forestry & natural resources
WILDLIFE AND FISHERIES

Fish Kills in Indiana – Their Causes and Prevention

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For anyone who has a stocked pond - and there are thousands in Indiana - fish kills can be quite a problem. The condition called "fish kill" occurs when a number of fish in a given body of water die from a specific cause. Among these causes are chemical pollution, water quality (pH, hardness, oxygen supply, etc.), old age, physical disturbance, oxygen depletion, parasites, blue-green algae, and/or disease.

Often, fish kills can be anticipated and measures taken to prevent them.

The most common cause of fish kills in Indiana ponds is oxygen depletion. Oxygen depletion results when conditions create a greater demand for oxygen than the aquatic environment can produce. Oxygen depletion can occur in both winter and summer.

Winter kill

The conditions which produce oxygen depletion in winter are quite different from those which result in summer kills. The results of a winter kill are seldom noticed until spring when the ice melts. Then the dead fish, often the larger ones, are seen washing up along the edge. Because they require more oxygen, the large fish suffocate and die first.

During winter, most ponds are covered by ice. The oxygen supply under the ice depends on the passage of light through the ice and the resulting production of oxygen by the tiny algae in the water. If the ice is snow-covered, sunlight cannot penetrate and the plants cannot produce oxygen. Just an inch of snow can shut out as much as 90 per cent of the light; and five inches will shut out about 99 per cent.

The existing oxygen is then gradually used up by the respiration of the fish and by natural decay processes. If the snow remains on the ice long enough, the fish will suffocate.

Generally, not all the fish are killed. Some are more resistant to low oxygen levels than others. In addition, poor conditions may not exist uniformly throughout the pond. So, the result may be that the larger fish, such as bass, die, leaving the smaller, immature fish in the pond. This creates conditions further unbalancing the pond population very quickly.

Preventing winter kill

Pond design is important to preventing winter kill. In Indiana, ponds should be at least eight feet deep over at least 25 per cent of the pond area. Greater depths are even better.

If, however, an eight foot depth isn't possible, a six foot depth over at least half the pond is an alternative. Deepening the pond and/or removing build-ups of dead and decaying organic matter from the pond will help preserve the oxygen.

Removing snow cover from at least 59 per cent of the pond surface may help. But, unless the ice is thick enough to hold a person or small tractor, this can be very dangerous. Be sure the ice is sufficiently thick! Chopping holes in the ice won't help.

Summer kill

The most common cause of summer fish die-offs is the same as winter kill - oxygen depletion. But the causes of depletion may be more complex than with winter kills. Summer depletion can result from oxygen removal by excessive quantities of plants, animals or decaying organic matter.

This can be caused by overstocking, overfeeding, over fertilization, pollution from barns, feedlots, improper septic drainage, or chemical treatment of aquatic weeds during the critical months — June through September.

Another common cause of summer fish kills occurs when a dense growth of submerged aquatic plants or algae in a pond dies suddenly from natural causes or from herbicides.

The decay process from the dead plants may use up the oxygen in the water. This type of summer fish kill almost always happens about sunrise, when the dissolved oxygen is at its low point for the day.

Another condition leading to summer fish kill, and related to the plant die-off, is high water temperatures. During July, and especially in August, water temperatures in ponds may reach 85-95°F. Water can hold much less oxygen when its temperature is above 80°F.

When overcast skies persist for several days, while temperatures are high and winds are calm, a fish kill may occur. Plants cannot produce sufficient oxygen at reduced light levels and calm weather reduces the exposure of water to oxygen in the air. Therefore, the dissolved oxygen may disappear entirely.

Signs of oxygen depletion

1. Large numbers of fish are seen at the water surface gulping air at night or early in the morning. When disturbed they dive, but quickly return to the surface.
2. If oxygen depletion is not severe, fish are at the surface in the early morning but go to deeper water as oxygen builds up during the day. This may continue or several days. If the owner is observant it will give him time to take corrective action.
3. Although feeding is not recommended in Indiana, if fish are being fed they will suddenly stop eating.

Prevention

Conditions leading to fish kills from aquatic plant die-offs and temperatures can be alleviated by controlling rooted aquatic vegetation and algae. When plants are dense, chemically treat only a portion of the pond at one time and allow that part of the vegetation to decay before further treatment.

In new pond construction, a bottom-water overflow outlet will reduce the chances of a die-off. Briefly, this type of outlet releases water from the pond bottom. Contact the local Soil Conservation Service office for details on this construction.

Emergency treatment is suggested if signs of oxygen depletion are observed. Steps should be taken immediately to prevent losses.

Physical treatments

1. Flush the pond with fresh aerated water from a well or adjacent pond.
2. Spray water from a 2 to 3 foot depth into the air with a pump.
3. In small ponds, add oxygen by stirring the surface water vigorously with an anchored outboard motor.

Chemical treatment

There is a chemical treatment to alleviate oxygen depletion temporarily, but this should not be attempted without obtaining advice from a fisheries biologist.

Emergency treatments will help alleviate oxygen depletion. However, the key to preventing oxygen depletion is first, proper pond construction, and second, proper pond management. After the emergency has passed, find and eliminate the cause of oxygen shortage.

Other factors causing fish kills

Fish kills can also be caused by organic pollution, chemical run-off, and disease. Organic pollution from barnyards, feedlots, and faulty septic system drainage consumes oxygen as it decays and quickly depletes oxygen content in the pond. Fish kills from these sources of pollution often occur after a rain has washed quantities of these materials into the pond.

Steps should be taken to prevent all organic waste from entering ponds. Preventive measures include properly installed tiling, grading, and/or diversion ditches.

Pesticides used on farm crops or in home yards and gardens may wash into a pond during heavy rains and cause a fish kill. Fish may die from the direct effect of the chemical.

Caution should always be exercised in the selection of pesticides and in the time of application.

In the spring or summer a few fish may be found dead along the shoreline. Such mortality is often the result of natural causes. The natural resistance of fish to disease is lower in the early spring than at any time of the year. Larger fish seem to be more susceptible, but, it may also be a simple case of old age. Heavy parasite infestation may also be a cause of death.

There are other less common causes of fish kills, but those dealt with here will account for the great majority.

Restoring the balance after a fish kill

Generally, to correct the population imbalance resulting from a fish die-off, regardless of cause, it is best to renovate the pond. That is, kill the remaining fish, either with a chemical or by draining, and restock.

If there is a question concerning the severity of the kill, contact the district fish management biologist, Indiana Department of Natural Resources, for advice on checking the pond's fish population.

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