

# What You Should Know About Water Quality and Ponds

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## *Pond Management Fact Sheet*

Many pond owners are curious about the quality of water in their ponds. This fact sheet is designed to provide you with basic information about some of the factors that affect your pond.

### **What Temperature Should the Water in My Pond Be?**

The best temperature for your pond will depend on the kinds of fish present. For example, trout are very sensitive to high temperatures. If you want trout to survive in your pond, the maximum temperature in the summer months should be no greater than 70 degrees F. This requires a relatively deep pond with a good source of fresh, cold water and plenty of shade. Fish such as bluegill, bass and catfish are considered warm-water fish, and will grow best at water temperatures between 64 and 90 degrees F. These fish will survive in shallow ponds, and it is not as important that the pond have a reliable source of fresh, cold water.

### **What Is pH, and What Does It Have to Do With My Pond?**

pH is a measure of the hydrogen ion (H<sup>+</sup>) activity in water; the more hydrogen ions in the water, the lower the pH, and the more acidic the water is. Normal pH ranges from 0 to 14. In general, the best pH for aquatic life ranges between 6.5 and 8.0. Fish can survive at pH levels outside of this

range; however, growth is slowed, and spawning often will not occur. You can test the pH of your pond using inexpensive equipment, or you can have your pond's water tested by one of many water testing laboratories in the state. Be careful when testing your pond, however, as pH changes through the day. During the day, when aquatic plants are photosynthesizing, the pH will rise as carbon dioxide is used by plants. At night, plants release carbon dioxide, and pH falls.

In most cases, problems occur in Maine ponds when the pH is too low. If the pH of your pond does not rise above 6.5, you should consider treating your pond. Apply agricultural lime at a rate of one to two tons per surface acre. After a few weeks, test the water again. You may need to apply more lime at this point.

### **Should I Be Concerned About Dissolved Oxygen?**

Dissolved oxygen (DO) is the free oxygen available for fish and other aquatic life. The amount of dissolved oxygen in the pond varies throughout the year and throughout the day. Water has a greater capacity to hold DO at lower temperatures. Therefore, DO concentrations in water are generally greater in winter than summer. Since plants release oxygen only in the presence of sunlight (during

photosynthesis), the DO content of water will be greater during the day than at night. DO will reach its lowest level in a pond just prior to sunrise, since no oxygen has been released by plants during the night, and oxygen has been used during the night by plants and animals. DO concentrations in ponds commonly vary from 10 parts per million during the mid-afternoon to four ppm or less at sunrise.

No specific statement can be given as to the minimum dissolved oxygen concentration required to support fish life. This is because fish vary in their oxygen requirements due to age, water temperature, the concentration of other materials in the water and other factors. However, a minimum DO level of five ppm should be sufficient to keep fish healthy.

Water can be tested for dissolved oxygen using relatively inexpensive test kits. DO should be checked just prior to sunrise, or if fish are swimming at the water's surface and "gulping air." If the DO level is less than two ppm, steps should be taken to add oxygen to the water. Possible methods for adding oxygen to the water include:

- Adding fresh water to the pond.
- Using a pump to remove water from the pond and spraying it back onto the surface of the pond.
- Running an outboard motor so that the top half of the propeller is out of the water. The splashing will trap oxygen in the water.

### **What Is "Turnover"?**

Pond water experiences an annual cycle of seasonal temperature changes. The density of water is greatest at 39.2 degrees F (4 degrees C). Such water is found at the bottom of a pond when the pond's surface is covered with ice.

The colder water above the bottom is less dense and the lightest water (about 32 degrees F) is just under the ice.

During this winter stagnation period, the upper portion of the pond contains enough oxygen for aquatic life, but there may be little oxygen in the deeper parts due to consumption by bacteria decomposing dead plants and animals. At this time, there may not be enough dissolved oxygen in the deeper water to support fish and other aquatic life. Some oxygen may be produced by microscopic plants (algae) in the upper region of the pond just under the ice, where enough light is available for photosynthesis. However, snow covering the ice can reduce light intensity to the point where oxygen cannot be produced. It may be a good idea to try to use a pump to keep part of the pond open all winter if fish production is an important management goal. Also, one can pump oxygen into the pond through a bleeder hose.

As the weather becomes warmer, the pond's surface warms from 32 degrees F to its maximum density at 39.2 degrees F, and the heavy surface water sinks. The surface water mixes with deeper water and the lighter, colder water rises from the depths, becoming oxygenated by spring winds. This spring turnover mixes the pond water so that water temperature is almost uniform at all depths and all the water has a high oxygen content.

A pond turnover may also be caused by a cool rain shower with wind and wave action forcing the surface layer to one side of the pond. When this happens, the cooler surface water falls to the bottom and forces the bottom water to the upper portion of the pond. Upon mixing of the two layers, dissolved oxygen may become so low throughout the pond that a fish kill results. Also, gases (such as

hydrogen sulfide, methane and carbon dioxide) from the decomposition of organic matter by bacteria can also be particularly toxic.

During summer, temperatures of the surface waters increase rapidly and become much less dense than the deeper, cooler water. This warm surface water stays at the top of the pond throughout the summer (due to its lightness) and does not mix with the cooler water below. In deep ponds, fish are mainly confined to the warm, upper levels of the pond during this summer stagnation period since the colder depths usually contain inadequate oxygen supplies.

In autumn, the surface water cools toward the temperature of the deeper water. As this water cools and becomes heavier, it sinks and mixes with the deeper water, until all the water has the same temperature and density. This is the fall turnover, and its effect on fish depends on the relative size of the well-oxygenated top layer. As vertical circulation takes place, stagnant water moves to the surface. Here it releases CO<sub>2</sub> and other undesirable gases and is recharged with dissolved oxygen. A fish kill can result when this occurs, especially if it occurs rapidly when the surface layer is low in dissolved oxygen.

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For more information on ponds and water quality issues, contact your County Extension office.

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