



Fish Kills

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Few things are as upsetting to a pond owner as discovering large numbers of dead or dying fish. In addition to the loss of fish, there are often worries about the safety of the pond water for livestock, human uses or other purposes.

Water tests available through OSU's Soil Water and Forage Analytical Laboratory (SWAFL) are not recommended for routine investigation of a fish kill. The leading cause of fish kills is lack of dissolved oxygen. Because samples change rapidly it is impractical to test for it in the lab.

Why ponds run out of oxygen

Ponds normally produce dissolved oxygen in excess of the amount needed by fish. It is produced through photosynthesis by microscopic algae in the water column ("green water") or by submerged aquatic plants. But oxygen is never abundant and always vulnerable to being used up, especially when a large amount of organic matter is decomposed by oxygen-consuming bacteria. This can happen when algae in the water column suddenly die or the pond mixes top to bottom, also known as a pond turn-over.

Measuring dissolved oxygen levels

If fish kills are encountered on a somewhat regular basis, consider obtaining a simple means of determining oxygen levels, such as a chemical test kit. One example is the CHEMetrics Dissolved Oxygen test kit, Model K-7510 (Figure 1). Store your test kit at cool or room temperature and it should last indefinitely. If you do a test within a day or two after the kill, you will have a good indication of whether or not low oxygen levels were the cause. Very early morning testing is recommended. There is no hard and fast lethal lower limit for dissolved oxygen - It varies by fish species and lifestage. Generally speaking, dissolved oxygen levels below 3 ppm for prolonged periods are stressful and relatively short exposures to levels below 1 ppm are often lethal.

Without having a way to measure oxygen levels, the following steps will allow you to assess the likely cause of the kill and be able to determine the best way forward:

Step 1. Determine if fish have died in less than one day or are dying over a period of multiple days or weeks. Sudden die-offs indicate that either low dissolved oxygen or something toxic is responsible.

Step 2. Look for other signs that help indicate the cause of the fish kill:

- Is there runoff into the pond bringing chemical fertilizers or animal wastes? Is there a black smelly layer of organic matter on the pond bottom? These things contribute

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Figure 1. A relatively inexpensive chemical test kit for dissolved oxygen concentration. The ampule neck is snapped, and water is drawn up into it. A simple color comparison indicates the concentration of oxygen.

nutrients to the pond fueling excess growth of algae or other plants, often leading to depletion of oxygen.

- Has the color of the water changed from green to brown or green to clear or is there a scum on the surface? These changes may indicate a die-off of microscopic algae (phytoplankton). Such die-offs result in dropping dissolved oxygen levels as the dead plant matter decomposes.
- Has a cold front with strong winds occurred? Deeper than average ponds are vulnerable to turnovers, especially in the fall. The warmer top water layer contains all of the pond's oxygen and it is used up as it mixes with organic matter from the cold bottom layer of water.
- Are fish seen gulping air at the surface, especially in the early morning? While not always seen, this is a strong indication of low dissolved oxygen levels.
- Are turtles, snakes, frogs or other air breathing animals also dead? Do some fish exhibit tremors or extended pectoral fins? These are signs that a toxic substance may be responsible. Unfortunately, SWAFL is not equipped to test for toxic substances. The [ODEQ hotline](#) might be contacted if these and other signs of chemical pollution are present.

Other kinds of fish kills

Fish also die for other, infrequent reasons. These include

- Diseases and parasites - These typically kill fish in recreational fishing ponds slowly, in limited numbers. These kills typically affect only one species of fish while the others may remain healthy. Signs include swollen abdomens, bulging eyes, sores, and other abnormal appearances.
- Spawning stress during the spring, especially in catfish. Look for scratches on the skin indicative of fighting.
- Lightning strikes
- Prolonged ice cover that blocks sunlight penetration due to cloudiness of the ice or snow cover. While “winterkill” is common in northern states, it is almost never experienced in Oklahoma and the other southern states.
- Abnormal hardness and alkalinity levels, sometimes referred to as “gypsum water.” In such cases fingerlings die soon after stocking. An Irrigation Water Test done through SWAFL will allow this to be determined. [Water Quality Testing and Fish Health](#)

Should I remove dead fish?

It is not essential to do so. Generally, there is no serious impact to leaving the fish to decay in place or be consumed by wildlife. However, if the smell or appearance is an issue, remove as many as practical and bury them.

Is the water safe?

Laboratory tests cannot determine the safety of water following a fish kill. But you can do an on-site check by holding baitfish or other small, inexpensive fish in a bait bucket in the pond.

(Never dump baitfish, pet fish etc into your pond – they can harm the quality of fishing by competing with bass and bluegill for insects and smaller food items.)

Restocking?

Dissolved oxygen levels generally return to normal within a few weeks as the water greens up with a new phytoplankton bloom and will likely be suitable for fish stocking. See the guidance in [Fingerlings for Pond Stocking](#).

If the pond was occupied by stunted or undesirable species, this could be a great opportunity to begin afresh. Drain and dry the pond completely until the bottom soil cracks to ensure that no bullheads, common carp, or other hardy, undesirable species survive. If you are thinking about getting free fingerlings from the Oklahoma Department of Wildlife Conservation, contact your local Game Warden or ODWC field office for an application and to see what they require as proof of complete fish elimination. Establishing and managing a pond fishery is outlined in [Improve Fishing in Your Pond](#).

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