



Strategies to Minimize Polluted Runoff

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Key Finding

Nonpoint source pollution is the number one water quality problem in the United States today. As the intensity of development increases, so does the amount of nonpoint source pollution or polluted runoff. A good indicator of the intensity of development in a given area is the amount of impervious surface (asphalt, concrete, roofing, etc.).



Photo courtesy of Robert McCormick, Purdue University

Studies have shown that increased impervious surface coverage in a watershed increases the degradation of its water systems. Local officials can do much to protect their water resources by considering the location, extent, drainage, and maintenance of impervious surfaces at individual and local sites as well as at watershed levels.

The Problem

Development affects both the quantity and quality of storm water runoff, which

in turn has impacts on water systems. By enhancing and channeling surface drainage, impervious surfaces increase the volume and velocity of the runoff. This often results in flooding, erosion, and permanent alterations in stream form and function. In addition, by blocking the infiltration of water and its associated pollutants into the soil, impervious surfaces interfere with natural processing of nutrients, sediment, pathogens, and other contaminants, resulting in degradation of surface water quality.

Many studies have found that without nonpoint source management, stream water quality becomes increasingly degraded as impervious levels climb above 10 percent; in highly sensitive streams, degradation can begin when as little as 7 to 8 percent of the watershed area has impervious cover.

What Your County Can Do

Pavement is an unavoidable fact of modern life; however, there are still many options available to counties interested in reducing impacts of existing or future development on water quality. Natural resource-based planning, appropriate site design and use of best management practices, and remediation and maintenance measures can be organized into an effective three-tiered approach – plan, minimize, mitigate.





Photo courtesy of Renee Gunn, Purdue University

1. Plan Development Based on Your County's Natural Resources.

First, a natural resource inventory is essential in acquiring a working knowledge of your county's natural resources. Inventory open space, including farm land, forest land, wild lands, and managed green spaces such as golf courses and public parks.

Second, prioritize these areas for protection. A number of planning tools and incentive programs are available to encourage protection of natural resources.

Third, target development to areas with suitable soils and adequate drainage where infrastructure, public services, roads, and sufficient school capacity may already exist to support the development.

Fourth, incorporate open space planning into the overall comprehensive plan process and in the design of residential, commercial, and industrial development.

Finally, devise a plan of action for natural resource-based planning. Revisions of zoning laws, subdivision ordinances, and an overall vision of sustainable growth must be considered while still protecting the critical natural resources of the local community.

For technical or regulatory assistance with your county's natural resources, contact: the Indiana Department of Natural Resources, 317-232-4004; the Indiana office of the Natural Resources Conservation Service, 317-290-3200; the

Indiana Department of Environmental Management, 800-451-6027; or the Indiana Association of Soil and Water Conservation Districts, 317-692-7325.

2. Minimize Impacts Through Site Design and Best Management Practices.

Site Design

The site planning stage offers the best chance for local officials, designers, and builders to work together to reduce polluted runoff from a site.

- Evaluate site plans with an eye to minimizing both impervious areas and disruption of natural drainage and vegetation.
- Consider cluster development areas that reduce the total area of paved surfaces and increase open space.
- Brick, crushed stone, or pervious pavements are often a viable alternative in low traffic areas.
- Are the proposed sidewalks, roads and parking lot sizes absolutely necessary, or could they be reduced?
- Are curbing and piping necessary, or could drainage be directed to vegetated swales or filter strips?

Designs that reduce grading and filling and retain natural features should be encouraged. In addition to protecting waterways, such designs are often less expensive and more pleasing to the eye.



Photo courtesy of Cindy Salazar, Purdue University

Best Management Practices (BMPs)

Best management practices (BMPs) include a whole range of methods designed to prevent, reduce, or treat

Planning with POWER Project Partners

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Indiana Department of Environmental Management (IDEM)

Indiana Land Resources Council (ILRC)

Indiana Department of Natural Resources (IDNR)

Natural Resources Conservation Service (NRCS)

Soil and Water Conservation Districts (SWCD)

Planning with POWER is funded by:

Purdue Cooperative Extension Service

Illinois-Indiana Sea Grant College Program

Indiana Department of Environmental Management (Sec. 319 Grant)

NOAA Coastal Services Center

storm water runoff. Choosing the correct BMP is often highly site-specific. *Planning with POWER* project partners (Page 2) can provide assistance and guidance. Here are some basic BMP concepts to keep in mind:

Target and protect open space, prime farmland, and critical wildlife habitat. Retain natural landscape and minimize impervious surfaces. Prime farmland converted to development has doubled in the last several years.



Corel Library Photo

Suggested Reading:

Watershed Restoration Sourcebook. Publication #92701 of the Metropolitan Washington Council of Governments. P. Kimble and T. Shueler, editors.

Water Resources Protection Technology: A Handbook of Measures to Protect Water Resources in Land Development. The Urban Land Institute, Washington, D.C.

Encourage agricultural BMPs. Buffers and filter strips along waterways and critical wildlife habitat in agricultural areas are good examples of ways to protect our natural resources.

Require proper septic system placement, design, and maintenance suited to soil and use conditions. Use cluster systems when possible. Many of the soils in Indiana are rated severe to very severe in their suitability for a conventional on-site septic system. Regular cleaning and maintenance is a requirement for long-term septic operation.

Encourage natural and vegetated storm water controls. The use of swales in place of curbs is one way to slow the runoff from development and impervious surfaces.

Emphasize on-site drainage of storm water. Improve infiltration of water through the use of porous paving materials, retention and detention ponds, where applicable, and other best management practices.

3. Mitigate Unavoidable Impacts by Remediation Measures and Maintenance of Existing Structures.

Remediation Measures

Remediation measures are practices designed to mitigate unavoidable impacts to natural resources caused by development. Most remediation measures are designed to slow or reduce storm water runoff, and the associated sediment and pollutants, resulting from development. In many cases, remediation measures are most effective when used in combination with BMPs.

In both cases, pollutant removal takes place through the settling of particles and through chemical and biological interactions in the standing water or soil. As with any practice, remediation measures must be correctly designed in order to work properly. For instance, basins must be large enough to treat runoff generated by the combination of local climate and site configuration.

Detention Basins. Detention basins are shallow depressions that are meant to slow and hold storm water before releasing it.

Retention Basins. Retention basins are designed to hold water permanently until it infiltrates into the ground.

Constructed Wetlands. Wetlands – natural and constructed – serve as sponges, soaking up rain and storing excess flood water runoff, then slowly releasing the flood waters back into streams, lakes, and groundwater.



Photo Courtesy of Brian Miller, Purdue University

Wetlands also support natural processes that facilitate the deposition of sediment, reduction of nutrients, and deposition and reduction of some pollutants.

Constructed wetlands are often designed as part of a system of remediation measures to reduce the impacts of development by reducing storm water runoff and improving the quality of water leaving the site. Wetlands can also be designed to improve aesthetics and wildlife habitat on a site and may cost less than some other remediation alternatives.

Ensure regular maintenance. Most structural BMPs require regular maintenance to ensure peak pollutant-removal efficiency. Maintenance ranges from the frequent, but simple (sweeping parking lots, cleaning storm drains) to the infrequent, but complex (sediment removal from detention/retention ponds or catch basins), but in all cases, it must be budgeted and planned for.

Don't forget the two "E's": Enforcement and Education. It's important to make sure that contractors are following through with agreed-upon designs and methods. Also, don't underestimate things like storm drain stenciling and hazardous waste disposal days, which can reduce pollution, raise public awareness, and help to engender support

for all your local water protection activities.

Economic Impacts to Your County

Depending on the location and size of your county, various federal and state laws pertaining to polluted runoff management will affect your community economically if you exceed established standards. The bulk of legislation affects a range of local activities, from zoning decisions to repair of septic systems to setbacks for future development near watercourses. Local officials should be in regular contact with IDNR, NRCS, IDEM, and SWCD offices.

Additional Information

The *Planning with POWER* program can assist you in learning more about strategies for coping with polluted runoff and what you and your community can do to minimize impacts to water and other natural resources. To learn more, contact:

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This paper has been modified from a publication originally written by Chester Arnold of the Connecticut Sea Grant Program and Jim Gibbons of the Cooperative Extension Service for the University of Connecticut. Revisions and adaptations were made with permission of the Connecticut NEMO Program.



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Illinois-Indiana Sea Grant College Program is 1 of 30 National Sea Grant College Programs. Created by Congress in 1966, Sea Grant combines university, government, business and industry expertise to address coastal and Great Lakes needs. Funding is provided by the National Oceanic Atmospheric Administration, U.S. Department of Commerce, Purdue University, West Lafayette, Indiana, and the University of Illinois at Urbana-Champaign.