# Clemson University
# Department of Pesticide Regulation

# How to Prevent Pesticide-Related Fish Kills

## *A Guide for Homeowners and Pesticide Applicators*


***Department of***

***Pesticide Regulation***

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**Bulletin 10**


The Clemson University Department of Pesticide Regulation (DPR) is responsible for education and enforcement of laws related to safe pesticide use. Part of this involves preventing the loss of natural resources in South Carolina's coastal and fresh water areas while maintaining efficient control of insects and other pests.

### Who is Responsible for Investigating Pesticide-Related Fish Kills?

Each year, inspectors with the Department of Pesticide Regulation investigate pesticide-related fish kills in South Carolina lakes, streams, ponds, and salt-water inlets. **A fish kill comprises large numbers of dead or dying fish, not just one or two.** Locations of these kills range from farm ponds, ponds located on or adjacent to golf courses, apartment buildings and condominiums, as well as salt water inlets and tributaries of SC rivers. Croaker, mullets, and bluegills are among the most common South Carolina fish reported.

The Department of Pesticide Regulation works together with other State agencies and the agricultural community to ensure that the continued availability of effective pesticides is not compromised by unwise, illegal, or inappropriate use. In the late 1980s and early 1990s, for example, the Department of Pesticide Regulation fought for and maintained a special pesticide registration to replace an environmentally harmful pesticide with a milder one. This eliminated a series of fish kills that had plagued coastal tomato growers in South Carolina for years.

### How Do Pesticide-Related Fish Kills Occur?

Fish kills occur when pesticides are improperly applied to or otherwise end up in bodies of water through either misapplication or drift. In the past, these incidents have primarily been a coastal problem, but in recent years, the Department has seen pesticide-related fish kills throughout the state. They are most common in ornamental lagoons around golf courses, apartment complexes, *etc*., and similar locations where low water and high temperatures combine with intensive landscape maintenance. Many of these lagoons and ponds were designed to control runoff and drainage, not as fish habitats.

### Are all Fish Kills Pesticide Related?

It is important to remember that not all fish kills are pesticide-related. In fact, the number one cause of fish kills is a naturally-occurring phenomenon caused by a result of low levels of dissolved oxygen kill (or DO kill). DO kills occur when the total demand for oxygen by biological and chemical processes exceeds the oxygen input by aeration and photosynthesis. Indications of a DO kill include fish dying abruptly in the early morning hours (between 2:00 a.m. and sunrise). In a DO kill, the larger fish species will die first because of the increased oxygen needs of a large fish. The smaller fish may survive a DO kill, but they will characteristically be at the water surface attempting to gulp air. This process is known as flaring. In a DO kill, the water will generally be brown, black, or grayish in color with an odor similar to that of sour cabbage. Other fish kills not involving pesticides can be linked to a result of a rapid proliferation of algal blooms, as well as fish disease.

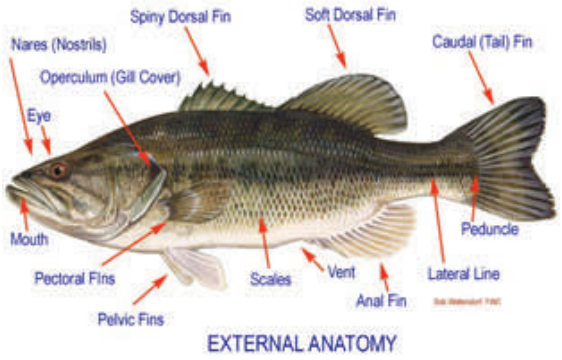
## Where Do I Get Information about a Pesticide?

Most pesticide labels contain very specific language about how a pesticide product should be mixed, what application equipment should be used, and where or when it can be applied. Phrases like “do not apply to water” or “do not apply to areas bordering any bodies of water” provide clear guidance for determining when a violation has occurred. Failure to follow the label directions is a violation of the South Carolina Pesticide Control Act (http://www.lpitr.state.sc.us/code/t46c013.htm) and may subject the violator to penalties.

## What are the Symptoms of a Pesticide-Related Fish Kill?

Determining whether a fish kill is “natural” or pesticide-related is often difficult; however, fish affected by pesticides will generally show some of the following characteristics within 24 hours of a pesticide application:

1. Lethargy.
2. Loss of equilibrium.
3. Dark, often reddish, discoloration (hemorrhaging) in muscles beneath the dorsal fin.
4. Hypersensitivity; erratic, uncoordinated movements (Fish, when startled, will often swim rapidly in circles.).
5. Tremors, convulsions, and “coughing.”
6. Gross involuntary extension of pectoral fins and opercula.
7. Spinal curves due to involuntary muscle contractions.
8. Death.




**External anatomy of a fish.**

In a fish kill that is a result of pesticide exposure, the smaller fish will die off first, unlike the larger fish in a dissolved oxygen (DO) kill. A pesticide-related fish kill can occur any time of the day, and the water will appear to be normal in color with no unusual odor. Other signs to look for in a pesticide-related fish kill are deaths of other aquatic and semi-aquatic animals such as turtles, frogs, invertebrate insects, shrimp, and crabs. There may also be evidence of secondary mortality in birds of prey or other scavengers feeding on the dead fish.

## What Can I Do if I Suspect a Pesticide-Related Fish Kill?

During an investigation of a potential pesticide-related fish kill, DPR inspectors will typically conduct interviews and take environmental samples to test for pesticide residues. The following information is especially important:

1. Time of day the kill started.
2. Kinds and sizes of fish present.
3. An estimate of the number of fish killed.
4. For fish production ponds, the number of fish in the pond, when it was stocked, and the amount and type of food being fed.
5. If fish kills have occurred in adjacent bodies of water.
6. If fish kills have happened previously in the same body of water.
7. If you have observed any possible applications of pesticides near or in the body of water.
8. Local weather conditions at the time you noticed the fish kill and weather conditions during the preceding 24 hours.

It is critical that DPR inspectors be notified immediately if a pesticide-related fish kill is suspected. Environmental conditions can change rapidly, and most modern pesticides are not very persistent. Measurements and samples must be obtained and stabilized quickly, especially in flowing or tidal systems where the chances of obtaining representative information decrease with each passing hour. If done quickly, corrective action can usually be taken to reduce further losses.

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