



How To Restore Lake And Pond
Water Quality Through
Nutrient Management

Lakes, stormwater ponds, reservoirs and other water resources are an important part of any community. Whether natural or manmade, they are places to enjoy the beauty of nature, go boating or fishing, store drinking water, or play a round of golf. Keeping them well maintained is critical to the overall appearance of any property, and, in many cases, a functional or regulatory necessity for managing stormwater. If a pond is laden with thick blooms of algae or losing valuable depth and volume over time, the whole area looks unkept – no matter how well maintained everything else may be.

Maintaining water quality in your lakes and ponds requires experience, attention to detail and an extensive scientific knowledge base. One of the most difficult tasks you will face is balancing nutrient levels in the water. Too few nutrients means the aquatic life quickly dies off, but water that is too nutrient-rich (eutrophic) is a breeding ground for unsightly and unhealthy algae and weeds.

Creating the perfect nutrient balance in your lake or pond makes maintenance easier, water cleaner and aquatic life healthier.



Why Do Nutrients Matter?

Nutrients are absolutely essential to a lake or pond's ecosystem, but the ideal nutrient levels and ratios vary with the type and use of the water feature in question. A recreational fishing pond's nutrients are indispensable to that ecosystem: Without the right balance, algae would disappear, plants would wither and fish would die off. In a short time, the pond would become a lifeless puddle. Natural lakes and ponds are brimming with nutrients, but keeping them balanced is not always easy. While it may be tempting to "let nature run its course," this often results in an algae-infested aquatic system that's virtually useless to anyone but the mosquitoes calling it home. Realistically, there are too many man-made inputs entering the aquatic system for it truly to be considered "natural," anyway. To keep the negatives in check and the positives flourishing, a little science-based manipulation is critical.

Man-made lakes, stormwater ponds or reservoirs often start with less plant and animal life. But, almost immediately upon creation, a waterbody becomes its very own ecosystem. Soon, the same challenges that face older lakes and ponds begin to negatively impact newly constructed man-made water resources. After every rain, runoff from the surrounding watershed flows into the water resource, carrying sediments, organic matter and fertilizer, which begin to accumulate in the waterbody. Coupled with leaves, grass clippings and other organic matter that get into the pond through the ongoing maintenance of the surrounding landscapes, as the pond ages, you have a recipe for significantly accelerated degradation of the water quality.

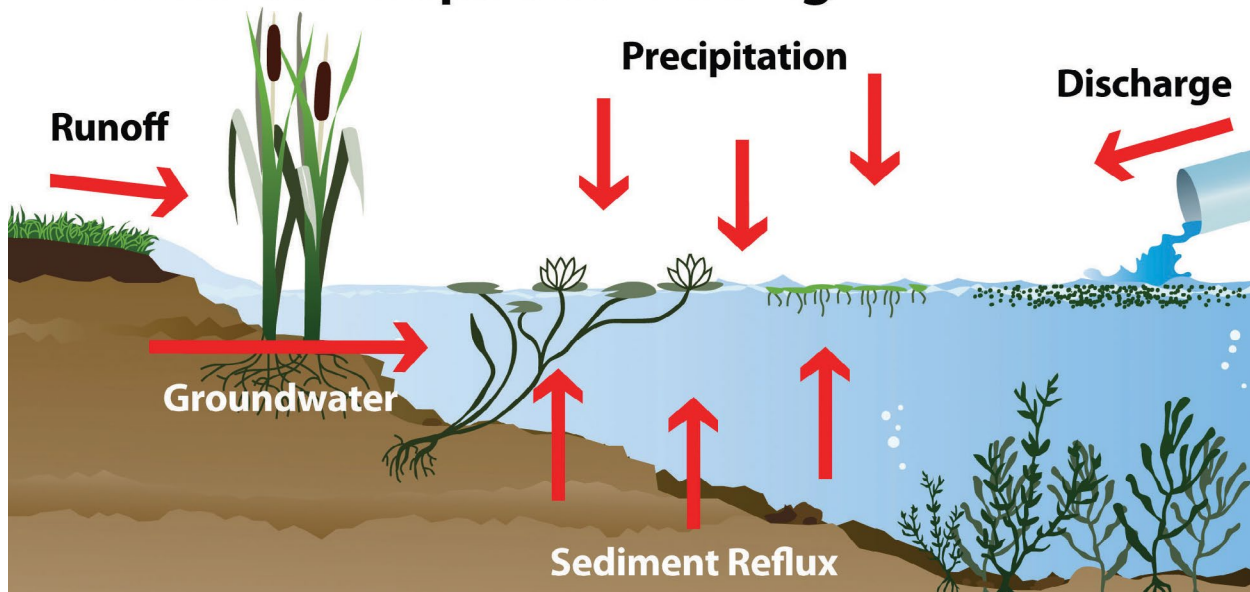


How Do Nutrients Get Into The Water?

An abundance of nutrients are found in lakes and ponds from a variety of sources. The over-enrichment of nutrients in water is called eutrophication, and it has far-reaching implications in all bodies of water.

The soil surrounding the aquatic ecosystem leaches its nutrients into the water. Nutrients seep in when water levels rise or when runoff flows into the waterbody. In addition, waste from livestock and fertilizers used in farming or poorly management turf fertilization programs ultimately find their way into lakes and ponds. The decomposition of organic matter like leaves and grass clippings is also a big contributor to the nutrient load. The breakdown of vegetation, fish and animal droppings, as well as decaying debris, all play a role in adding nutrients – especially phosphorous – to a water resource.

Sources of Phosphorus Loading



What Havoc Do These Nutrients Wreak?

Excessive nutrient accumulation causes aquatic ecosystem changes, such as increases in phytoplankton, filamentous algae, macro algae and nuisance or invasive aquatic weeds. One of the most frustrating symptoms of eutrophication is the creation of unsightly algal blooms, which are toxic at times and dangerous to fish and other aquatic life that are sensitive to dissolved oxygen depletion. If these conditions persist, the bottom of the waterbody often becomes anoxic, and foul odors become prevalent. These conditions also result in an interruption to recreational activities that occur in a lake, stormwater pond, reservoir or recreational fishery.



For residential communities, parks, municipalities, commercial developments, golf courses and anyone else with a lake or pond, these conditions have the potential to be devastating. There are severe financial risks associated with the loss of drinking water, recreational facilities, irrigation sources, valuable crops, nursery stock.

Should They Stay Or Should They Go?

The first step to an effective aquatic management strategy is knowing the difference between beneficial nutrients and those that need to be kept in check. The most common nutrients found in lakes and ponds are:

Nitrogen • Phosphorous • Carbon • Silicon

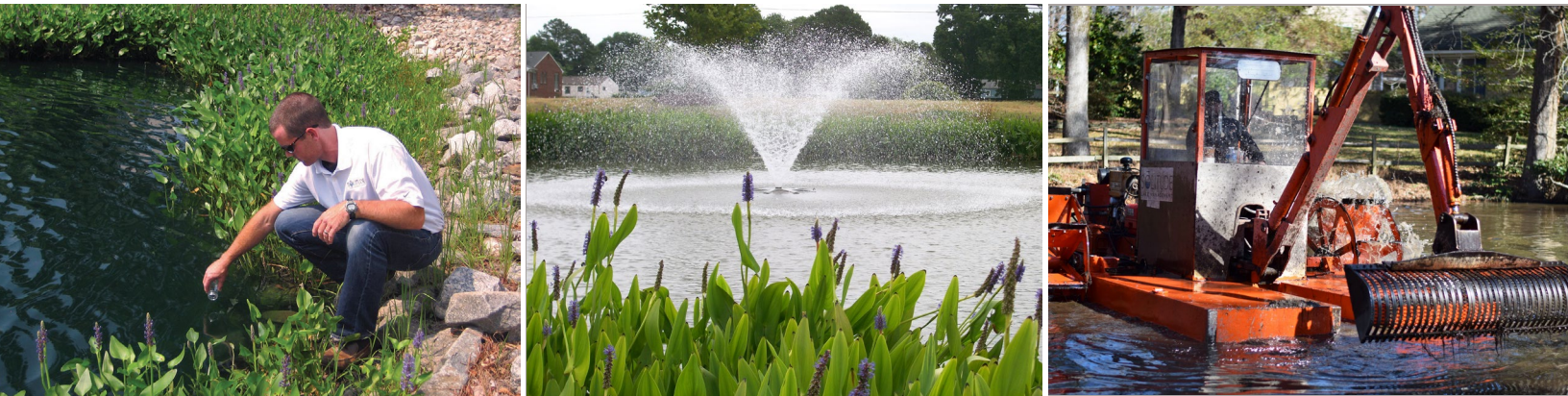
A vital focus for lake and pond management is phosphorous, because it's a food source for algae. Finding ways to control the input and/or existing levels of phosphorous has the most significant impact on water quality. It's important to remember, though, that phosphorous is not the only culprit contributing to impaired waters. Nitrogen is also a limiting nutrient that greatly impacts the water quality issues plaguing many of our lakes and ponds. It is the ratio between these key nutrients that determines the health of your pond.



How Should Nutrients Be Controlled?

Removal and control are not the same. Treating algae with an algaecide, for example, is a very temporary solution: In the short-term, the water clears up. But soon, the dying algae release their nutrients back into the water column as they degrade, which provides potential fuel for new blooms.

Maintaining a controlled balance of nutrients requires consistent analysis and a scientifically based strategy to mitigate and maintain. Water-testing data allows you to understand the total nutrients and other water chemistry constituents, the ratios between them and the overall conditions in your lake or pond. With this knowledge, you're able to formulate a plan to best balance out your aquatic ecosystem.



Mechanical dredging to remove the unconsolidated and typically nutrient-rich sediment layer on the bottom of your lake or pond is the most direct mitigation strategy. However, this process is highly disruptive and extremely expensive, especially for a site like a golf course, where downtime is unacceptable, or a homeowners association with poor access for heavy equipment. Although dredging is inevitable for many sites as their ponds age, the need to do so is greatly deferred with proper management.

So, how do you save money and buy yourself time through sound water quality management? The best proactive management programs typically combine the benefits of water quality testing, aeration, biological controls, improved cultural practices, vegetative buffers, hydro-raking and prescription water quality restoration through the application of natural binding agents that sequester available nutrients from the water column and sediments.



Nutrient Remediation

Binding renders a nutrient unusable, and it's a great way to target specific nutrients. Since phosphorous and, to a lesser extent, nitrogen are the most significant contributors to algae growth, they are often the focus of nutrient binding. Unlike dredging and draining, nutrient binding costs much less in terms of time and money – and, most important, a golf course that uses this method of treatment stays open for business.

Aluminum Sulfate

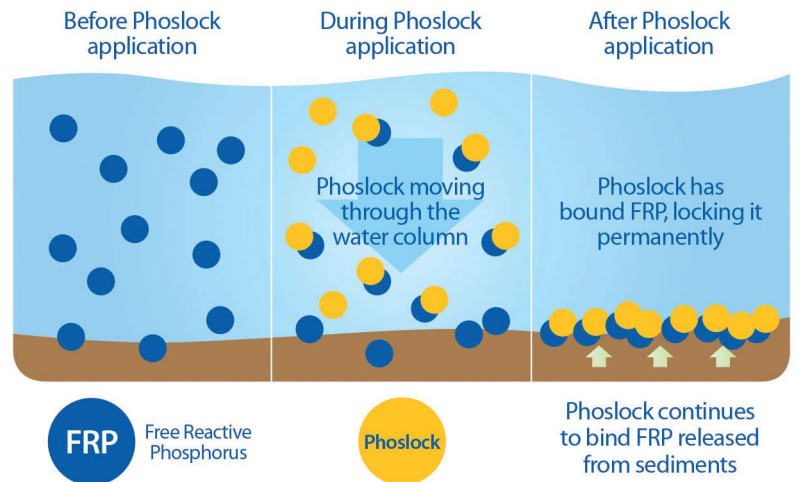
Aluminum sulfate, also known as Alum, is often added to water to bind with phosphorous. It eliminates the ability for algae to feed on phosphorous, ultimately purifying the water and decreasing turbidity. Alum is often applied as a nutrient remediation solution in large lake systems using a small barge with tanks, which spread alum across the water. As alum falls to the bottom of the lake, it makes contact with nutrient-heavy sediment. In a process called flocking, the alum binds with the nutrients, preventing them from supporting future algae and plant growth.



Phoslock

A comparable tool called Phoslock works similarly. Phoslock is a mineral (lanthanum) with an extremely high affinity for phosphorus. It is embedded into bentonite clay to create a product that binds with available phosphorous in water. Applied to the surface of the water in granular or slurry form, Phoslock may be used in both mitigation and maintenance

applications. Any unbound lanthanum sinks to the bottom of the waterbody with the clay, and continues to release and sequester phosphorous until all the lanthanum in the waterbody is saturated. This highly efficient method of mediation also eliminates the need for shutdown during treatment, much to the delight of golf course superintendents, community managers and recreational lake managers everywhere.



Bichar

For waterbodies that experience regular water movement, a new technology called Biochar is making waves. Biochar is produced from wood products processed in a high heat, low oxygen environment to create highly porous, carbon-rich properties with a high affinity to absorb contaminants. Biochar is produced in the form of chips or powder, which are then introduced to a lake or pond in permeable socks or bags. The bags absorb undesirable nutrients as water flows through. After all pores are full, the material can be disposed of or repurposed as garden fertilizer. Depending on water quality, the socks can actively collect nutrients for up to two years.





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Biological Bacteria Applications

While it may seem counterintuitive to add more microorganisms to your lake or pond, supplementing your waterbody with beneficial bacteria inoculations is another great strategy for nutrient management. Since the beneficial bacteria in the waterbody are typically able to outcompete algae for the available food sources (namely phosphorous), they help to enhance water quality and prevent the conditions that are otherwise favorable for issues like foul odors and algal blooms.

Beneficial bacteria also aid in the decomposition process. In a form of “biological dredging,” certain types of bacteria may be added to water to speed up the decay of organic matter in the substrate. In digesting the decaying matter, beneficial bacteria may eliminate sludge on the pond’s bottom, add depth to the waterbody and improve water quality.

Aeration

Properly sized aeration systems are often the backbone of any sustainable lake or pond management program. The benefits of aeration are many, and in almost every case, the water quality in a waterbody is greatly enhanced through the addition of aeration. The improved circulation and destratification, and the increase in dissolved oxygen throughout the water column that results from good aeration, enhance water quality and help prevent eutrophication.

The improved dissolved oxygen also positively impacts fish and other aquatic organisms, and limits the likelihood of fish kills and other water quality issues that often result from excessive algae growth. Aeration is achieved in many ways, including submersed air-diffused aeration systems and floating fountain aerators.



Nanobubble Aeration Treatments

Nanobubble aeration treatments offer a premium lake management tool designed to naturally control algae by providing unparalleled direct and lasting oxygenation of the waterbody. This technology is EPA-registered, lab tested and proven to kill algae. The microscopic bubbles produced by these cutting-edge systems remain within the water column, rather than immediately rising and popping at the surface. As a result, dissolved oxygen levels are stabilized at desirable levels for 2-3 months at a time, often transforming a waterbody in a matter of days or even hours without the use of traditional herbicides.



Beneficial Vegetative Buffers

Beneficial vegetative buffers are a smart addition to any new lake or pond. Installing beneficial buffers, consisting of native vegetation along the shoreline areas and within the inflow channels and forebays of a lake or pond, help anchor any long-term integrated management plan. Naturally occurring beneficial plants along the shoreline areas of a water resource should be encouraged to grow and thrive. Well-established vegetative buffers help filter runoff and remove nutrients from the water, prevent erosion, stabilize the shoreline and firm the substrate. Forebays are designed to trap sediment in a small area near the mouth of the pond, facilitating frequent and small-scale removal while preventing accumulation in the main body of water.



Lakes and ponds that have been subject to many years of erosion may require more a more impactful shoreline solution. Depending on the type of waterbody on your property and degree of sedimentation, rip rap, a bulkhead or coconut coir logs may be utilized to protect the shoreline. However, the most comprehensive and technologically advanced solution is a biodegradable woven mesh system called ShoreSOX. SOX systems help transform eroded banks while facilitating the growth of new buffer plants and vegetation. SOX are an ecologically-friendly,

completely customizable solution that is guaranteed to stabilize shorelines for at least 10 years.

Hydro-raking

Mechanical hydro-raking is a widely used and effective technique for selective removal of nuisance, rooted vegetation in lakes and ponds. The hydro-rake is also used to clear accumulations of unconsolidated bottom muck and debris (i.e. decaying leaves, peat, etc.). Its ability to effectively remove all organic debris from the bottom of a pond make it an ideal choice for routine maintenance that will help to prolong or prevent the need for future dredging. Removing plants and debris will help to reduce the overall nutrient load, minimizing volume loss and the risk of common water quality issues like foul odors and nuisance algae blooms.



Dive Deep Into Your Own Waters

Ideally, you would have pristine waters with no maintenance or management effort. In reality, the absence of an aquatic resource management plan means that water quality suffers, unsightly algae flourishes and your waterbody is rendered unsightly or unusable. Invest in a proactive lake and pond management strategy that incorporates water quality restoration based on the principles of ecological balance and scientific knowledge. By doing so, you ensure that your waterbody is not only healthy and beautiful, but that the management program being used to keep it that way is sustainable and environmentally sound.





Put your waterbody in the hands of the experts. SOLitude's team of biologists and environmental scientists has the expertise to start you on the path to a perfect lake and pond management strategy.

Visit us online at solitudelakemanagement.com
or call **888.480.LAKE** (5253)
to speak with one of our aquatic resource professionals.

Restoring Balance. Enhancing Beauty.