Appendix U: Management Brochures

Wetland Conservation

Indiana identifies nonpoint source (NPS) pollution as the state's leading source of surface water and ground water quality impairment. A wetland, a land area where water saturation is the dominant factor, can help prevent NPS pollution from degrading water quality.

Acting like a coffee filter, wetlands intercept runoff and capture NPS pollutants. Wetland vegetation helps keep stream channels intact by reducing the velocity of runoff thus reducing stream bank erosion during periods of high flow. Wetland vegetation also reduces stream temperature by providing streamside shading.

Data recorded from the 1981 National Wetlands Inventory, shows Indiana's Lake Michigan coastal region contains approximately 7,240 wetlands covering more than 11 percent of the total coastal land area.

However, development or excessive pollutant loads can damage wetlands. Once degraded, a damaged wetland cannot provide the same water quality benefits and often becomes a significant source of NPS pollution. For example, excessive amounts of decaying wetland vegetation can reduce the amount of available dissolved oxygen for fish and other aquatic life. In addition, degraded wetlands also release stored nutrients and other chemicals into surface water and ground water.

Three management strategies can be used to maintain water quality benefits provided by wetlands and riparian areas:

- preservation of existing wetlands
- restoration
- construction of engineered systems

Riparian areas, or stream corridors are defined as vegetated ecosystems along a water body through which water and materials pass. Characteristically, riparian areas have high water tables and are subject to periodic natural flooding.

Wetland Preservation

As the first of three strategies, wetland preservation protects the full range of wetland functions by discouraging development activity in and around wetlands. Simultaneously, this strategy encourages proper management of upstream activities, including agriculture, forestry, and urban development.

Wetland and Riparian Restoration

The second strategy, wetland and riparian restoration, promotes the restoration of degraded wetlands and riparian areas with NPS pollution control potential. Wetlands that have been filled and drained retain their characteristic soil and hydrology, allowing their natural functions to be reclaimed. Restoration is a complex process that requires planning, implementation, monitoring, and management. It involves renewing natural and historical wetlands that have been lost or degraded and reclaiming their functions and values as vital ecosystems.

Wetland and riparian restoration activities which factor in ecological principles include replanting degraded wetlands with native plant species and constructing structural devices to control water flows.

Construction of Engineered Systems

The third strategy recommended promotes the use of engineered vegetated treatment systems (VTS). Designed to remove suspended sediments from NPS pollution before the runoff reaches a natural wetland, VTS have proved especially effective in the restoration of degraded wetlands.

One example of a VTS is the vegetated filter strip. A vegetated filter strip is a swath of land planted with grasses and trees to intercept uniform sheet flows of runoff before reaching a wetland. Vegetated filter strips are most effective at sediment removal, with removal rates usually greater than 70 percent.

Another type of VTS, constructed wetlands is an engineered complex of water, plants, and animals that simulate naturally occurring wetlands. Studies indicate that constructed wetlands can achieve sediment removal rates greater than 90 percent. Like vegetated filter strips, constructed wetlands offer an alternative to other systems that are more structural in design.

Healthy wetlands benefit plants, animals, and humans because they protect many different natural resources, only one of which is clean water. Unfortunately, an estimated 85 percent of wetlands in Indiana were lost between the late 1700's and the mid 1980's, and undisturbed wetlands still face threats today. To help prevent NPS pollution from further degrading Indiana's waters, and to protect many other State natural resources, wetlands protection must remain a focal point for Indiana education campaigns, watershed protection plans, and community conservation efforts.

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INDIANA LAKE MICHIGAN COASTAL PROGRAM

Urban Conservation

Did you know that impervious surfaces such as pavement and rooftops of a typical city block generates nine times more runoff than a woodland area of the same size? In contrast, the porous and varied terrain of natural landscapes like forests, wetlands, and grasslands trap precipitation and allow it to slowly filter into the ground.

Increased Runoff: While the installation of storm sewer systems helps cities to quickly divert runoff from roads and other impervious surfaces; runoff gathers speed once it enters these storm sewer systems. Upon leaving these systems and emptying into streams, this large volume of rapidly flowing runoff erodes adjacent streambanks, damages streamside vegetation, and widens stream channels. Ultimately, this results in lower water depths during non-storm periods, higher than normal water levels during wet weather periods, increased sediment loads, and higher water temperatures.

Increased Pollutant Loads: In addition to increased runoff, urbanization also increases the variety and amount of pollutants transported in runoff. Sediment from new construction sites and development projects; oil, grease, and toxic chemicals from vehicular traffic; road salts; nutrients and pesticides from turf management and gardening; and viruses and bacteria from failing septic systems are examples of pollutants generated in urban areas.

When this urban polluted runoff enters storm drains, it can kill native vegetation, harm fish and wildlife populations, foul drinking water supplies, and make recreational areas unsafe.

Point and Nonpoint Distinctions

There are two different types of laws that help to control urban runoff; one focusing on urban point sources and the other focusing on urban nonpoint sources. The National Pollution Discharge Elimination System of the Clean Water Act addresses urban point source pollution from industrial and sewage treatment plants. Urban nonpoint source pollution is covered by Indiana's Stormwater and Sediment Control Program under the Clean Water Act, as well as through state water quality protection programs.

Measures to Manage Urban Runoff

Plans for New Development: New developments should make every effort to maintain the volume of runoff at pre-development levels by using structural controls and pollution prevention strategies. The *Indiana Handbook for Erosion Control in Developing Areas,* available through the Indiana Department of Natural Resources – Division of Soil Conservation, establishes guidelines to minimize land disturbances, retain natural drainage and vegetation, and protect sensitive ecological areas.

Plans for Existing Development: Runoff management plans for existing areas should identify priority pollutant reductions opportunities, protect natural areas that help control runoff, and begin ecological restoration activities to clean up degraded water bodies. Involving groups within the community as well as private citizens helps to prioritize the cleanup strategies, increase volunteer turnout in restoration efforts, and protect ecologically valuable areas.

Plans for Onsite Disposal Systems: The control of nutrient and pathogen loadings to surface waters can begin with the proper design, installation, and operation of onsite disposal systems (OSDSs). These septic systems should be situated away from open waters and sensitive resources such as wetlands and floodplains. Septic systems should be inspected, pumped out, and repaired at regular intervals. Household maintenance of these systems plays a large role in preventing excessive system discharges.

Public Education: Educational projects can help increase understanding and management of nonpoint source pollution in communities. Indiana schools are encouraged to work through their county soil and water conservation districts and the Indiana Lake Michigan Coastal Program to conduct educational projects that teach students how to prevent pollution and keep their community waters clean.

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INDIANA LAKE MICHIGAN COASTAL PROGRAM

Protecting Indiana's Coastal Waters

Today, more than 700,000 people live in Indiana's coastal counties (Lake, Porter, and LaPorte). Aside from aesthetics, Indiana's coastal waters provide homes for an amazing array of plants and animals and are recreational retreats for more than two million visitors per year.

Yet, high levels of bacterial pollution closed beaches in these three coastal counties 347 times in 2001. Rapidly increasing population growth and urban development along our state's coast could cause a higher frequency of future coastal water quality problems.

Many times the source of these coastal water quality problems is nonpoint source (NPS) pollution. Within Indiana, sources of NPS pollution include agricultural and urban runoff, faulty septic systems, marinas and recreational boating, physical changes to stream channels, and habitat degradation.

During 1998 to 1999, the Indiana Department of Environmental Management (IDEM) conducted a Unified Watershed Assessment of Indiana's Lake Michigan region. IDEM ranked the present condition of water in lakes, rivers, and streams and investigated resource concerns and stressors on water quality for the region. IDEM found that all the watersheds in the coastal region did not meet designated uses or other natural resource goals. Stressors were identified as residential septic system density, urbanization, and some agricultural activities.

In 1990, Congress enacted Section 6217 of the Coastal Zone Act Reauthorization Amendments to confront the NPS pollution problem in the United States' coastal waters. The central purpose of this program, the Coastal Polluted Runoff Program is to strengthen coordination between federal and state coastal management and water quality programs and to enhance state and local efforts to manage land use activities that degrade coastal waters and habitats. As one of 34 states and territories with approved coastal management programs, Indiana will implement a Coastal Polluted Runoff Program within its Lake Michigan coastal watersheds.

Indiana will develop goals for four major categories of NPS pollution:

1. Agricultural runoff;
2. Urban runoff;
3. Marinas and recreation boating; and
4. Hydrological modifications.

Examples of practices or methods for addressing NPS pollution include:

- Reducing runoff from impervious parking lot surfaces by placing gently sloping grassy swales between rows of parking spaces;
- Installing soil erosion and sedimentation controls to prevent pollutants from leaving the site of land disturbing activities; and
- Planting or preserving buffer strips of vegetation along stream banks to reduce runoff and protect against erosion.

The Indiana Department of Natural Resources through the Lake Michigan Coastal Program (LMCP), will work with IDEM, Purdue Cooperative Extension Service, and other stakeholders to identify strategies and coordinate public participation in development of a Coastal Polluted Runoff Program. Development of the program will include the public and representatives from business, industry, local, state, and federal agencies, environmental organizations, recreational interests, and agriculture.

Several existing state programs work to address NPS pollution through voluntary partnerships. The LMCP will work with these existing programs to develop specific goals for Indiana's coastal waters; this approach, in addition to public involvement will reduce duplication and lead to the development of a successful Coastal Polluted Runoff Program in Indiana.

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INDIANA LAKE MICHIGAN COASTAL PROGRAM

Nonpoint Source Pollution

Why are some of Indiana's waterways too dirty for swimming, fishing, or drinking? Why are native plants and animals disappearing from state rivers, lakes, and coastal waters?

Over 100 million tons of soil erodes annually from Indiana's landscape. Much of that soil enters the state's waterways as sediment. Sedimentation and polluted stormwater runoff affect the use of Indiana's waters.

Today, nonpoint source (NPS) pollution remains the state's largest source of water quality problems. It's the main reason that many of Indiana's surveyed rivers, lakes, and coastal waters are not clean enough to meet basic uses such as fishing or swimming.

NPS pollution occurs when rainfall, snowmelt, or irrigation water runs over land or through the ground, picks up pollutants and sediment, and deposits them into rivers, lakes, and coastal waters or introduces them into groundwater. NPS pollution is widespread and can occur any time activities disturb land or water.

Imagine the path a drop of rain takes from the time it hits the ground to when it reaches a river. Any pollutant it picks up on its journey has the potential to become part of the NPS pollution problem.

Agriculture, forestry, grazing, urban runoff, construction, recreational boating, septic systems, physical changes to stream channels, and habitat degradation are all potential sources of NPS pollution. Even careless or uninformed household management can also contribute to NPS pollution problems.

The most common NPS pollutants are sediment and nutrients. These wash into water bodies from agricultural land and animal feeding operations, construction sites, and other areas of disturbance. Other common NPS pollutants include pesticides, pathogens (bacteria and viruses), salts, oil, grease, toxic chemicals, and heavy metals. The United States annually spends millions of dollars to restore and protect the areas damaged by NPS pollutants.

Since most nonpoint source pollution is caused by land-based activities, each of us may be contributing to the pollution without even being aware of it. Some of the ways you can make a difference include:

- Place all trash in receptacles; never throw down a storm drain.
- Keep roadways, street gutters, and walkways swept and clear of soil, grass, and debris.
- Use environmentally safe cleaning products that do not contain phosphorus or other toxic chemicals.
- Recycle all used motor oil by taking it to an authorized service station or local recycling center.
- When washing your vehicle, direct the flow of water into the grass or gravel. Never let it flow into the street gutters or storm drains.
- Reduce the amount of pesticides and fertilizers applied to plants and lawns (read the directions carefully).
- Use biological methods and traps to reduce insects, weeds, and fungus instead of toxic insecticides and herbicides. Never apply pesticides or herbicides near wells.
- Plant grass or other plants in exposed soil areas.
- Inspect your septic system annually; pump the septic tank every three to five years.

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INDIANA LAKE MICHIGAN COASTAL PROGRAM

Clean Marinas

Thousands of people annually enjoy recreational boating within the state of Indiana and more than 21 marinas dot the coastline and waterfront property of Indiana. Because boats, wave runners, and other watercrafts are operated and maintained directly in the water or near the shore, the growing number of recreational boaters and marina managers must take special care to manage maintenance activities that cause water pollution.

Individual watercrafts and marinas usually release only small amounts of pollutants. Yet, when multiplied by thousands of boaters, they can cause distinct water quality problems in Indiana's lakes, rivers and coastal waters. The following are potential environmental impacts from boating and marinas: high toxicity in the water; increased pollutant concentrations in aquatic organisms and sediments; increased erosion rates; decrease in oxygen (eutrophication); and high levels of pathogens. Additionally, marina construction can lead to the physical destruction of sensitive ecosystems and bottom-dwelling aquatic communities.

Water pollution from boating and marinas is linked to poorly flushed waterways, boat maintenance, discharge of boat sewage, stormwater runoff from marina parking areas, and the physical alteration of shoreline, wetlands, and aquatic habitats during marina construction and operation.

Managing Boat Operation and Maintenance

During boat operation and maintenance activities, a significant amount of solvent, paint, oil, and other pollutants can potentially wash directly into surface water or seep into ground water. Many boat cleaners contain chlorine, ammonia, and phosphates - substances which can potentially harm fish and limit aquatic bottom growth. Additionally, petroleum hydrocarbons released through small oil spills during refueling and/or motor activities can harm bottom-dwelling organisms that form the base of the aquatic food chain.

Managing Boat Sewage and Waste

Water quality is degraded by the discharge of sewage and waste from boats. Fecal contamination from improper disposal of human waste during boating makes water unsightly and unsuitable for recreation; causes severe human health problems; and stimulates algae growth, reducing the available oxygen needed by fish and other aquatic organisms.

Boaters should avoid the discharge of all sewage into recreation waters. While on the boat, fecal matter and other solid waste should be contained in a U.S. Coast Guard-approved marine sanitation device (MSD). Upon return to the marina or dock, portable toilets should be emptied into approved shore side waste handling facilities and MSDs should be discharged into approved pumpout stations.

Boaters can reduce pollution by:

- Selecting nontoxic cleaning products that will not harm humans or aquatic life;
- Using drop clothes;
- Cleaning and maintaining boats away from the water;
- Vacuuming up loose paint chips and paint dust;
- Fueling boat engines carefully, avoiding petroleum spillage;
- Recycling used motor oil;
- Discarding worn motor parts into proper receptacles;
- Draining water out of all waterlines and tanks during winter freezes; and
- Keeping boat motors well tuned to prevent fuel and lubricant leaks and to improve fuel efficiency.

Managing Location and Design of Marinas

The location and design of marinas are two of the most significant factors impacting marina water quality. Poorly planned marinas disrupt natural water circulation and cause soil erosion and habitat destruction. To reduce activities that contribute to NPS pollution, marinas should be located and designed so that natural flushing regularly renews marina waters. Additionally, incorporation of some simple design elements can greatly reduce NPS pollution, including:

1. Where possible, minimize paved surfaces next to the bulkhead to allow rain to soak into the ground instead of running into the water; install lawn and garden buffers along the bulkhead to act as natural filters and add beauty to the facility; each year fix up a section of the facility with new landscaping to reduce runoff.
2. Use the earth as much as possible as a natural filtration system with crushed stone paving, sand filters, wet ponds, grassy swales (low areas), traps to catch solids from runoff.
3. Install simple oil traps with absorption pillow and debris filters between the work areas and the bulkhead to protect the water quality.

Proper planning and an educated boating public will help reduce marina pollution, promote long-term economic benefits and environmental health, and help recreational boating to remain a fun-filled outdoor experience. Clean marinas, clean boats, and clean boating habits benefit the entire boating community as well as aquatic life.

Agricultural Conservation

Indiana has more than 15,000,000 acres of agricultural land that produce an abundant supply of low-cost, nutritious food and other products. Based on 1990 land use data, approximately 35 percent of Lake Michigan's coastal region is identified as agricultural land. Noted worldwide for its high productivity, quality, and efficiency in delivering goods to the consumer, Indiana's agriculture has increased its conservation farming practices by more than 80 percent since 1990.

Throughout the United States, land managers observed, that when improperly managed, agricultural land can greatly affect water quality. Improperly managed agricultural activities that cause nonpoint source (NPS) pollution include confined animal facilities, grazing, irrigation, plowing, planting, pesticide spraying, fertilizing, and harvesting. The major agricultural NPS pollutants that result from these activities are sediment, nutrients, pesticides, and pathogens.

Managing Sediment: Sedimentation occurs when soil particles from an area, such as a plowed farm field, are carried through wind or water runoff to a water body, such as a stream or lake. Excessive sedimentation clouds the water, reducing sunlight penetration to aquatic plants; covers fish spawning areas and food supplies; and clogs the gills of fish. Too often, other pollutants like phosphorus, pathogens, and heavy metals are attached to the soil particles washing into the State's lakes, streams and rivers.

Agricultural landusers can reduce erosion and sedimentation by 20 to 90 percent through the application of conservation tillage measures, buffer strips, and nutrient management to control the volume and flow rate of runoff water, keeping the soil in place, and reducing soil transport.

Managing Nutrients: To enhance production of agricultural crops, nutrients such as phosphorus, nitrogen, and potassium are applied. When applied in excess of the crop's needs, unused nutrients are washed into streams, rivers, and lakes, causing excessive plant growth; creating foul tasting and smelling drinking water; and killing fish.

Agricultural landusers can reduce the overload of nutrients in runoff through the implementation of nutrient management plans. In turn, these plans help the agricultural landuser maintain high yields while sustaining low fertilizer expenditures.

Managing Confined Animal Facilities: Although by confining animals to areas or lots, farmers can efficiently feed and maintain livestock; these confined animal facilities become major sources of animal waste. Runoff from poorly managed facilities can contaminate streams, rivers, and lakes, as well as ground water sources. With the installation of appropriate waste management systems, livestock managers can limit discharge by storing and managing facility wastewater and runoff.

Managing Irrigation: Irrigation water is applied to supplement natural precipitation or to protect crops from freezing or wilting. Inefficient irrigation can cause water quality problems. Agricultural landusers can reduce NPS pollution from irrigation by improving water use efficiency through the measurement of actual crop needs.

Managing Pesticides: Pesticides, herbicides, and fungicides are used to kill pests and control weed and fungus growth. To reduce NPS contamination from these chemicals, agricultural land users can apply Integrated Pest Management (IPM) techniques based on the specific soils, climate, pest history, and crop for a particular field. IPM helps limit pesticide use and manages necessary applications to minimize pesticide movement from the field.

Managing Livestock Grazing: Overgrazing exposes soils, increases erosion, encourages invasion by undesirable plants, destroys fish habitat, and reduces the filtration of sediment necessary for building streambanks and floodplains. To reduce the impacts of grazing on water quality, livestock managers can adjust grazing intensity, keep livestock out of sensitive areas, provide alternative water and shade sources, and revegetate rangeland and pastureland.

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INDIANA LAKE MICHIGAN COASTAL PROGRAM

Hydromodification/Wetland Management Measure Implementation Objectives for 6217 Watershed

HYDROMODIFICATION

Eugene Matzat, Purdue CES, Section Moderator

Objectives	Measures of Success	Resources Needed	Agencies	Time
Protect and restore instream and riparian habitats (channels)	Increase in high quality instream and riparian habitats and biodiversity.	Funds, technical assistance, education, and monitoring	IDEM, IDNR, US Army Corps of Engineers, US Fish & Wildlife	1-5 years
Reduce erosion and sediment and chemical pollutant loading	Reduced rates of erosion and sediment and chemical pollutants	Funds, technical assistance, education, and monitoring	IDEM, IDNR, US Army Corps of Engineers, Drainage Boards, USDA-NRCS	5-10 years
Minimize the negative physical and chemical impacts of channelization (surface waters)	Fishable, swimmable, drinkable surface waters.	Funds, technical assistance, education, and monitoring	IDEM, IDNR, US Army Corps of Engineers, Drainage Boards	10-15 years

WETLANDS and RIPARIAN AREAS

Kenneth Eck, Purdue CES, Section Moderator

Objectives	Measures of Success	Resources Needed	Agencies	Time
Protect wetlands and riparian areas in Coastal Zone.	No net loss of wetlands and riparian areas	Funds, technical staff, education	IDNR, IDEM, US Army Corps of Engineers, US Fish & Wildlife, USDA-NRCS	1-5 years
Restore and enhance wetlands and riparian areas in Coastal Zone	Increase in wetlands and riparian areas	Funds, technical staff, education	IDNR, IDEM, US Army Corps of Engineers, US Fish & Wildlife, USDA-NRCS	1-5 years
Explore applications for use of vegetated treatment systems	Increased use and decreased cost of vegetated treatment systems	Education, policy changes for select systems, funds for demonstrations	IDEM, IDNR, Ind. State Board of Health, USDA-NRCS, USDA-RD	1-15 years