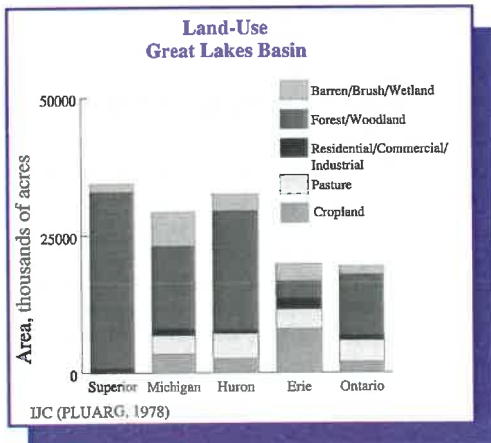
- Fish habitat is destroyed when sediment fills air spaces between rocks and gravel of the streambed. Sedimentation smothers fish eggs and other aquatic animals, such as worms and clams, that play an important role in the food chain.
- Toxic contamination is introduced when sediment-laden runoff transports chemicals, such as pesticides and herbicides, from land into Great Lakes waters.
- Adverse health effects on fish and wildlife result from bioaccumulation of toxic chemicals in the food chain.
- The aesthetics of Great Lakes resources are compromised by the damaging effects of soil erosion and sedimentation.



Desired future state of habitat. Credit: Jim McEvoy

# The Water Quality/Land-Use Connection in the Great Lakes Basin

**T**he water and related land resources in the Great Lakes Basin form a single, interconnected ecosystem. Despite the large volume of the Great Lakes, their waters are particularly vulnerable to pollution. Soil erosion and sedimentation, resulting from both rural and urban land-use activities in the Great Lakes Basin, can significantly impair water quality.

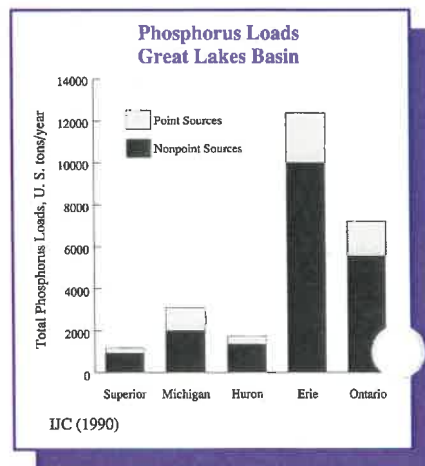
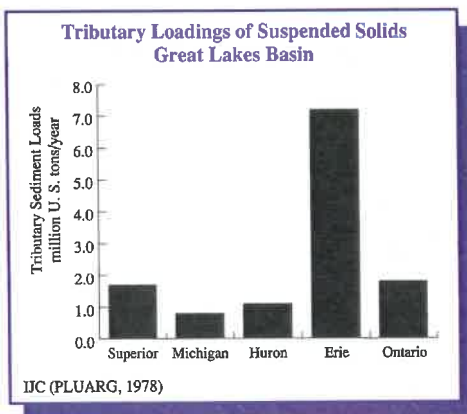
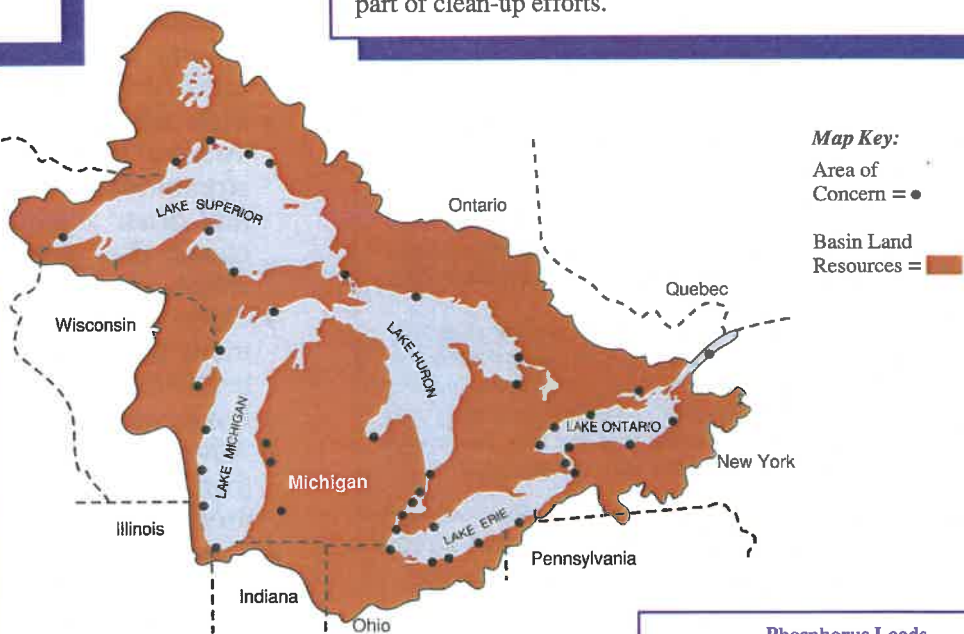


### Contaminated Sediments in Great Lakes Areas of Concern

Great Lakes waters are highly polluted in the 43 Areas of Concern designated as toxic "hot spots" by the International Joint Commission (see map). Sediments that erode from upland areas and drain into the Great Lakes act as a sink for toxics in their path. Contaminated sediments are a problem in 42 of the 43 Areas of Concern. Responsible land-use management in both rural and urban areas will be a critical part of clean-up efforts.

### Water Quality Along Great Lakes Shoreline Threatened

Water quality along virtually the entire U.S. shoreline of the Great Lakes is degraded or threatened by degradation, according to state water quality assessment reports submitted to the U.S. EPA. Recreational opportunities, fish and wildlife habitat and fish consumption are among the threatened uses of shoreline waters. Soil erosion and sedimentation contribute to water quality degradation that impairs these uses.





## Economic Impacts of Soil Erosion and Sedimentation

Agricultural productivity is reduced as 606 million tons of topsoil erode from cropland in the Great Lakes states each year, a loss of nutrients valued at over \$3 billion annually.

- Swimming opportunities and other water-based recreational opportunities are impaired by increased sediment and nutrient loading that often cause weed growth and high bacteria counts.

### MICHIGAN

#### Sedimentation and Nutrient Enrichment in Saginaw Bay

*Soil erosion and sedimentation takes its toll on Michigan's Saginaw Bay, where the high level of agricultural activity in the Bay's watershed releases heavy loads of soil, fertilizer and pesticides into tributaries that flow into Lake Huron. Nutrient enrichment causes high levels of weed growth along the Saginaw Bay shoreline and near-shore zones. The organic debris produced from weed growth is unsightly and its decomposition produces unpleasant odors. Often washed ashore during storm events, the debris limits the use of beaches and its periodic removal adds to costs of swimming area maintenance.*

- A multi-billion dollar sport and commercial fishing industry is threatened by the effects of soil erosion and sedimentation.

Dredging of sediment from recreational and commercial harbors of the Great Lakes costs the public tens of millions of dollars annually. Disposal of the spoils is another huge expense of dredging operations, particularly in cases involving contaminated sediments.

- Flooding costs increase when erosion impacts reduce the capacity of the watershed to absorb flood waters.
- Maintenance costs increase for water treatment and drainage systems, and ditch and road operations that are impaired by the effects of sedimentation.

### MINNESOTA

#### Construction Site Runoff Contributes to Dredging Costs in Duluth-Superior Harbor

*A Duluth golf course under construction was the source of severe erosion in May, 1989 during a torrential downpour. In a span of 20 minutes, two inches of rain eroded 10,000 tons of soil -- enough to cover one acre, five feet deep -- from the barren golf course into Lake Superior!*

*Sedimentation in the Duluth-Superior harbor increases the need for dredging to maintain navigation. Each year about 150,000 cubic yards of sediment are dredged from the harbor, costing \$7 per cubic yard. Dredging costs increase if sediment contains a high level of contaminants, requiring disposal in a confined disposal facility.*

## TAKING ACTION TO PREVENT SOIL EROSION AND SEDIMENTATION IN THE GREAT LAKES BASIN



Farmers observing dredging operations in Maumee Bay, Ohio.  
Credit: Seneca Soil and Water Conservation District (OH)

A partnership approach is now emerging throughout the Great Lakes Basin to solve its land and water resource problems. Government agencies at all levels are working with landowners to preserve and protect these valuable assets. Progress is being made in the control soil erosion and sedimentation, however, much more needs to be done!

### INDIANA

#### Lost Opportunities for Recreational Boating in Michigan City Harbor

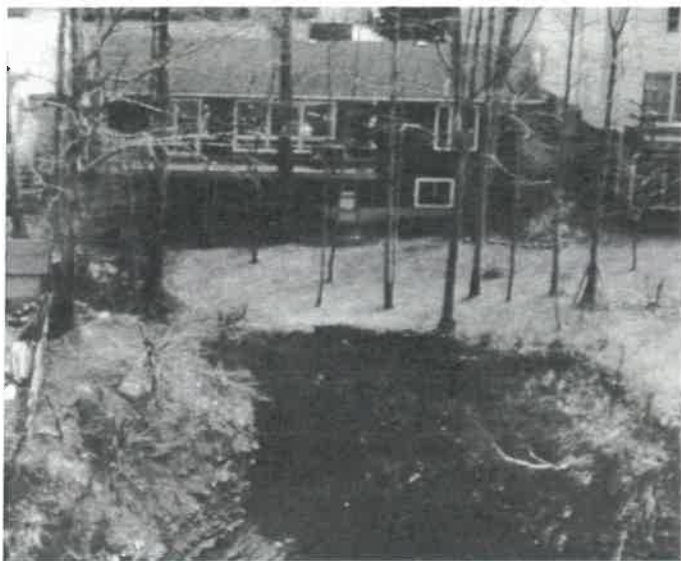
*Sedimentation due to agricultural and urban runoff has left the channel of Trail Creek, a tributary to Lake Michigan at Michigan City, Indiana, so shallow that many recreational boats cannot navigate the waterway. Lack of funds has prevented dredging of the channel. The problem has cost the city and private marinas at least \$250,000 in lost revenue for the 1992 boating season. The costs will be significantly greater if boaters decide to permanently leave the harbor's marina facilities.*

**Here's a sampling of what is currently being addressed by existing programs and agencies.**

At the federal level, agencies such as the U.S. Department of Agriculture's Soil Conservation Service (SCS) and the Agricultural Stabilization and Conservation Service (ASCS) are responsible for reducing soil erosion and sedimentation problems. SCS provides technical assistance to farmers through emphasis on voluntary landowner actions, application of best management practices and compliance with state water quality standards. ASCS provides financial support to farmers to control erosion and sedimentation problems through the administration of federal agricultural programs.

Also, the U.S. Environmental Protection Agency manages a federal **Nonpoint Source Program**, under Section 319 of the Clean Water Act. The program calls for states to assess water quality problems caused by nonpoint source pollution, such as soil erosion and sedimentation, and to develop management programs to solve these problems. Section 319 authorizes matching grants for the implementation of approved nonpoint source management programs.

At the state level, various **nonpoint source programs** and **soil erosion control programs** have been established to identify and control soil erosion and other nonpoint source pollution problems. The programs in the Great Lakes States have components that address erosion and sedimentation problems, including water quality impacts. Best management practices coupled with technical, educational and cost-share support are common mechanisms used by these state programs which are primarily based on voluntary participation.



Bluff recession threatens shoreline property. Credit: Pennsylvania DER

#### PENNSYLVANIA Bluff Recession and Water Quality Degradation

*Bluff recession is a severe erosion and water quality problem occurring along the Pennsylvania shoreline of Lake Erie. The bluffs are composed primarily of erodible layers of clay, silt, sand and gravel. Bluff recession occurs when these materials are exposed to wave action, groundwater seepage and surface erosion caused by rain, wind and runoff. The water quality of Lake Erie is degraded by the sedimentation of eroded bluff material. This erosion/sedimentation problem is accelerated when shoreline property owners cut down trees and vegetation on their land.*

*The Erie County Conservation District provides advice to property owners on actions that can help solve bluff recession problems. The advice is based on an evaluation of the physical setting of the property and the causes and mitigation of bluff recession.*

At the local level, **soil and water conservation districts** provide technical assistance to farmers and other land resource users in implementing land management practices that control soil erosion and protect water quality from the impacts of sedimentation. There are 207 county conservation districts in the Great Lakes Basin.

The binational **Great Lakes Water Quality Agreement** between the U.S. and Canada sets guidelines for reducing point and nonpoint source discharges into the Great Lakes. Among other goals, the Agreement: (a) calls for each country to designate **Areas of Concern (AOCs)** and develop **Remedial Action Plans (RAPs)** where persistent water pollution is impairing the area's ability to support aquatic life or sustain beneficial water uses; (b) establishes phosphorus load reduction targets to minimize water quality impacts in the lakes; and (c) provides guidelines for the reduction of nonpoint source pollution from land-use activities.



Silt fence: construction site erosion control measure. Credit: University of Wisconsin-Extension

*While existing programs are making progress in addressing nonpoint source pollution, there is a definite lack of focus on the problem of soil erosion and sedimentation and its impact on Great Lakes water quality. According to the recommendations of the Great Lakes Commission regional Soil Erosion and Sedimentation Task Force, the following action is needed to solve the problem more effectively:*

- *Provide priority funding for soil erosion and sedimentation problems and their water quality impacts.*
- *Expand eligibility of federal cost-share support to farmland causing water quality problems rather than limiting these opportunities to farms with higher erosion rates.*
- *Target technical assistance beyond on-site productivity impacts to include off-site impacts, namely, Great Lakes water quality.*
- *Develop innovative programs to promote more responsible land-use management by all sectors of the public.*
- *Establish a federal/state partnership targeted specifically at soil erosion and sedimentation problems.*



## NEW DIRECTIONS IN EROSION AND SEDIMENT CONTROL

The Great Lakes Basin Program for Soil Erosion and Sediment Control (GLBP), established in 1990, is a federal/state program with the specific goal to protect and improve Great Lakes water quality by controlling erosion and sedimentation. The GLBP is also committed to limiting the input of nutrients and toxic contaminants and minimizing the off-site damages to harbors, streams, fish and wildlife habitat, recreational facilities and the Basin's system of public works.

### ILLINOIS

#### Streambank Erosion in Parks Along Waukegan River

*Streambank erosion is destroying park lands and bridges and endangering sewer lines along the Waukegan River which flows into Lake Michigan about 35 miles north of Chicago. With the expansion of commercial construction and residential housing development in the watershed, the increase in nonporous surface area has caused a sharp rise in flood water velocity -- a primary force in channel erosion.*

*To prevent further infrastructure costs and water quality degradation, federal, state and local officials are working together in restoring the Waukegan River. Bioengineering techniques have combined the introduction of gamefish habitat with the willow and dogwood revegetation of eroding banks.*

The GLBP is coordinated by the Great Lakes Commission, the U.S. Environmental Protection Agency-Region V and the Soil Conservation Service. The Task Force, with representation from federal and state agencies and regional organizations, plays an advisory role.

To effectively promote program goals, the GLBP is pursuing special legislative recognition for water quality problems associated with erosion and sedimentation. Other program objectives include:

- *To better coordinate efforts, roles and initiatives between government agencies in the Great Lakes Basin;*
- *To support the development and implementation of the erosion and sedimentation components of Remedial Action Plans under terms of the U.S.-Canada Great Lakes Water Quality Agreement;*
- *To build coalitions and networks to inform and educate all sectors of Great Lakes interest groups on common interests and goals; and*
- *To protect and enhance the region's water quality for the benefit of all environmental and economic interests.*

One mechanism being used to implement the GLBP includes a grants program to Basin jurisdictions providing support for: 1) programs and technical assistance; 2) demonstrations; 3) special projects; 4) evaluation and monitoring; and 5) education and information.

### NEW YORK

#### Using Pollution Prevention to Control Agricultural Runoff into the Buffalo River

*The water quality of the Buffalo River is threatened by sediments, nutrients and pesticides produced from agricultural activities in the river's watershed. Water quality degradation impacts both the river's fishery and navigational activities. Low dissolved oxygen and a lack of shallow vegetated areas allow pollution-tolerant fish, such as bullhead and carp, to replace pollution-sensitive fish, such as walleye and bass. Navigation is impaired by the high costs of dredging and disposing of contaminated sediments, and the danger of resuspending toxic substances during the dredging process. Erie County is now implementing a pollution prevention program\* to control the agricultural runoff that is polluting the Buffalo River.*

\* A funded project of the Great Lakes Basin Program.

The GLBP for Soil Erosion and Sediment Control became reality in 1990, when the U.S. Congress appropriated one million dollars in start-up funds. Efforts to ensure long-term federal funding for the GLBP continue to be a valuable investment for the region and the nation.

## WHERE DO WE GO FROM HERE? WHAT MUST BE DONE ON A BASIN-WIDE LEVEL?

The Great Lakes Commission, an interstate agency of the eight Great Lakes States, believes that combatting soil erosion and sedimentation problems is a key element in the battle to improve Great Lakes water quality. The Commission recommends the following strategy to win this battle.

- **FUNDING:** Generate congressional support for increased federal funding for the GLBP -- a prerequisite for the long-term financial and technical assistance needed to solve the erosion and sedimentation problems in the region.
- **POLLUTION PREVENTION:** Prevent soil erosion and sedimentation problems at the source, to avoid the costly economic and environmental impacts.
- **PROGRAM COORDINATION:** Strengthen coordination of existing programs to focus more financial/technical support on soil erosion and sediment control and on water quality protection.
- **INFORMATION/EDUCATION PROGRAM:** Develop strong outreach programs for the GLBP to inform and educate Basin residents of the soil erosion and sedimentation problems and encourage adoption of best management practices that will prevent this type of pollution.
- **LOCAL SUPPORT:** Maintain and strengthen local support provided by conservation districts to assist rural and urban landowners in the control of soil erosion and sedimentation.

## WHAT CAN YOU DO AS A BASIN RESIDENT?

If you are a farmer, shoreline property owner, developer, resource manager, local official or concerned citizen – there is something you can do to help!

- If you are a farmer, contact your local conservation program for information on soil erosion control and water quality protection programs.
- If you are a shoreline property owner, seek advice on proper land-use practices that reduce soil erosion and bluff recession on your property.
- If you are a developer, make sure that proper measures are taken to prevent construction site erosion.
- If you are a resource manager, be informed on how to apply existing programming to control soil erosion and sedimentation and protect water quality.
- If you are a local official, ensure that local zoning and construction site erosion ordinances are adequate.
- All citizens should inform their local elected officials about their concern over the costly environmental and economic impacts caused by soil erosion and sedimentation.

### ACKNOWLEDGEMENTS

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*Michael J. Donahue, Ph. D.  
Executive Director*

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## For Further Information

A multitude of local, state, federal and regional agencies can help you address soil erosion and sedimentation problems. Please use the following list (drawn from the membership of the Great Lakes Commission's Soil Erosion and Sedimentation Task Force) for initial contacts. They can refer you to other resources as necessary. For local contacts, you may wish to consult your local soil and water conservation district.

### STATE

#### ILLINOIS

Bureau of Soil Conservation  
Illinois Department of Agriculture  
State Fairgrounds  
Springfield, IL 62794-9281  
(217) 782-6297

#### INDIANA

Division of Soil Conservation  
Indiana Department of Natural Resources  
1147 FLX 1 Purdue University  
West Lafayette, IN 47907-1147  
(317) 494-8383

#### MICHIGAN

Office of Policy and Program Development  
Michigan Department of Natural Resources  
P.O. Box 30028  
Lansing, MI 48909  
(517) 373-3588

#### MINNESOTA

Minnesota Board of Water and Soil Resources  
394 S. Lake Avenue-Room 403  
Duluth, MN 55802  
(218) 723-4752

#### NEW YORK

Bureau of Water Quality Management  
NYS Department of Environmental Conservation – Division of Water  
50 Wolf Road  
Albany, NY 12233-3508  
(518) 457-3656

#### OHIO

Division of Soil and Water Conservation  
Ohio Department of Natural Resources  
Fountain Square, Building E  
Columbus, Ohio 43224  
(614) 265-6619

#### PENNSYLVANIA

Bureau of Soil and Water Conservation  
Pennsylvania Department of Environmental Resources  
P.O. Box 8555  
Harrisburg, PA 17105-8555  
(717) 540-5080

#### WISCONSIN

Nonpoint Source and Land Management Section  
Wisconsin Department of Natural Resources  
P.O. Box 7921  
Madison, WI 53707  
(608) 266-9254

#### FEDERAL

USDA Soil Conservation Service  
1405 S. Harrison Road, Room 101  
East Lansing, MI 48823  
(517) 337-6702

U.S. Environmental Protection Agency - Region V  
WQW-163  
Watershed Management Unit  
77 West Jackson  
Chicago, IL 60604

#### REGIONAL

National Association of Conservation Districts (NACD)  
1052 Main Street  
Stevens Point, WI 54481-2895  
(715) 341-1022

Conservation Technology Information Center (CTIC)  
1220 Potter Drive, Room 170  
Purdue Research Park  
West Lafayette, IN 47906-1383  
(317) 494-9555

Great Lakes Commission  
The Argus II Building  
400 Fourth Street  
Ann Arbor, MI 48103-4816  
(313) 665-9135

The Great Lakes Commission is an eight state compact agency that guides, protects and advances the common interests of its membership in areas of regional environmental quality, resource management and economic development.

Established in 1955 by the Great Lakes Basin Compact and founded in state and federal law, the Commission is comprised of state officials, legislators and Governor's appointees. Its research, policy development and advocacy activities are unique to the region and dedicated to securing a strong economy, clean environment and high quality of life for the Great Lakes region and its citizenry.