



Pesticide Educational Program

Understanding Fish Kills

Introduction

Natural conditions often cause water quality to deteriorate to a point where fish cannot survive, especially during hot weather. Nonetheless, many incidents which involve the death of large numbers of fish are the result of our industrialized society. Industrial pollutants from mining and petrochemical industries, as well as wood and food production, cause fish kills every year throughout the United States.

Municipal sewerage, storm runoff from urban areas, pest control activities and power generation can also cause water quality problems associated with fish kills. Under certain weather conditions, problems resulting from agricultural production practices such as nutrient and pesticide runoff can contribute to fish kills in natural and man-made aquatic habitats.

The cause of a fish kill can usually be determined by trained professionals if an investigation begins immediately. They know what to look for and the correct procedures to follow in gathering and reporting evidence. When a qualified professional is notified and can come quickly to the scene of a recent fish kill, corrective action can usually be undertaken to reduce future losses.

In some situations, fish kill investigations result in the filing of lawsuits. For this reason, it is imperative that the investigator be able to collect reliable evidence and follow strict procedural guidelines for the evidence to stand up in court.

Oxygen Depletions

Many people are under the false impression that fish kills in natural waters are always the direct result of man-made chemicals and toxins. Although many substances can kill fish directly in large numbers if accidentally introduced into aquatic habitats,

most fish kills are caused by oxygen depletion from algae die-offs and/or weather-related "turnovers."

Phytoplankton are microscopic, single-celled algal plants suspended in the water column. Water with a greenish tint usually indicates that phytoplankton are present. Phytoplankton "blooms" occur when excess nutrients such as nitrogen and phosphorus are present. These nutrients may come from natural sources or may result from pollution by fertilizers or detergents. Phytoplankton use these nutrients along with sunlight to grow and multiply through a process called photosynthesis. As a result, dense populations of phytoplankton often occur.

Municipal sewerage discharges and runoff from improperly applied agricultural fertilizers or animal feedlots are often sources of excessive nutrients in canals, streams and rivers. In fish ponds, especially commercial catfish ponds, excessive nutrient levels result from over-fertilization, runoff and uneaten fish feed. Excess nutrients usually end up dissolved in the water where phytoplankton can use them to grow. (For more information on algal blooms in fish ponds, see Extension publication #2472, "Algal Blooms in Fish Production Ponds.")

Phytoplankton blooms add oxygen to the water in the sunlight as a by-product of photosynthesis but consume some of this oxygen at night. If a pond, bayou or other water body experiences several days of hot, calm and cloudy weather, the amount of oxygen added to the water from photosynthesis will not be sufficient to compensate for the amount of oxygen used by the phytoplankton, fish, bacteria and other organisms. When this occurs, oxygen levels can drop to zero, causing a fish kill which usually happens in the early morning hours.

Occasionally a phytoplankton bloom dies suddenly. Phytoplankton die-offs can occur naturally or can be caused by inadvertent herbicide contamination. As the die-off progresses, millions of bacteria use the dead plant cells for food, and these bacteria consume large amounts of oxygen. Since the algae are no longer producing oxygen through photosynthesis, oxygen levels can drop to zero regardless of light conditions.

What To Look For

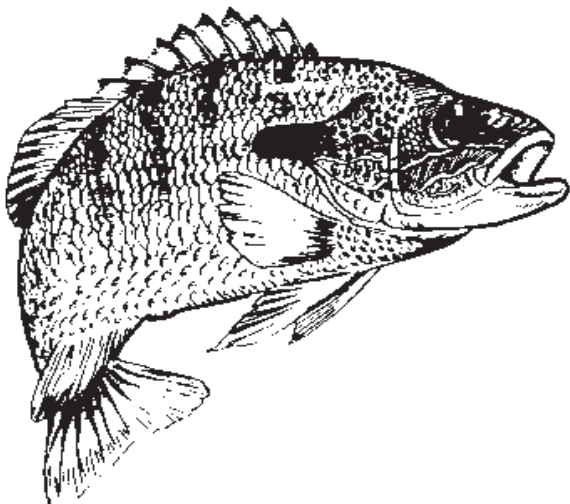
Some of the physical signs to look for when an oxygen depletion is suspected are:

- Fish gasping, swimming at the surface, acting sluggish
- Some fish species affected much earlier than others
- Larger fish die earlier than smaller fish of the same species
- Kill occurs at night or in early morning
- Few microscopic animals in the water; lots of algae, mostly dying
- Oxygen very low (<2 ppm)
- pH low to normal
- Water color brown, grey or black, occasional bad odor

Fish kills can often be traced to inadvertent run-off of industrial chemicals, improper application of herbicides (which kills the phytoplankton and causes oxygen depletion) or improper application of other pesticides. Some physical signs of fish kills associated with pesticide toxicity are:

- Convulsive, erratic swimming, sluggishness
- Some fish species affected much earlier than others
- Smaller fish die earlier than larger fish of the same species
- Kills may occur at any time
- Zooplankton and/or algae dead or absent
- Oxygen normal
- pH high or normal
- Water color and odor normal

All these signs listed above are the result of direct impacts of pesticides upon aquatic organisms. Some indirect impacts include "bio-accumulation" of toxins in fishes' body fat deposits, which are released during cold weather or spawning, and food chain disruption, where massive death of animals low on the food chain may cause starvation for larger animals. Often, low dissolved oxygen levels may magnify the effects of toxic substances on fish and other aquatic organisms.



What to do

If you observe a large number of dead or dying fish and/or suspect that fish have been exposed to some sort of toxin, every effort must be made to contact professionals knowledgeable in the correct procedures to follow. If the fish kill is suspected to have been caused by pesticides, the person listed below should be contacted immediately:

Director
Pesticide and Environmental Programs
Louisiana Department of Agriculture and Forestry
5825 Florida Blvd.
P.O. Box 3596
Baton Rouge, LA 70821-3596
Phone: (504) 925-3763

A fish pond owner should immediately contact his or her county agent or one of the Extension specialists listed below and request assistance in determining the cause of the fish loss.

Dr. C. Greg Lutz
Aquaculture Specialist
P. O. Box 25100
Baton Rouge, LA 70894-5100
Phone: (504) 388-2152

Dr. Wendell J. Lorio
Aquaculture Specialist
P. O. Box 25100
Baton Rouge, LA 70894-5100
Phone: (504) 388-2152

Mr. Jimmy Avery
Area Aquaculture Agent
P. O. Box 25100
Baton Rouge, LA 70894-5100
Phone: (504) 388-2152

Dr. Mary L. Grodner
Pesticide Safety Specialist
P. O. Box 25100
Baton Rouge, LA 70894-5100
Phone: (504) 388-2152

By law, the Office of Pesticides and Environmental Programs, Louisiana Department of Agriculture and Forestry, must be notified within 15 days of the discovery of a fish kill if the kill is suspected to be the result of pesticides.

- I. As preventive measures, fish farmers and farm pond owners should take the following steps:
 1. Get the name and phone number of all adjacent landowners and farmers so they can be contacted in case of suspected pesticide drift.
 2. Advise all adjacent landowners of the location of your fish ponds.
 3. Get the name and phone number of all aerial applicators who will be flying for adjacent landowners. Advise them of the location of all ponds on your property. Obtain a description of their plane(s) and its "N" number. Also, give them your telephone number.

II. If fish losses occur and pesticides are suspected as a cause, take the following actions IMMEDIATELY.

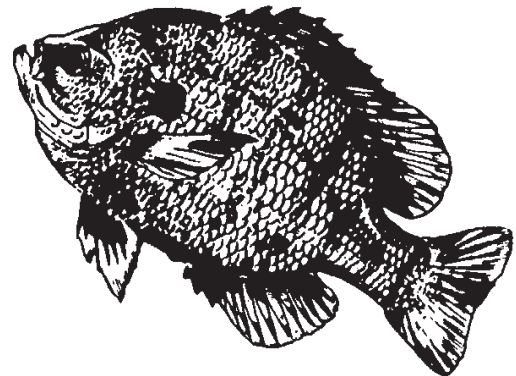
1. Advise the Office of Pesticide and Environmental Programs of the problem immediately (see above.)
2. Request assistance from the county agent or one of the Extension specialists in determining the cause of the losses. If the investigation indicates that a pesticide may be responsible for the losses, all adjacent landowners and applicators who may have been involved should be notified.
3. Advise all parties of the location where losses are occurring. If the fish kill occurs in fish production ponds, report the number, size and kind of fish stocked in each pond, and the number of fish lost in each pond.
4. Make sure that official samples of fish and water for analysis are collected from each water body involved. These samples should be taken by **Louisiana Department of Agriculture and Forestry personnel** or their designated representatives.
5. Other information that should be noted and given to all parties involved includes:
 - (a) time of day the kill first started
 - (b) kinds and sizes of fish present, if known, and kinds and sizes of fish dying
 - (c) an estimate of the number of fish killed
 - (d) for fish production ponds, the number of fish in the pond, when stocked, amount of food being fed and type of food
 - (e) occurrence of fish kills in adjacent ponds, rivers or bayous and location in relation to water bodies where no kill has occurred
 - (f) location of farm lands in relation to the affected area(s) and the type of crop(s) being grown
 - (g) location of any pesticide spraying, either by ground or air, in the area, and the type of pesticide being used
 - (h) identification number of any spray planes in the area or ferrying over affected ponds
 - (i) wind speed and direction

III. Adjacent landowners and aerial or ground applicators who are advised that their operations may have been responsible for fish losses should take the following steps:

1. Verify by an on-site visit, as soon as possible, that a fish kill has occurred or is occurring
2. Cooperate as fully as possible with all parties in determining the cause of the fish losses

IV. It is the responsibility of all landowners, aerial applicators and operators of ground rigs to ensure that there is no direct application or drift of material (regardless of what kind) into any pond.

Remember, most samples are of little use once a fish kill has run its course. Rapid response is critical in determining the cause of fish kills when there is reason to believe toxic substances are



involved.

C. Greg Lutz, Ph.D., Assistant Specialist (Aquaculture)
Maxwell Mayeaux, Graduate Assistant (Pesticide Safety)
Mary L. Grodner, Ph.D., Specialist (Pesticide Safety)

Louisiana State University Agricultural Center, H. Rouse Caffey, Chancellor
Louisiana Cooperative Extension Service, Denver T. Loupe, Vice Chancellor and Director

Pub. 2416-G (2.5M) 9/92

Issued in furtherance of Cooperative Extension work, Acts of Congress of May 8 and June 30, 1914, in cooperation with the United States Department of Agriculture. Louisiana Cooperative Extension Service follows a nondiscriminatory policy in programs and employment.