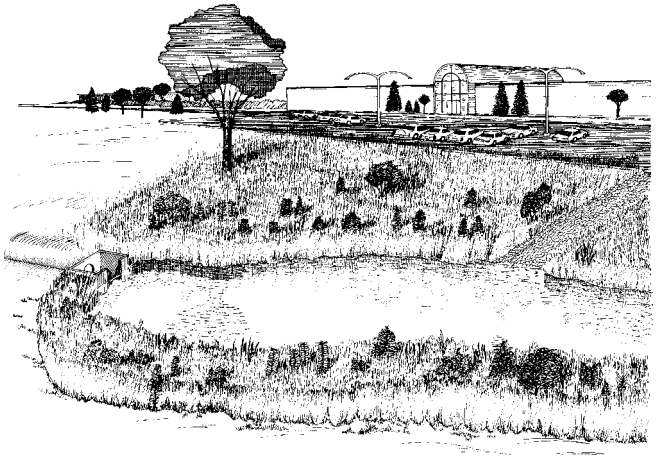
Stormwater Detention Ponds

Recently, there has been an explosion in the number of ponds dotting the suburban landscape. Most have been created to satisfy local government regulations for stormwater detention in new developments. These ponds can be attractive features—they provide opportunities to observe nature, engage in recreation, or simply enjoy the view. Perhaps your home sits alongside a stormwater detention pond, or there's one down the street in the neighborhood park. Your office complex may have a detention pond or two on its property.



Stormwater detention ponds or "basins" are designed to hold rain water that has "run off" the surrounding landscape of lawns, roads, and rooftops. The stormwater is held in the basin awhile and slowly released to a nearby waterbody. In this way, stormwater detention basins reduce how fast runoff enters our natural waterways. This protects areas downstream from flooding and erosion. Most detention ponds also function to trap pollutants in runoff such as nutrients, metals, and sediments. As a result, detention ponds most likely aren't going to look like a natural pond or lake. They may not have clear water, provide certain recreational activities, or be a top destination for wildlife. Still, there are things that can be done to improve the appearance and recreational benefits of detention ponds, while they continue to do their main work of stormwater detention.

In this edition of *Lake Notes*, we'll first talk about what signals a degraded detention pond, what some of the causes might be, and what can be done to better manage the pond for recreation and aesthetics.

Signs of Degradation

Undesirable Water Quality

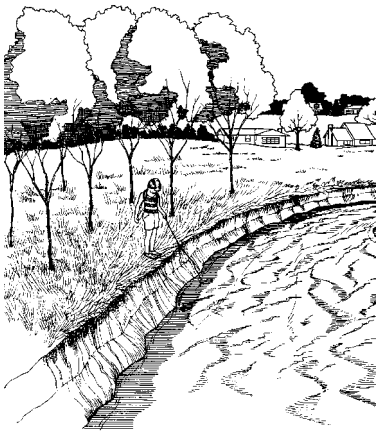
Turbidity: Turbid water, appearing cloudy or muddy, is caused by sediment, algae, and other particles suspended in the water. Stormwater runoff carries soil and debris into detention ponds from the surrounding landscape. Erosion of the pond's shoreline also contributes to turbidity. Bottom-feeding fish, notably carp, can cause a lot of turbidity as they stir up the bottom sediments in search of food. Rooted aquatic plants have a hard time growing in turbid water. Without such plants covering the pond bottom, sediments are more easily resuspended by wind and waves.

Algae Blooms: Algae thrive in water that is rich with the nutrients phosphorus and nitrogen. Stormwater runoff carries into detention ponds excessive amounts of these nutrients from lawn fertilizers and pet and waterfowl waste. When algae become abundant enough to color the water green or form paint-like scums, it's called a "bloom." Like sediment turbidity, algae blooms block sunlight from reaching through the water to the pond bottom, which prevents the growth of rooted aquatic plants—a beneficial part of a pond ecosystem. Algae blooms also can create a situation where oxygen levels in the water become very low or even near zero—thus affecting aquatic life.

Poor Habitat for Plants and Animals: Detention ponds have little chance of supporting a wide variety of aquatic and terrestrial plants and animals when poor water quality and shoreline conditions exist. Without shoreline and aquatic plants, habitat (including food, nesting materials, and cover) for animals, fish, and other aquatic organisms is limited. Turbid water and low oxygen levels favor fish species that can tolerate those conditions (such as carp and bullhead) while other species such as bass and bluegill suffer.

Eroded Shorelines

Some detention ponds may have shorelines with bare, exposed soils, and these may be "sloughing" (falling) into the pond. Such erosion can be caused by many things including steep side slopes, excessive soil moisture, inappropriate soil types, and lack of deep-rooted, water-tolerant stabilizing vegetation.



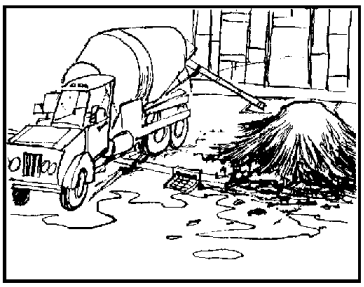
Pond shorelines often are designed too steep, making it difficult to establish stabilizing vegetation. Furthermore, detention pond shorelines typically have been planted with turfgrasses such as Kentucky bluegrass. Turfgrasses are too shallow-rooted to hold shoreline soils against the action of waves. They also cannot survive long periods of being underwater or in saturated soils—as often occurs in stormwater ponds.

Soil type and structure play a major role in shoreline stability. If the soil is too compacted or there is not enough fertile topsoil, stabilizing vegetation will be tough to establish. Highly erosive or bare soils around the detention pond will not hold together when water levels fluctuate. Soils with a high organic content (e.g., peat or muck) hold water and are prone to sloughing (unless the shoreline is graded to a very flat slope).

Sedimentation

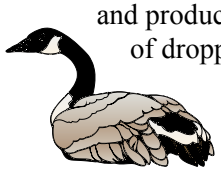
Detention ponds will fill with sediment when shorelines are eroding and as stormwater runoff carries in soils from the surrounding land. Sedimentation can cover fish spawning beds and create mudflats where opportunistic, weedy species such as purple loosestrife, reed canary grass, cattails, and willows can invade. Sediment accumulated along shore can impede recreation such as fishing and launching of boats. Sedimentation also decreases the pond's water volume. This reduces how well the pond protects downstream waterbodies—since less water volume means there's less time for pollutants to settle out within the pond and be broken down biologically.

While soil erosion from agricultural croplands in Illinois typically ranges from 1 to 10 tons/acre/year, erosion from construction sites can exceed 100 tons/acre/year!



Reduced Aesthetics

Any of the above-mentioned signs of degradation can contribute to a decline in the pond's visual appeal. High turbidity and brown or green water colors can detract from the pond's appearance. Eroding shorelines and bare side slopes can be an eyesore. Even the droppings left behind by waterfowl on lawn and park areas can detract from the overall enjoyment of the pond. In fact, large, resident flocks of Canada geese have become quite a nuisance in urban and suburban areas. Detention ponds provide the perfect habitat for them: open water typically surrounded by low-growing vegetation. By grazing heavily on nearshore grasses, these birds contribute to shoreline erosion and produce excessive amounts of droppings that are extremely rich in phosphorus and nitrogen.



Solutions

Watershed Management

A "watershed" is the area of land that drains into a waterbody. Managing the activities going on within a detention pond's watershed is just as important—if not more so—as managing the pond itself. There are several things that you can do in your own yard and community that can help reduce sediment and nutrient runoff or how much water levels fluctuate. These include:

- Establish a "buffer strip" of native vegetation along the pond shore (see another *Lakes Notes* fact sheet, "Shoreline Buffer Strips").
- Have soils tested to see what nutrients your lawn and garden areas really need.
- Reroute roof downspouts onto lawns rather than onto driveways or streets.

- Ensure that soil erosion and sedimentation control practices (e.g., silt fences, sediment ponds) are installed and maintained on construction sites within the detentions pond's watershed.
- Encourage regular street sweeping, cleaning of storm sewer catch basins, and maintenance of vegetated drainage swales.
- For more tips, see the *Lake Notes* fact sheets "Home and Yard" and "Fertilizers and Pesticides: Options for Lawn and Garden Use."

Stabilize Eroding Shorelines

The planting of native wetland plants along the shore and deep-rooted prairie grasses on pond side slopes should, in most cases, be adequate to stabilize eroding detention pond shorelines. Some minor regrading may be necessary. Depending on the steepness of the side slopes, the incorporation of "bioengineering" materials such as fiber rolls or A-jacks structures also may be appropriate (see the *Lake Notes* fact sheet "Shoreline Stabilization: Bioengineering Alternatives").

Pond Cleaning (Dredging)

Periodically, sediments accumulated in the pond will

need to be removed. The frequency will depend on how well soil erosion and sedimentation controls are working at construction sites, on the effectiveness of other "best management practices" (BMPs) in the watershed, and how well the pond shoreline is stabilized. With good BMPs, sediment removal may not be needed more often than every 10 to 20 years, depending on how much sediment the pond was designed to store.

Although the sediments must be tested prior to removal, in most cases they will be clean enough to dispose of in a landfill. In many cases, the sediments will be sufficiently clean to spread on land and be reseeded. A permit(s) for sediment removal also may be required. (More information on sediment removal can be found in the *Lake Notes* fact sheet "Lake Dredging.")

Minimize Resident Waterfowl Populations

For suggestions on how to discourage large numbers of resident waterfowl at your pond, especially Canada geese, refer to the *Lake Notes* fact sheet "Canada Geese and Your Lake."

Regular Inspection and Maintenance

To ensure the proper operation, acceptable aesthetics, and water quality effectiveness of the detention pond, several basic maintenance activities should occur.

- Inspect the outlet structure periodically and after storms, and remove debris blockages.
- Inspect the inlets for scour and pond shorelines for erosion, and stabilize as necessary.
- Regularly remove trash and debris.
- During the first three years after planting, monitor shoreline and side slope vegetation frequently and conduct supplemental plantings as needed to ensure good cover. After that, inspection once a year should be enough.
- Maintain the shoreline and side slope vegetation and remove nuisance plants. Native wetland and prairie vegetation will need much less frequent maintenance than a pond surrounded by turfgrass which needs frequent mowing. However, native plants may require more specialized expertise (such as prescribed burning).

Who is responsible for long-term inspection and maintenance will depend on local circumstances. In residential settings, the basin may be owned by the local municipality or park district and thus would be their responsibility. In many cases, however, the surrounding homeowners association is the owner and thus is responsible for upkeep.

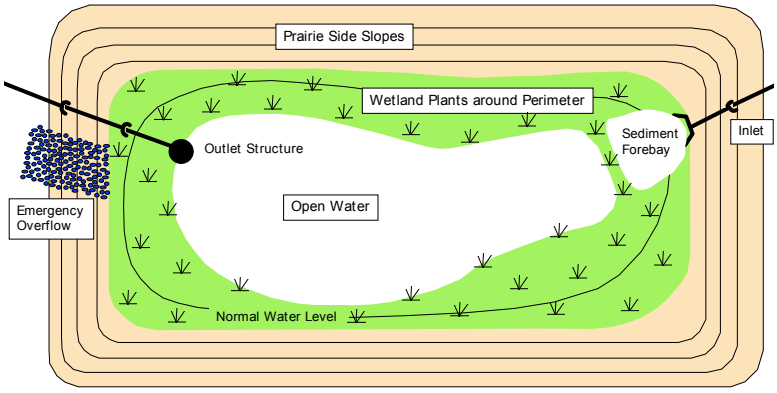
Public Education and Awareness

- Share this publication—and others in the *Lake Notes* series—with your neighbors and public officials.
- Organize or participate in a storm drain stenciling project.

Proper Design

Shoreline slope is one of the most important factors from an erosion control, as well as a safety, standpoint. Detention pond shorelines should be very gradual—ideally 5:1 (5 feet horizontal to 1 foot vertical) or flatter. At such slopes establishment of vegetation will be much easier and more likely to last. Also, adding a wide, underwater ledge about 6 to 12 inches below the pond's normal water level will provide a perfect place to establish wetland plants around the shoreline.

The shoreline should be planted with wetland plants and the basin side slopes with prairie vegetation. Wetland plants tolerate water level fluctuations and absorb wave energy, thus protecting the shoreline against erosion. On slopes, the deep, intricate root systems of native prairie plants are able to hold soil together very well.



The detention pond's depth influences its water quality. Generally, detention ponds should be deep enough to maintain open water areas and limit sediment resuspension by current, wind, or waves. Typically, the average depth should be at least 4-5 feet and maximum depth at least 8 feet. If you want fish to survive through the winter, it is generally recommended that at least 25% of the pond be at least 10-12 feet deep.

Access for maintenance equipment should be provided in the design. Incorporating a separate pond ("pre-sedimentation basin") or area within the basin ("sediment forebay") where sediments can settle out before reaching the main detention pond will localize sediment deposition, making sediment removal easier. Also, having a bottom drain valve built in will allow the pond to be drained and make maintenance easier.

Finally, the surrounding development that contributes stormwater to the detention pond should be designed with natural drainage features. These include vegetated "swales" and "filter strips" wherever possible—as opposed to street curbs and gutters, storm sewers, and concrete-lined channels. Natural drainage techniques reduce the amount of surface water runoff entering the basin and also filter out pollutants.

"Retrofitting"

If certain of the design features recommended above are lacking in your detention pond, the basin still can be improved by modifying, or *retrofitting*, it to reduce operational, aesthetic, or maintenance problems. While particular site or monetary constraints may limit what can be done, in most cases revegetation of the shoreline with wetland plants and side slopes with prairie vegetation can be readily accomplished.

A Word of Caution about Certain Recreational Uses

Stormwater not only carries with it sediments and nutrients, but also bacteria and other pathogens. Consequently, swimming in detention ponds typically is cautioned against.

On industrial sites, the potential exists for serious contamination of both water and sediment. Hence, eating fish from such detention ponds is discouraged.

Lake Notes is a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. The objective of these publications is to provide lake and watershed residents with a greater understanding of environmental cause-and-effect relationships, and actions we all can take to protect our lakes.

Appreciation is extended to the University of Wisconsin-Extension and the Wisconsin Department of Natural Resources for illustrations from their "Water Quality Digitized Clip Art Collection." The detention pond schematic was prepared by Tom Price and Holly Hudson.

This *Lake Notes* publication was prepared by Holly Hudson of the Northeastern Illinois Planning Commission, Chicago, Illinois. Thanks are extended to Dennis Dreher and Tom Price for their review and comments.

For more information about other publications in this series and to request copies, please contact: Illinois Environmental Protection Agency, DWPC-Lake and Watershed Unit, P.O. Box 19276, Springfield, Illinois, 62794-9276; 217/782-3362.