

“What happens in Vegas stays in Vegas.” But a property with a *pond* works according to a different rule: “What happens on your property washes into the pond...and eventually into streams, rivers, lakes, and drinking water sources.” In short, what happens on your land gets shared with everyone downstream.

It works like this: Rain runs off the landscape, collecting soil, fertilizers from lawns, motor oil off pavement, litter, and anything else in its path. Water, being fluid and subject to gravity, collects in low areas, such as ponds.

Manmade ponds, such as those in residential developments and corporate campuses, are typically built to detain storm water on the lowest, wettest spot on the property. That location likely used to be a *wetland*, such as a bog, swamp, marsh, or stream. A wetland is nature’s way of storing, cleaning, and releasing water. More recent regulations aim to preserve natural wetlands while creating manmade stormwater ponds. Manmade *detention basins* or *retention ponds* are good for storing and releasing water, but they aren’t as effective as wetlands in treating and cleaning the water. So much of the polluted sludge simply collects in the pond, creating odors, mucking up the water, and encouraging weed and algae growth. But, it doesn’t stop there. Unfortunately, with each large rain storm, some pond water (and the stuff in it) moves to other, larger bodies of water downstream.

A *watershed* is an area of land that drains into a body of water. Small watersheds drain into larger ones, until water reaches rivers and eventually lakes and oceans. The upshot? The health of the world’s oceans begins on your property. The sustainability goal for your pond is *protect water quality*.

You can address common problems such as water smell and clarity, heavy algae outbreaks, and nuisance animals like geese. But managing these problems is different from helping a pond be truly sustainable. The truth is, successfully managing a manmade pond takes a big-picture, long-term approach. And a true sustainable aquatic community may not conform to a tidy aesthetic.

THE VALUE OF MANAGING A POND SUSTAINABLY

By creating a long-term plan that minimizes pollutants washing into your pond, you can enjoy many benefits.

Increased property values

A beautiful, well-maintained pond can increase property values. In a residential community, this can be especially true for homes next to the pond.

Fewer geese and more desirable wildlife

You can decrease the number of geese, creating a more attractive *shoreline* without the unhealthy mess of droppings. Depending on your goals, you can also attract other kinds of beneficial waterfowl, as well as fish, frogs, toads, and other wildlife that are enjoyable to watch. .

Recreation and beauty

A well-maintained pond potentially offers many kinds of recreation opportunities: walking paths, fishing, and wildlife viewing. In addition, tranquil views and soothing sounds of water are have been shown to be beneficial to human health

Cost Comparison of Shoreline Options

Assuming a half-acre circular pond centered in a two-acre open space.

	Turf Grass (to edge)	6' Stone Revetment (3' in the water to 3' out of the water)	Native Plant Buffer Zone (12" from water's edge)
Installation Cost (grading, soil prep, material)	\$1,170	\$65,000	\$10,000 (seed) to \$30,000 (live plants)
Years 1–3			
Maintenance (mow, weed, fertilize)	\$600	\$400	\$3,600
Goose Control	\$10,170	\$10,100	\$0
Algae Control	\$6,700	\$6,700	\$6,700
Years 4–9			\$3,000
Burn & Seed			\$2,400
Maintenance (mow, weed, fertilize)	\$5,200	\$1,200	\$0
Goose Control	\$19,500	\$19,500	\$12,000
Algae Control	\$18,400	\$14,900	\$3,000 Burn and seed
Year 10	\$50,000 to \$100,000 Shoreline repair and sediment removal	\$10,000 to \$30,000 Replace rock	
10 Year Cost	\$111,670 to \$161,670	\$128,300 to \$148,300	\$40,700 to \$60,700

Courtesy of Integrated Lakes Management, Inc. The cost ranges listed are given for comparison purposes and can vary widely due to many factors, including site accessibility, soil type, slope, and others. Costs are based on averages of cost range quotes given by service providers based on an existing half-acre circular pond centered in a two-acre open space.

COMMON POND CHALLENGES

Grateful acknowledgement for much of the content in this section is owed to *Lake Notes*, a series of publications produced by the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. Request copies by calling 217-782-3362 or download them from www.epa.state.il.us/water/conservation/lake-notes.

Manmade retention ponds were built to collect storm water runoff from the site

It's difficult to build a healthy pond that duplicates the functions and stability of a natural water body. With few exceptions, most developers never even try. They are focused on one goal: collecting storm water from the surrounding roads, lawns, and rooftops. Typically, they contour the land and use a variety of stormwater drains, *swales*, underground pipes, and channel systems to direct water to a shallow, steeply banked hole. Often, shorelines are planted with lawn grass, and water has very little circulation. Sound familiar? You may be dealing with the consequences: eroding shorelines, thick algae and *invasive*

species, green stinky water, geese droppings, and other problems. The solution is to incorporate pond management into your landscape plan.

It's expensive to remediate a manmade retention pond

Many residents, employees, and visitors expect to see a pristine, crystal-clear pond. But the unfortunate reality is that most manmade ponds are not designed to promote natural processes. In naturally occurring ponds, beneficial aquatic life (including insects, fish, and plants) clean the water. In natural ponds, their shape and depth help maintain even temperatures. If they are undisturbed by development around them, naturally occurring ponds also contain a high amount of oxygen, which is good for aquatic life. It's very expensive to set up and maintain ponds to create those conditions, and special dredging permits are difficult to obtain. But it's possible over time to gradually work toward improving the health and beauty of a pond.

Pond problems are managed, but not pond health

We intuitively understand the value of keeping grass mowed and maintaining paved surfaces, but many people don't know that ponds need maintenance, too. The fact is, manmade ponds need an ongoing, long-term management plan. When the pond was built, all of the natural systems that helped the former wetland clean the water were destroyed. Now it needs help from humans to manage the water quality and shoreline. Have your pond evaluated by a pond professional to help you understand the needs and challenges of your particular pond. For more information, see "Protect Water Quality: Implementation" later in this chapter.

Algae blooms are common in manmade ponds

When lawns are fertilized, rain or irrigation washes the nutrients into ponds. Even small amounts of phosphorus (an eyedropper-full in a tanker truck of water) can create excessive algae growth. Unfortunately, the same nutrients that lawns love are also enjoyed by aquatic plants such as algae. A pond covered over by a thick layer of green scum is not attractive, to say the least. In Illinois and many other states, the nutrient phosphorus has been banned from commercial fertilizer applications, and that is great news for ponds. However, algae are also nourished by other lawn fertilizer ingredients, as well as pet and geese droppings. Excessive algae growth can block sun from reaching the bottom of the pond, preventing beneficial water plants like lilies and other *native* rooted aquatic plants from growing. Algae can also create very low levels of oxygen in the water, which harms fish and other aquatic life. Have your lawn soil tested annually to determine which nutrients it truly needs. Simply planting a *buffer* of native plants between lawn and pond can slow and even reduce the migration of nutrients into the pond. (See "Keep It Simply Sustainable!" for more information about buffers.)

Ponds lose depth over time

Retention ponds fill with *sediment* (particles of soil and pollution that fall to the pond's bottom) as shorelines erode and storm water runs off buildings and land. As a result, the body of water loses depth, which causes the kinds of plants living there to change. You may see invasive plant species move in, such as Eurasian water milfoil, curly-leaf pondweed, cattails, and phragmites. Due to lower oxygen levels, desirable fish species may die off, leaving less desirable ones that can survive in low-oxygen environments. When water is shallow, winter *fish kills* (a large dying-off of fish) increase. Sediment in the water can clog irrigation systems as well. Stabilizing the shoreline by planting a buffer of deep-rooted *native* plants can help hold the soil and slow some forms of sedimentation.

Water appears cloudy, green, or brown instead of crystal-clear blue

Cloudy or muddy water (technically called *turbid* water) is caused by sediment, algae, and other particles floating in the water. Much of this material enters the pond through stormwater runoff from the surrounding land. Other ponds are engineered so that water collected from storm sewers is channeled into an underground pipe system, which dumps into the pond. Cloudy water can also be caused by erosion of the pond's shoreline or even the movements of fish like carp, which disturb the sediment and soil at the bottom of the pond as they look for food. The fish kick up particles and kill the roots of beneficial water plants that help anchor the soil and sediment at the bottom of the pond. The cloudy

water also hurts these plants' health, so a downward spiral occurs when they die off and more sediment is released. Encourage regular street sweeping, cleaning of storm sewer catch basins, and rerouting of roof downspouts onto lawns or gardens rather than pavement. These simple actions can help improve water quality and extend the life of your pond.

Some people think it's okay to use a pond as a dumping ground

For unwanted chemicals, trash, and lawn waste. Eliminate these obvious sources of pollution by creating and enforcing "no dumping" policies.

Once the shoreline is gone, it's gone

The sooner you address pond erosion, the better. Otherwise, you lose property and perhaps risk an accident. Sometimes *banks* were designed too steeply; these are more likely to be unstable and slough off. Beavers and muskrats may dig into the shoreline to make dens. But one of the most common causes is shallow-rooted lawn grass planted right up to the pond's edge—its roots are no match for the forces of erosion. Stabilizing a pond's shoreline may seem like an expensive proposition, but there are sustainable measures you can take that are actually less expensive and less maintenance-intensive than many traditional solutions. Consider planting a shoreline buffer (see "Keep It Sustainably Simple!") while the shoreline is still intact.

Early detection and maintenance of invasive plant species are essential

While there are many beneficial water plants, some species are nuisances. It's important to learn the difference. A qualified pond professional can show you. Invasive species such as Eurasian milfoil and curly-leaf pondweed are opportunistic and highly adaptable. Once they gain a foothold in your pond, they will take over within a short period of time. Your goal is to prevent colonization, because removing established colonies in and around your pond is difficult and very expensive. Don't be fooled by invasive plants that are attractive. Some, like purple loosestrife, may look good, but they are very bad for your pond's health!

Not everyone will agree on their objectives for the pond

What is realistic to expect from a body of water, and where do you want to be on the sustainability spectrum? Does your pond need to be clean for swimming, fishing, or other activities? Is it simply a water feature meant to be looked at? Management tools will be determined by expectations like these. Visit other ponds that are successfully managed to find models and develop a frame of reference. Talk to the land or pond managers about their management costs and strategies.

Activities on the land affect water quality

As we stated in the introduction to this chapter, ponds collect all the problems of the urban environment. When you fertilize your lawn, rain can wash those nutrients off the grass and into the pond, causing algae to bloom. Using herbicides incorrectly can kill fish in the pond. It's less expensive to keep pollutants out in the first place than to extract them from the environment. Educate residents or other stakeholders about the vital land-water connection.

Changes in boards, management, or ownership make it difficult to plan for the long term

For example, homeowners associations have a high level of turnover of residents, board members, management companies, and contractors. For any property, it's important to establish a long-term vision with a five- to ten-year plan. Include this task in your reserve study or other long-term budgeting process. Your goal should be to encourage a balanced, sustainable biological system. Establish a documentation process so future managers and owners know what's been done and why.

PROTECT WATER QUALITY: IMPLEMENTATION

A sustainably managed pond is certainly attainable, but it may take years of planned improvements. A sustainably managed pond is not maintenance-free. Build a management strategy that includes these steps to achieve a sustainable pond:

1. Work with a qualified pond professional

Have your pond evaluated by a pond professional to help you understand the needs and challenges of your particular pond. Before hiring, be sure to gather references and examples of other ponds they manage. (See Chapter 2: Property Management for tips on evaluating contractors.) Ask for a price quote for annual costs of managing the pond sustainably.

2. Establish a budget for operating expenses

Tackle long-term funding by adding pond maintenance to a reserve study or budget. It is not easy or cheap, but a sustainable pond is attainable. For the best results, educate stakeholders to get their buy-in and support.

3. Deter geese and other nuisance waterfowl

The presence of Canada Geese has a direct relationship with your pond maintenance practices. Discourage people from feeding geese. Modify your shoreline to include tall grasses, plants, and shrubs; preferring to be out in the open so they can see their predators and escape more easily, geese avoid areas with tall foliage. Allow your pond to freeze over in the winter by turning off aerators (if you're not concerned about winter *fish kills*.) You can also build physical barriers such as fences and grids.

4. Provide information to stakeholders about what is happening

Simple signage can help people understand and appreciate the work involved in creating a sustainable pond. Describe new plants, expectations about water quality, benefits to wildlife, and impacts to the watershed. Communicating about these features will go a long way toward building support for changes to the pond.

5. Manage the watershed

Take into account your pond's watershed. You will probably need to work with a pond or *lake* professional to understand how practices on your property specifically impact your water quality. Here are some key watershed management ideas from *Lake Notes*:

- Learn your pond's watershed (see "Determining Your Lake's Watershed" in *Lake Notes*). First, check if a government agency has already done this. Try your county stormwater department, regional planning commission, local Soil and Water Conservation District (SWCD), Natural Resource Conservation Service (NRCS), state EPA office, or state water survey. If not, you can obtain a U.S. Geological Survey topographic map, and then get help interpreting it from a pond professional or the SWCD or NRCS.

Learn More:

Lake County, IL, Stormwater Management Commission:

<http://www.lakecountyil.gov/STORMWATER/Pages/default.aspx>

Chicago Metropolitan Agency for Planning: www.cmap.org

National Association of Conservation Districts: <http://www.nacdnet.org/>

USDA Natural Resources Conservation Service:

<http://www.nrcs.usda.gov/wps/portal/nrcs/site/national/home/>

Illinois Environmental Protection Agency: <http://www.epa.state.il.us/water/>

Illinois State Water Survey: <http://www.isws.illinois.edu/>

U.S. Geological Survey: <http://nationalmap.gov/>

- Establish a buffer strip of native vegetation along the pond shoreline to filter pollutants and halt erosion (See "Keep It Simply Sustainable!"). Good plants to include may be bur reed, cord grass, lake sedge, and other plants that form dense colonies that hold the soil. Wildflowers can be added for color and interest.
- Have your lawn or landscape contractor test the soil to determine the nutrients your lawns and gardens really need. Only apply the treatments that are necessary.
- Reroute roof downspouts onto lawns rather than pavement so the plants and soil can filter contaminants. Similarly, encourage practices that collect rain where it lands, such as porous pavement, *bioswales*, and *rain gardens*.
- Employ soil-erosion and sedimentation controls during any construction activities within the pond's watershed. These may include silt fences and sediment ponds. Most counties regulate these activities. Talk to your county's stormwater department for more information.
- Encourage regular street sweeping, cleaning of storm sewer catch basins, and maintenance of drainage swales. Swales are contoured, planted sections of low land that collect and absorb water from downspouts.
- Discourage dumping in storm drains.

6. Stabilize eroding shorelines

Work with a qualified pond or lake professional who will take a sustainable approach. This might include planting a buffer of native grasses and flowering plants that can hold the soil. Other methods recommended by *Lake Notes* include planting cuttings or *live stakes* of willow or other water-loving shrubs along the shoreline. You can also use *fiber rolls* and other similar reinforcement to provide a protected zone along the shoreline.

7. Reduce hard surfaces

Evaluate your walkways, roads, driveways, parking areas, and other hard surfaces. When it's time to patch or replace these surfaces, consider replacing them with porous surfaces, such as pea gravel, porous pavement, or porous pavers to mitigate runoff. These alternative surfaces will allow rainwater to percolate into the ground.

8. Inspect and maintain

Most systems in nature are ever changing, and a pond is no different. Protect your investment by periodically monitoring the health and function of the pond. Ongoing maintenance might include removing debris from the pond and at the detention pond's outlet structure, inspecting the shoreline for erosion, monitoring the growth of newly installed plantings, and eradicating invasive plants.

COMMUNICATING AND ADDRESSING CONCERN

Perhaps more than any other element in a landscape, a manmade pond has the most unrealistic expectations set upon it. And due to its location on the property, its flaws are always at center stage.

Educating stakeholders is key to your pond management effort. Because restoration and management is expensive and long-term, it's important to communicate the risks and rewards of acting versus doing nothing. Here are some ways to help people understand the risks and rewards:

Address the bottom line

Your pond will be a money pit unless you address issues when they are small. Erosion and invasive plants are two great examples. The bigger and more established the problem, the bigger and more expensive it will be to resolve it.

Appeal to people's interests and desires

A healthy pond can be a true asset, especially in helping people enjoy their time outdoors. A healthy pond can increase property values. Imagine enjoying a lazy hour of skipping rocks on sparkling water,

observing frogs along the shoreline, listening to the rustle of wildflowers and grasses, and glimpsing the occasional turtle or great blue heron. Fishing, sailing, whatever it is... your vision for the pond could be a reality with the right plan and funding.

When people know better, they do better

You may start down a sustainable path, but a few vocal stakeholders may become weary and stop the whole thing dead in its tracks. Don't let that happen to your project. Manage expectations by emphasizing that this project takes patience. It may not look good in one or two years. It may take three years to see improvements. Working with natural systems takes time and is never perfect, but if you are in it for the long haul, your commitment will pay off.

Join a watershed group

Adopt a local watershed to protect. Find them at the U.S. Environmental Protection Agency's Adopt Your Watershed website (<http://water.epa.gov/action/adopt/index.cfm>), which offers a Watershed Stewardship Toolkit.

POND MANAGEMENT RESOURCES

General

Illinois Environmental Protection Agency - *Lake Notes* Fact Sheets:

<http://www.epa.state.il.us/water/conservation/lake-notes/index.html>

Michigan United Conservation Clubs: *Managing Michigan Wildlife: A Landowner's Guide - Building and Managing Ponds*

http://www.dnr.state.mi.us/publications/pdfs/huntingwildlifehabitat/landowners_guide/habitat_mgmt/Wetland/Building_Managing_Ponds.htm

Land and Water Magazine - Manicured Lawn vs. Functioning Ecosystem:

http://www.landandwater.com/features/vol50no3/vol50no3_1.html

Watershed and Conservation

Center for Watershed Protection: <http://www.cwp.org/>

Natural Resources Conservation Service - Technical Publications:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/plantmaterials/technical/publications/>

United States Geological Survey - Common Environmental Problems in Lakes and Probable Causes: <http://pubs.usgs.gov/fs/fs06303/#heading127927216>

DuPage County, IL, Water Commission: <http://dpwc.org/AboutUs/tabid/86/Default.aspx>

Salt Creek Watershed: <http://www.saltcreekwatershed.org/>

U.S. Environmental Protection Agency - Identifying and Protecting Healthy Watersheds:

http://water.epa.gov/polwaste/nps/watershed/hw_techdocument.cfm

GLOSSARY

Bank: the edge of land leading into a pond.

Bioswale: a managed planting bed designed to remove pollution from stormwater runoff. A swale is a purposeful ditch with gently sloped sides. A bioswale is typically filled with plants that capture water temporarily and allow it to slowly be absorbed into the ground or run into another body of water.

Buffer: carefully selected plants that live next to a pond to stabilize the *bank* (to prevent soil erosion) and filter out pollutants before they drain into the pond.

Detention Basin: usually the lowest spot on the property designed to hold water for a brief time during heavy rainfall. A small pipe or "restrictor" releases the water slowly downstream.

Fiber Rolls: also called fiber logs or wattles, these are tube-shaped erosion-control devices filled with straw, flax, rice, coconut fiber material, or composted material. Each roll is wrapped in UV-degradable polypropylene netting or biodegradable materials like burlap, jute, or coir. Fiber rolls can help prevent erosion and clean the rainwater that runs into ponds.

Fish Kill: a large die-off of fish in a pond, usually caused by reduced oxygen in the water. Oxygen levels are affected by drought, algae bloom, or increase in water temperature. Fish kills can also be caused by diseases, parasites, and poisoning.

Invasive Species: plants or animals that cause economic or environmental harm or harm to human health. These species can sometimes be native but most often are non-native.

Lake: there is no set size definition of a *pond* versus a lake. The State of Illinois defines anything less than ten acres as a pond, but other states may define them differently.

Live Stakes: cuttings from a tree or shrub with the branches trimmed off. These are planted into a pond bank, and the stakes develop roots that stabilize the soil.

Native: originating from the local environment. Not imported from other parts of the country or other continents.

Pond: there is no set size definition of a pond versus a *lake*. The State of Illinois defines anything less than ten acres as a pond, but other states may define them differently.

Predator: an animal that hunts other animals.

Rain Garden: usually a depressed area in the soil that collects rainwater, either from the sky or building downspouts. A rain garden is planted with water-loving plants that absorb the excess water.

Retention Pond: a dredged low area on a property, often a former wetland, designed to hold water. Unlike a detention basin, a retention pond has no pipe to let water drain away.

Sediment: particles of soil and pollution that fall to the bottom of a pond or lake.

Shoreline: the edge of a pond or lake.

Swale: a natural or manmade ditch designed to slow and capture rainwater, rather than letting it run off the land. The water slowly percolates into the ground.

Turbid Water: Cloudy or muddy water that is caused by algae and other tiny floating particles.

Watershed: an area of land that drains into a body of water. In general, the larger the urban watershed, the more opportunity there is for contamination. As a result, a pond functions very differently within a natural environment compared to one in a manmade environment. It is therefore extremely important to identify the causes of problems, rather than simply addressing the symptoms.

Wetland: an area of land that is saturated with water for all or part of the year.



A lawn growing up to the edge of a pond creates many problems, including erosion, excess algae, and geese habitat. The best course of action is to tear out the grass and replace it with a buffer strip of water-loving plants. *Photo courtesy of Integrated Lakes Management*



Creeping water primrose is a highly invasive plant species. Keep on top of this and other invasive species before they overtake the pond and choke out other beneficial plants. *Photo courtesy of Integrated Lakes Management*



While a certain amount of algae growth in a pond is healthy, excess filamentous algae, as pictured above, can block light to the bottom of the pond, compromising its health. *Photo courtesy of Integrated Lakes Management*

Wetlands: Yesterday and Today

Today, 90 percent of the wetlands that used to exist in Illinois are gone, including the animals and plants that lived in them.

Many wetlands were drained with drain tiles, which channel water underground to the closest flowing body of water. These drain tile networks still exist on many agricultural properties.

Today, there are enough drain tiles in Illinois to go around the world six times!

The water-holding ability of the land has been changed drastically by the paving of roads and parking lots, and the construction of homes and other buildings.

As a result, water moves farther and faster than it did a hundred years ago. Back then, many rivers remained dry through most of the year and ran only in times of high water, such as springtime. The soil, gentle contours of the land, and special water-loving plants helped water seep slowly into the ground.

By contrast, today, as we see every spring, summer, and fall, overburdened rivers overflow their banks with devastating regularity. When rivers flood, they can cause millions of dollars in damage.

Keep It Simply Sustainable!

Build a Shoreline Buffer

Lawn grass along shorelines produces a trifecta of problems:

1. Lawn grass planted right to the edge of a pond acts like a big, green welcome mat for rain-washed chemicals, road salts, and lawn fertilizers (which encourage pond algae to grow).
2. Lawn grass also provides the perfect habitat for Canada Geese. They feel safest when there's a clear path between the pond and the shore.
3. Thin, short grass roots are no defense against shoreline erosion.

Lawn grass is a no-win situation. What to do? Ditch the grass around the pond and replace it with a shoreline buffer of native plants. It's a sustainable solution that can address all of these problems and more:

- Native plant foliage and root systems filter out pollutants before they reach the pond.
- Canada Geese fear potential predators may be lurking among the tall shoreline foliage—so they'll abandon your pond.
- These plants' extensive fibrous root systems prevent shoreline erosion by holding the soil.
- Another winning attribute: these native plants do not require weekly mowing or watering!

A REVIEW OF IMPORTANT INFORMATION

What is a Healthy Pond?

- Healthy, diverse fishery as determined by periodic sampling
- 20 to 30 percent emergent and submergent aquatic plants; normal algae density
- 25-foot buffer zone made of native plants and trees that aren't mowed; pockets of shoreline planting are better than nothing if placed close together
- Depth of at least 15 feet for every quarter-acre of surface area
- Irregular shoreline
- Slope of shoreline should have a ratio of 6-feet horizontal to 1-foot vertical
- If pond is less than 7 to 8 feet deep, it may never be a sustainable system; explore options, such as converting to a wetland
- Moving water is good; it provides oxygen

A New Perspective

Look beyond your property's borders to understand the larger ecosystem. What you do on your land affects the surrounding land.

Find more Sustainability Perspectives in the Introduction.

