

How to Naturally Combat Muck, Algae and Foul Odors

**Nanobubble Technology:
A Restorative Tool for Lake Managers**

MOLEAER®
ADVANCING NANOBUBBLE TECHNOLOGY



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If you're a lake or pond manager or owner, you're probably all too familiar with the frustrating problems that can plague your water body. There's an independently validated and proven tool that can help keep your water clear, healthy and more resilient to these problems.

That tool is nanobubble technology.

Nanobubbles kick-start natural lake recovery processes to restore lake ecosystems.

How to Reduce Muck, Algae and Foul Odors without Chemicals

Lakes and ponds can be wildlife habitats and recreational retreats but unfortunately, they can also suffer from a variety of issues that can make them unpleasant and even unsafe. Common issues include muck buildup, excessive algae growth, foul odors, and water quality issues. Without a proactive lake management plan and the right tools, it may be difficult and even costly to combat these problems.

Nanobubble technology helps kick-start natural lake recovery processes to combat these problems and restore water quality for healthier, more resilient water bodies.

Researchers all over the world are studying nanobubbles for a variety of applications. These studies have validated the use of nanobubble technology as a restorative tool to improve lake and pond health.

The *Chemical Engineering Research and Design* journal published the article, “Fundamentals and applications of nanobubbles: A review”. They studied sediment decontamination and lake management applications of nanobubbles and found that nanobubbles reduce pollution, mitigate hypoxia and anoxia, improve dissolved oxygen levels, help with algae control and deliver more benefits.

Independent researchers have also validated Moleaer’s nanobubble technology. Paul Westerhoff, Professor at Arizona State University (ASU) School of Sustainable Engineering and member of Nanotechnology-Enabled Water Treatment (NEWT), confirmed the

oxidative properties of Moleaer’s nanobubbles and the formation of hydroxyl radicals in their [study](#). Michael Stenstrom, UCLA professor and aeration expert, proved Moleaer’s nanobubble technology achieves >85% oxygen transfer efficiency at standard conditions (SOTE) per foot of water compared to less than 3% SOTE per foot of water with conventional aeration methods. Additionally, Reza Ovissipour, Virginia Tech, [demonstrated](#) that Moleaer’s nanobubbles eliminate pathogens like e. Coli and Listeria on surfaces within five minutes of exposure.

In this eBook, we’ll take a look at some common lake and pond issues, the importance of proactive management, and how nanobubbles can help to restore water bodies.



Common Lake and Pond Problems: Nutrients, Muck, Algae, & Foul Odors

Lakes and ponds can have several issues that arise due to human activities, as well as natural occurrences. Human activities such as agricultural runoff, untreated sewage, industrial waste, and improper land use can all lead to contamination of the water. Natural occurrences such as changes in water levels and erosion can also cause problems. All of these issues can lead to changes in water quality and have an impact on the aquatic life in the lake or pond.

We'll dive into some of the most common issues lake owners and managers experience: high nutrient concentrations, muck buildup, excessive algae growth, and foul odors.

High Nutrient Concentrations

Lakes and ponds accumulate high levels of nutrients mainly from runoff from nearby agricultural land and urban areas. This runoff contains fertilizer, animal waste, and other pollutants that can cause large algae blooms and create an overabundance of nutrients, such as nitrogen and phosphorus. Too much of these nutrients in the water can lead to excessive growth of algae and aquatic plants, which can deplete oxygen levels in the water, making it difficult for fish and other aquatic organisms to survive. This problem is known as eutrophication, and it can threaten the health of entire ecosystems.



Common Lake and Pond Problems: Nutrients, Muck, Algae, & Foul Odors

Muck

Muck is a type of organic sediment that can accumulate in lakes and ponds, often consisting of decomposing plant material, algae, and other organic matter. It can have a variety of negative impacts on the health of a lake or pond, including low oxygen levels, reduced water clarity, and the release of harmful gases. Muck can also contribute to the proliferation of harmful algae blooms (HABs), which can be toxic to aquatic life and humans.

Algae and HABs

Algae are a type of plant that can grow in lakes and ponds when there is an abundance of nutrients available. Algae can lead to reduced water clarity and decreased oxygen levels in the water. In addition, some types of cyanobacterial (called blue-green algae and referred to as harmful algae blooms or HABs) can produce toxins that are harmful to humans and animals.

Algae blooms have become an increasing problem for many bodies of water. Algae consumes oxygen and sunlight needed for other aquatic life, such as fish and plants, often leading to massive fish kills. These blooms can also lead to an unpleasant smell and appearance. Also, overtime, the resuspension of organic material in the water can negatively impact the health of lakes and cause fish kills. By reducing fertilizer and other nutrient runoff, we can help to reduce the amount of algae and keep our lakes and ponds healthy. However, this prevention tactic isn't always possible depending on the lake's location and environment.

Foul Odors

Foul odors in lakes and ponds are a sign of water pollution and poor water quality. When pollutants such as sewage, fertilizers, and agricultural runoff enter the water, dissolved oxygen levels decline and hydrogen sulfide (H_2S) is produced, leading to an unpleasant 'rotten egg' smell. In some cases, the smell can be strong enough to be detected from a distance and can cause health issues. This can be a sign of serious water contamination and should be taken seriously.



Creating a Proactive Lake Management Plan

It is estimated that nearly two-thirds of the world's lakes are eutrophic, meaning they are nutrient-rich and often plagued by problems such as algal blooms, excessive aquatic weed growth, muck accumulation and foul odors. While there are many different factors that can contribute to these problems, one of the root causes is typically the same: an imbalance in the ecosystem.

This is where proactive lake management comes in. Proactive lake management is all about taking a holistic approach to solving problems, rather than simply treating symptoms. It's about understanding the importance of sustainability and using restorative

tools to prevent or mitigate problems before they occur. And one of the most effective restorative tools available today is nanobubble technology.

A good lake management plan includes a variety of control methods, though a proactive plan focuses on tools that are restorative, preemptive, and sustainable. Using a combination of tools, including beneficial bacteria, enzymes, nanobubble technology and other sustainable tools, lake owners and managers can restore water bodies with lower impacts on the environment, ecology, or bottom line.



Creating a Proactive Lake Management Plan

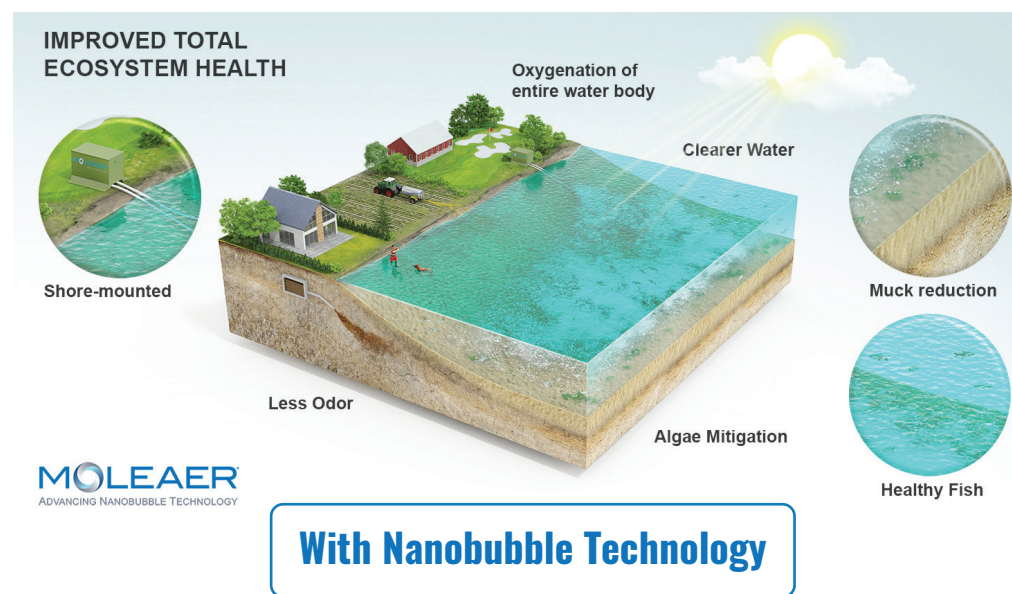
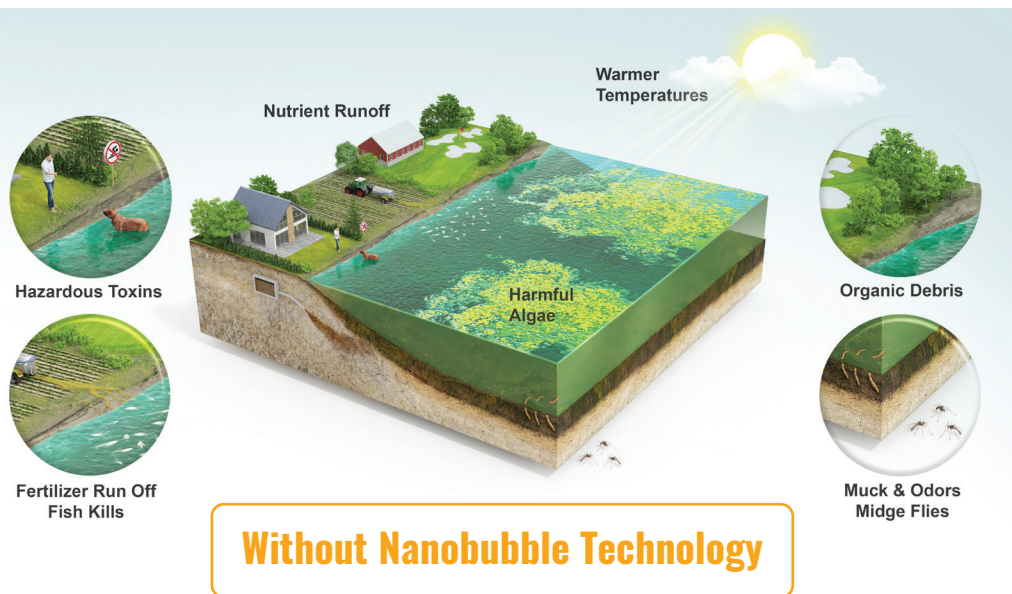
Using Nanobubble Technology to Naturally Restore Lakes & Reduce Common Problems

Nanobubbles are tiny bubbles of gas (typically oxygen or air) that are under 200 nanometers in diameter. They are created when pressurized air or gas is injected into water, and they have a number of unique properties that make them ideal for proactive lake management. When used in lakes and ponds, nanobubbles can have a profound impact on water quality, reducing muck, algae and foul odors.

Nanobubbles increase dissolved oxygen concentrations throughout the entire water column, particularly at the lake bottom, which significantly enhances the lake's natural recovery processes. This

oxygenation reverses anaerobic conditions, stimulating aerobic microbial activity that immobilizes phosphorus and curtails nitrogen release, thereby reducing internal nutrient loading and mitigating algae growth. Enhanced dissolved oxygen levels also lead to the breakdown of accumulated organic matter or "muck," improving water clarity, increasing the water body's depth, and providing a better habitat for fish and aquatic vegetation.

Additionally, higher oxidation-reduction potential (ORP) in the water due to nanobubbles boosts the lake's ability to degrade contaminants and organic matter, including algae toxins and foul-smelling gases like hydrogen sulfide and methane, resulting in safer and more pleasant conditions for both aquatic life and human recreation.



Creating a Proactive Lake Management Plan

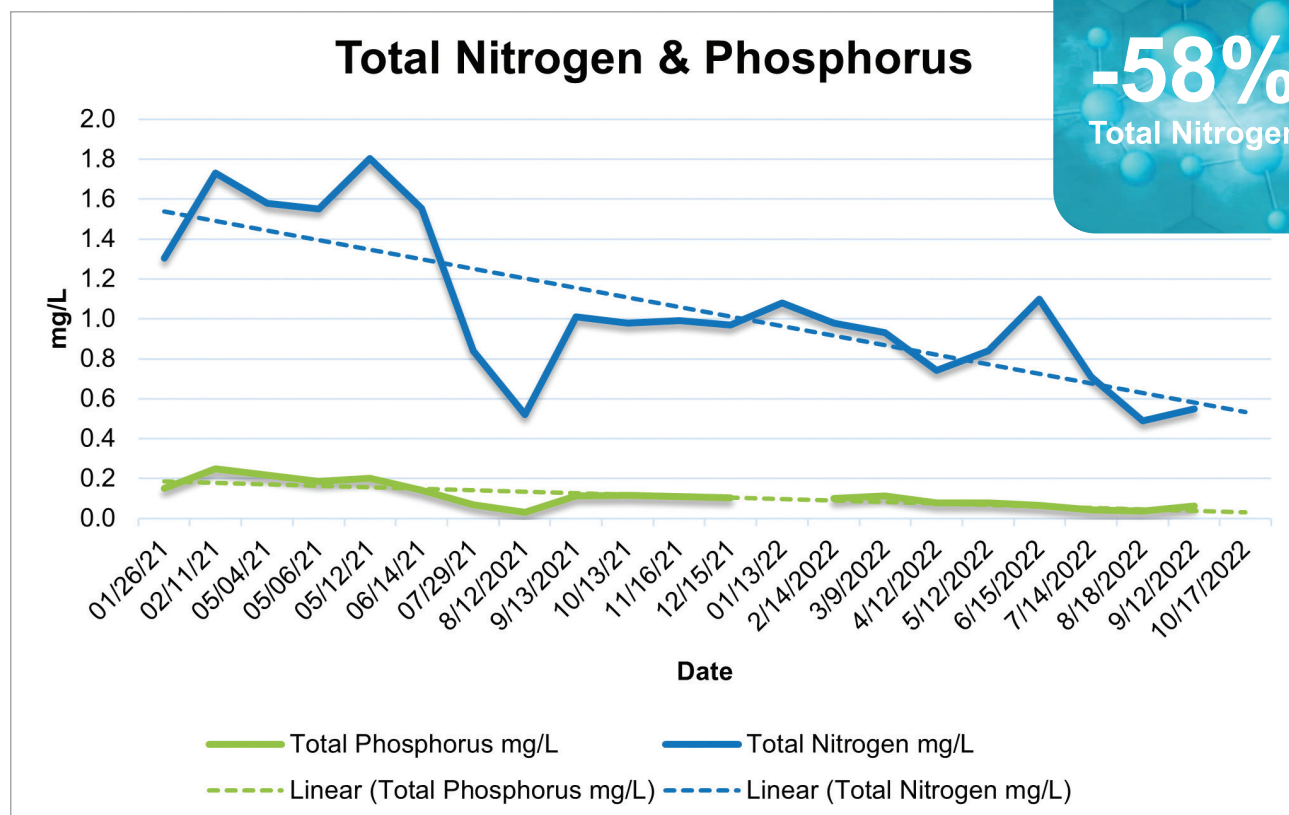
Controls for Common Lake Problems

High concentrations of nutrients can be hard to control once established. Prevention is key to reducing nutrient impact, however, traditional aerations systems have been used with less efficacy. Nanobubble technology, with highly efficient gas transfer, has been proven to increase dissolved oxygen much more effectively and helps reduce nutrients.

At Lake Theresa in Orlando, Florida, nanobubbles improved water quality and turbidity while reducing total nitrogen and phosphorus levels. Nanobubble technology processes nitrogen in the water, incorporating it into the natural food chain and making it less toxic to aquatic life. In the presence of iron, nanobubble technology also enables the sequestration of phosphorus, lessening its impact on the aquatic environment. These two parameters improve water quality and help restore lake health.

There are several ways that muck can be controlled, including physical, chemical and chemical-free methods. Common methods tend to be reactive, only controlling muck once it's become a major problem. Physical methods tend to be a

last resort option for most lake and pond managers because they disturb the ecology, are often costly and require heavy equipment. These methods include dredging and barriers. Chemical methods include chemical pesticides to control aquatic plants and enzymes and bacteria to break down organic material. Each has varying levels of efficiency, environmental impact and cost.



Creating a Proactive Lake Management Plan

There are several methods to control algae growth in lakes and ponds. One of the most common is to add a natural enzyme that helps to break down the nutrients that the algae needs to survive. Conventional aeration has been commonly used, however, with little efficacy on algae. Additionally, adding certain species of fish such as grass carp and fathead minnows or certain aquatic plants can help to reduce the amount of algae in the water.

A cost-effective, environmentally friendly option is using nanobubble technology to kick-start lake recovery processes to increase natural muck digestion. This results in clearer, healthier water bodies and reduces the occurrence of algae blooms.

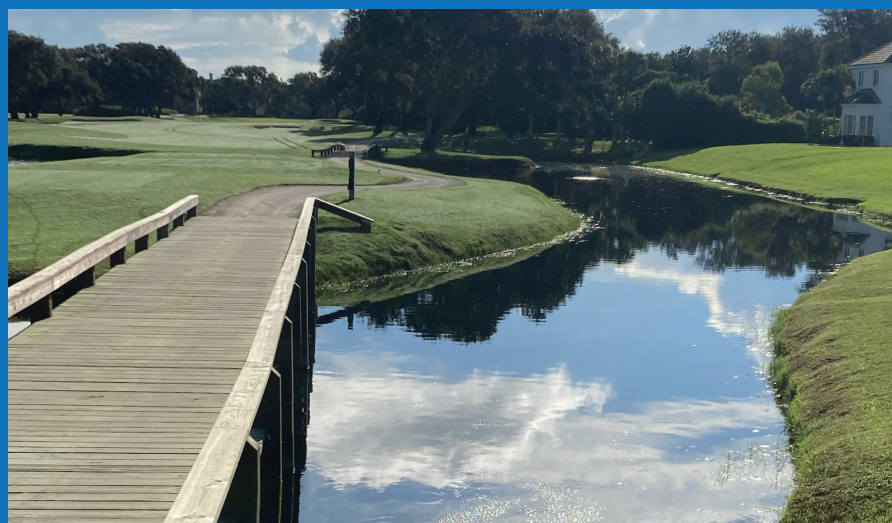
At a coastal golf course in Florida, nanobubbles reduced algae growth and foul odors, helping to restore water clarity.

To prevent and reduce foul odors in lakes and ponds, it is important to reduce runoff from agricultural land and decrease the number of pollutants entering the water. Prevention is not always possible, though there are proactive tools, like nanobubble technology, to address increased nutrients in the water and keep the dissolved oxygen levels optimal to reduce H₂S formation.

There are many other benefits of nanobubble technology as well, but these are just a few of the most important when it comes to proactive lake management. When used as part of a comprehensive plan, nanobubbles can be an extremely effective tool for preventing or mitigating many of the common problems associated with eutrophic lakes and ponds.



Before



After

Case Studies:

Promote Healthy & Resilient Lakes and Ponds



Sands Community Lake, Florida

15 surface acres, 150-acre feet

- Eliminated fish kills
- Reduced midge fly outbreaks
- Improved discharge quality into surrounding ecosystems

[Download Case Study](#)

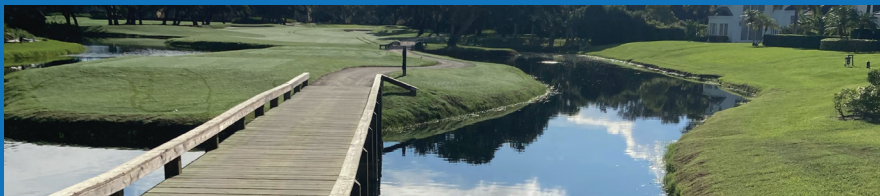


Lake Arrowhead Marina

295 acres with a 2.5-acre marina area

- 100% higher DO levels than control after 75 days
- Improved water clarity by more than 3 feet
- Improved sediment hardness composition

[Download Case Study](#)



Private Golf Club, Florida

2.87 acres, 14.35-acre feet

- Reduced algae
- Improved water clarity
- Eliminated foul odors

[Download Case Study](#)



Private Trout Pond, Wisconsin

- Improved water clarity
- Reduced algae blooms
- Reduced gill lice parasites in trout

[Download Case Study](#)

Nanobubble Solutions from Moleaer

Moleaer offers nanobubble systems specifically designed for lakes and ponds, the Titan Series, Clear and Kingfisher. Depending on the size of the water body and goals, Moleaer's team of experts will help you pick the best nanobubble generator for you.

TITAN™ PRODUCT SERIES



CLEAR™ NANOBUBBLE GENERATOR



KINGFISHER™ NANOBUBBLE GENERATOR



The Titan Series offers Moleaer's most modular and scalable nanobubble generators to treat even the largest of water bodies. The Clear is designed for larger lakes and ponds with flow rates of 50 or 150 GPM, while the Kingfisher is designed for smaller-sized lakes and ponds and has a 40 GPM flow rate. Both are easy to install and maintain, shore mounted and quiet.

Learn more about our nanobubbles generators on our [product page](#).

Ready to Combat Muck, Algae, Foul Odors, or High Nutrient Concentrations with Moleaer's Nanobubble Technology?

Our team of experts can help find the best product for your goals, water body size and site conditions. [Contact us](#) today to get connected with an expert in your region.



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