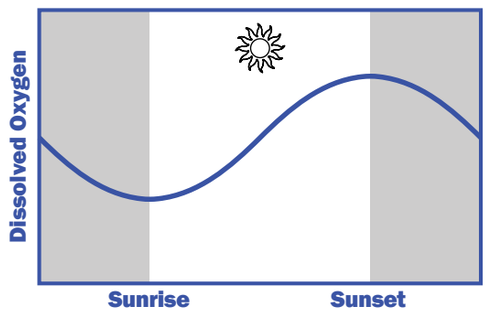
The sudden appearance of dead fish in a lake or canal causes considerable concern and alarm for most people. The first reaction is to suspect that somebody has poisoned the water body. However, most fish kills result from natural events. Too little oxygen in the water is the primary cause of fish kills in south Florida. Cold weather also results in kills of non-native tropical fish that have become established here. Fish kills resulting from the presence of illegal chemicals in the water are rare.

Causes of fish kills

■ Lack of dissolved oxygen

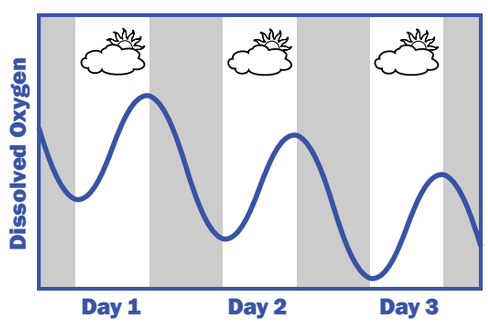
O_2 Fish, like people, need oxygen to survive. Most dissolved oxygen (**DO**) in the water is produced by aquatic plants through **photosynthesis**, but some also enters the water directly from the atmosphere by **diffusion**. At the same time, however, oxygen is being removed from the water by the **respiration** (breathing) of fish, plants, and other underwater inhabitants. Decomposition of plant and animal matter in the water also consumes oxygen.

Fish usually require a minimum of 5 milligrams per liter (mg/l) of DO for optimum health. Most fish can tolerate DO below 2 mg/l for short periods, but start dying when DO drops below 1 mg/l. Under normal conditions, the DO in a water body is lowest in the morning just before the sun rises. As the sun comes up and aquatic plants begin to photosynthesize, the oxygen level rises steadily and continues to do so until the sun sets. Then the DO level drops continuously until sunrise occurs again.



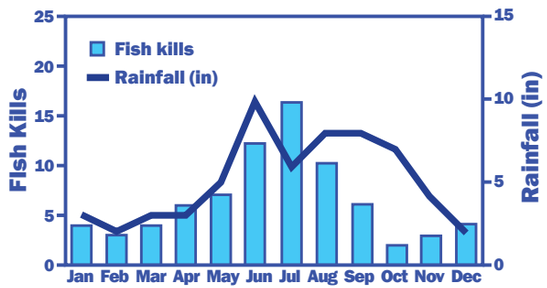
The normal daily cycle of dissolved oxygen production. Production starts when the sun rises and stops when it sets.

During cloudy weather with less available sunlight for photosynthesis, the DO may not return to the previous day's high. The next morning starts with a lower-than-normal oxygen level. If more cloudy days occur, the amount of oxygen can drop even lower.



Several continuous days of cloudy weather can repeatedly drop the oxygen level lower and lower.

Several other factors can contribute to low DO. The rains associated with south Florida's summer weather can wash large amounts of organic material (such as grass clippings and lawn fertilizer) into the water. Their decomposition will use up even more oxygen. In addition, warm summer water cannot hold as much dissolved oxygen as cooler water can.

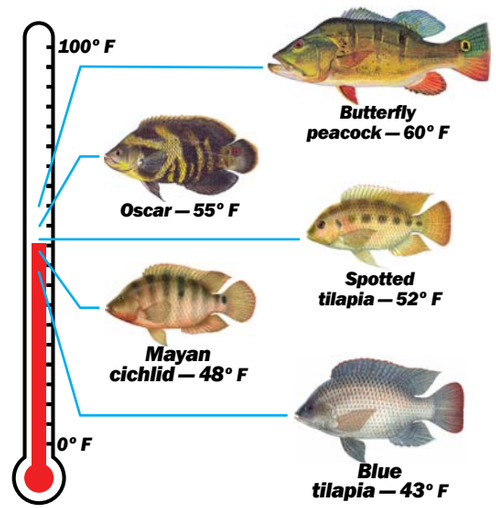


Most of south Florida's fish kills occur during the summer rainy season.

(Data from South Florida Water Management District.)

■ Low temperatures

Native south Florida fish are rarely killed by cold. However, more than 30 freshwater **exotic fishes** (fishes from other countries) are reproducing in Florida. Most of these species come from warm tropical climates and are less adapted to live here. During cold weather, water temperature may drop low enough to cause a fish kill. These kills are characterized by dead fish of only one to a few kinds of exotic species.



Different exotic fishes have different lower lethal temperatures.

(Fish illustrations by Diane Peebles and Duane Raver, Jr.)

■ Spawning stress

Spawning stress is common in spring when most fish reproduce, although in south Florida many species continue to spawn throughout summer. A fish kill resulting from spawning stress usually involves adults of only one species.

■ Diseases and parasites

Viruses, bacteria, and fungi are common causes of fish disease; fish parasites include various protozoans, crustaceans, flukes, and worms. These often cause visible lesions or

sores on a fish's body, fins, eyes, or gills. A disease-related fish kill is often characterized by dead fish of only one species.

■ Algae blooms

Blooms (rapid reproduction and spread) of algae may cause fish kills. Some algae are actually toxic, but most algae-related fish kills result from low DO caused when the algae rapidly dies off due to lack of sunlight and begins decomposing. An algae bloom is usually obvious as a visible scum or film of green or brown on the water's surface.

A combination of various natural events is the cause of most fish kills. Any of these mentioned—such as low DO levels affecting fish already weakened by spawning stress or disease—can be contributing factors.

■ Human induced

Man's interaction with his environment can sometimes cause fish kills. If pesticides, herbicides, or fertilizer are applied on land prior to heavy rain, chemicals washed into the water may kill fish. Excessive or improper use of aquatic herbicides may result in a kill as well. However, a fish kill following an aquatic herbicide application is usually caused by low DO due to decomposition of the treated vegetation, rather than directly by the chemical itself.

These are the most common causes of human-induced fish kills.

Chemical spills can cause fish kills too, but are rare. In these cases, there may be other dead animals present (birds, turtles, frogs, etc.), and there may be a visible "film" on the water's surface.

Preventing fish kills

- Do not chemically treat large areas of vegetation in or around a waterbody during hot times of year.
- Do not fertilize or use pesticides when and where heavy rains can wash material into nearby waters.
- Leave a buffer zone of vegetation along shorelines between uplands and water.
- Do not dump organic material such as leaves, grass clippings, etc. into or alongside waterbodies. These can increase nutrient loads immediately or when the water level rises and floods the decomposing material.
- If aeration is desired, use an air pump with underwater diffusers instead of fountains. An air pump circulates water deeper and more efficiently throughout the water column.

If a fish kill occurs

- Record the location, date, and time.
- List affected fish and/or wildlife species, and estimate the numbers and sizes of each.
- Observe any sores, lesions, or unusual coloring on affected animals.
- Note recent weather patterns.
- Note water level and color, and look for a "film" on the surface.
- Look for large dead areas of vegetation around the waterbody.
- Talk to surrounding property owners and identify any recent activity in or around the lake regarding herbicides, pesticides, or fertilizers.
- Observe surrounding inflows for possible chemical spills.

Even during the worst fish kills, some fish survive and will eventually replenish the population.

Report fish kills
Florida Fish and Wildlife Conservation Commission Fish Kill Hotline: 1-800-636-0511.

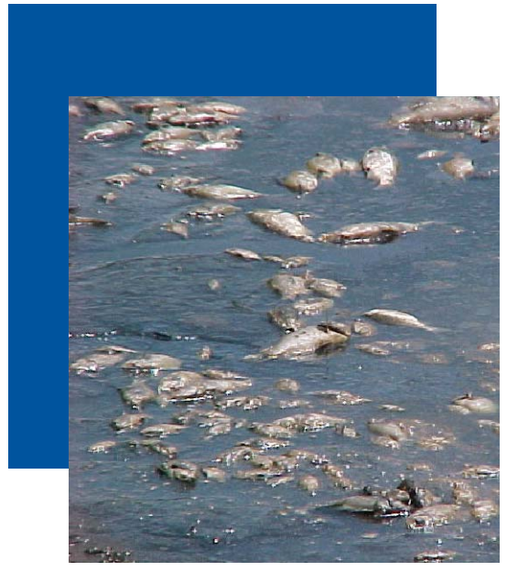
Report hazardous substance spills
Florida's 24-Hour Hazardous Substance Hotline: 1-800-320-0519 or 850-413-9911.

Fish health diagnostics questions
University of Florida Department of Fisheries and Aquatic Sciences: 352-392-9617.
fishweb.ifas.ufl.edu/Contact.htm

Florida Department of Agriculture and Consumer Services: 321-697-1400 or 386-330-5700.
doacs.state.fl.us/ai/labs/lab_sub_hints.shtml

Paid for in part by Sport Fish Restoration monies.

Freshwater Fish Kills in South Florida



Causes and Prevention

Florida Fish and Wildlife Conservation Commission
MyFWC.com