

# *Water Quality Solutions!*



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### **Water Quality Problems Introduction**

Water quality problems have numerous causes and various symptoms. These problems can be thermal, nutrient, chemical, aquatic plants, or organism related. A single pond can, and will, have several of these problems occurring simultaneously because they are all related with cause and effect relationships.

Most of the time, the best thing to do when deciding to address your pond or lake water quality problems is to consult a local, reputable lake management professional. They should have the equipment and knowledge needed to diagnose the problem and ways to fix it, as well as being up to speed with local, regional, state, and federal restrictions and regulations pertaining to pond and lake management. It is a good idea to have some background knowledge, however, so you will be able to tell if the suggestions make sense and are worth doing.

Water quality problems cover a wide array of individual cause and effect relationships. As stated in the first paragraph, the basic breakdowns of poor water quality are typically related to temperature, nutrients, pH, aquatic plants, and fish and other living organisms in the water. If you have a good idea of what your pond or lake is suffering from, you can see more detailed information on these subjects in the Aeration, Temperature Solutions, Nutrient Solutions, Aquatic Plant Solutions, Algae Solutions, and Fish & Wildlife pages. Below are a few water quality parameters and some information on each.

## **Dissolved Oxygen Problems**

Dissolved Oxygen (DO) is one of the most important water quality parameters concerning your fish and other aquatic life in your pond. It is a measure of the amount of oxygen dissolved in the water that is available for aquatic life and is typically measured in Parts Per Million (PPM). Cold water has the ability to hold more dissolved oxygen than warm water.

Dissolved oxygen levels fluctuate with the time of day and the activities in the pond. During the nighttime hours, plants stop producing oxygen in the photosynthesis process and actually start using up oxygen. Fish and aquatic life activity such as feeding also uses up dissolved oxygen in the pond. Another large dissolved oxygen user is bacteria. During the decomposition process, bacteria use oxygen to breakdown organic material. During a plant or algae die off, decomposition rates greatly increase and so does the demand for oxygen. This can drastically drop the dissolved oxygen rates and cause fish die off.

Dissolved oxygen is provided from plants during the photosynthesis process, diffusion of oxygen at the air-water interface, wind/wave action, and cascading or splashing water. However, this often is not enough to support large fish populations, especially during the late summer. A great way of adding supplemental dissolved oxygen is to add an aeration device.

## **Temperature Problems**

Temperature problems are caused from uneven warming or cooling of your pond. During the summer, the surface water is warmed and the colder, denser bottom water does not get warmed as much. This causes two distinct layers of water with a dividing line, called a Thermocline. The problems associated are due to inadequate mixing of the water. Oxygen diffused into the water from the air is not mixed with the cooler bottom water. Therefore, you have a warm, oxygenated layer of water on top of a cool, low oxygen level layer at the bottom. When the surface cools in fall, it becomes denser than the bottom and the pond "turns over" called Turnover. This causes a mixing of all water and an overall decrease in dissolved oxygen levels. Turnover can lead to massive fish die off and major problems with your pond.

## **Nutrient Problems**

Nutrient problems are the most common cause of aquatic plant and algae problems. Nutrients can enter the pond naturally from leaves of nearby trees, die off of existing aquatic plants, wildlife waste, etc. The biggest problem is with unnatural, non point source pollution or runoff. The runoff of nutrients from fertilized lawns, farm fields, cattle pastures, grass clippings, roadways, etc. add large amounts of nutrients to your water. This sets off a major aquatic plant and algae growth, which leads to more problems.

## **Aquatic Plant and Algae Problems**

Aquatic plant and algae problems, as stated, are typically caused by increased nutrients in the pond. Plants produce energy through photosynthesis. During this process, they use sunlight and carbon dioxide to produce energy and oxygen as a byproduct. However, during the night when there is not sunlight, the plants use up oxygen and give off carbon dioxide. Therefore, oxygen levels drop all during the night in your pond and could harm your fish and overall water quality. Also, when the plants die off, especially a massive algae bloom die off, the oxygen levels drop drastically over a short period of time. When the plants die, bacteria begin to decompose the organic material and use up oxygen quickly and causing the overall dissolved oxygen in the pond to drop.

## **Other Living Organism Problems**

Other living organisms can also cause problems in your pond. Wildlife that use your pond are adding nutrients with their waste and can create an unbalanced pond ecosystem. Too many or too few fish and of the wrong species can also have a negative affect on your pond and the overall water quality. Also, as stated earlier, bacteria are a major player in water quality of your pond. They breakdown the organic material during decomposition. The two ways of decomposition are aerobic and anaerobic. Anaerobic occurs without oxygen present and is a slow process that has byproducts of sulfur dioxide and other sulfur compounds which give you the rotten egg smell in your pond sediment. It is also not the greatest for your fish. Aerobic decomposition occurs in the presence of oxygen and is much quick with a byproduct of carbon dioxide.

## **Clarity Problems**

Clarity of the water can pose a water quality problem. Lack of clarity or turbidity can have several causes, but the effects are typically the same, cloudy water and decreased aesthetics of the pond. The cloudy water can prevent sunlight from reaching the aquatic plants in the pond, which wouldn't be bad if your pond is overrun with weeds. However, most ponds with turbidity problems do not have much aquatic vegetation to begin with because the cloudiness of the water is caused by bottom sediment mixed up in the water column. The lack of vegetation allows for the sediment to be stirred up and then it blocks the sunlight to prevent further growth. A cloudy pond can also decrease your enjoyment of your pond. Typically, the turbidity is from stirred up sediment, such as clay, or it can be organic, like planktonic algae. If the turbidity is caused by bottom sediment, to fix it is usually a waiting game, however there are some products available which will help remove the cloudiness. If it turbidity is caused by organic growth, the organisms can be treated.

## **pH Problems**

The pH level is a numeric value that indicates the relative acidity or alkalinity of the water on a scale of 0 to 14, with neutral at 7. Acidic water has pH levels below 7 and basic or alkaline water has pH levels above 7. Most lake and pond organisms prefer pH levels of 6.5 to 9. The pH levels in a given pond can fluctuate daily and is determined by complex relationships between carbon dioxide, hardness, alkalinity, photosynthesis, and respiration. If pH levels are not maintained, there could be negative affects in your pond.

Alkalinity or basic materials such as carbonates, hydroxides, phosphates, and bicarbonates are common in pond environments. Alkalinity is the buffering capacity of a pond or lake. This buffering capacity is important to allow pH levels to remain constant even with the introduction of acids from non point source pollution and acid rainfall. If pH levels are too acidic, lime is a common additive to bring the pH back to normal levels. Maintaining a healthy pH for your pond will help your pond organisms to thrive.

## **Hardness Problems**

Water hardness is the measure of divalent ions in the water. Some common causes of hardness are calcium and magnesium carbonate. If you go through a lot of salt in your water softener in your home, and your pond is in your backyard, there is probably a good chance you have hard water in your pond as well. Hard water can decrease the effectiveness of certain algae and aquatic plant chemical treatments. It can also limit the growth of plankton in your pond and limit fish growth.

## **Common Theme: Oxygen and Water Movement**

As you can see from a general overview of the common water quality problems, water movement and oxygen play a major role in each problem and effects of those problems. A balanced pond ecosystem always includes adequate levels of oxygen. Aeration is a great way to combat these problems and limit the negative effects of them. Adding an aeration device will add vital dissolved oxygen to your pond and also water movement.

The water movement will help combat the temperature problems by mixing the water and lowering or eliminating the thermocline. The added oxygen will help reduce the negative effects of Turnover. If the pond does experience Turnover, it will be a much less drastic event and the pond will be able to handle the mixing much better.

Water agitation at the surface will help mix the water and vent off some of the extra nutrients entering your pond. Also, the water movement will help desirable aquatic plants out compete more undesirable ones that use up the extra nutrients in your pond.

The extra oxygen added from the aeration device will buffer your pond from an aquatic plant or algae die off so your fish do not die. Even when oxygen levels are low after the die off or at night, the aerator is providing oxygen for the pond. Also, the water movement will help limit the growth of algae and other aquatic plants. It will limit the amount of sunlight that is able to penetrate the water and decrease plant growth.

The dissolved oxygen is also great for the fish and wildlife in the pond as well. Oxygen will allow the decomposition process to occur aerobically, which is faster and a more efficient way. The byproduct of carbon dioxide will be vented off with the added agitation at the surface, as well.

## **How Kasco Can Help**

Overall, oxygen is a balancing agent in your pond. Most water quality problem causes and effects are related to an unbalanced system and one that lacks adequate oxygen levels. Aeration tends to create a healthier pond

or lake with its added oxygen levels, water agitation at the surface, and mixing of water throughout the water column. There are several aeration devices available and you can see more detail in the Aeration page.

Kasco offers several models and sizes of aeration equipment to suit your ponds needs. Kasco's Pond Aerators are a surface agitator/aerator that floats at the surface and splashes the water. This model is great for adding oxygen to the pond and has a high flow rate. These are Kasco's most efficient model at adding oxygen. They come in 1/2, 3/4, 1, and 2hp sizes.

Kasco's Water Circulators are horizontal mixers of water. They float at the surface on a horizontal float, or can be mounted to a dock or below a boat. These models are great for water movement and directional flow. These are Kasco's most efficient models at moving and mixing deep water. They come in 1/2, 3/4, 1, and 2hp sizes.

Kasco's Aerating Fountains are the best of both worlds when you are looking for a nice display in your pond. They add oxygen, water movement, and give you a beautiful display feature in your pond. They come in 1/4, 1/2, 3/4, 1, and 2hp sizes.



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