



## OXYGEN DEPLETIONS IN FARM PONDS

### Causes, Signs and Correction

Billy J. Higginbotham\*

#### INTRODUCTION

Every year a number of Texas pondowners lose part or all of their farm pond fish population due to an oxygen depletion. An oxygen depletion is not the only cause of fish die-offs in Texas ponds, but it is the most common. Pondowners should be aware of the causes, signs and corrective measures to lessen the likelihood of experiencing an oxygen depletion.

#### CAUSES

Many factors or combinations of factors can contribute to an oxygen depletion. The most common factors (not all of which can be controlled by the pondowner) which account for the majority of oxygen depletions in Texas farm ponds are as follows:

- (1) **SEASON** - Most oxygen depletions occur in warm weather, usually June-September. Warm water holds less oxygen than does cool water. In addition, fish experience a faster metabolic rate as water temperature increases, therefore their requirement for oxygen increases. As a result, more oxygen is needed by the fish during a season when less is available. The fish are therefore more likely to become stressed during the warmer months.
- (2) **WEATHER CONDITIONS** - Sunlight is necessary for phytoplankton to produce oxygen through photosynthesis. Several cloudy days in succession will limit photosynthesis, which then decreases oxygen production. If the cloud cover is accompanied by hot, still weather, conditions continue to worsen. The oxygen demand by fish and plants can exceed the rate oxygen is replaced so conditions become conducive for a depletion to occur.

Another weather condition conducive to oxygen depletion is cold wind and/or rain during the summer. Usually, ponds are stratified during the summer season, with a warm oxygen-rich layer of water near the surface and a cooler oxygen-deficient layer of water on the bottom. Cold wind and/or rain causes these two layers to mix rapidly, resulting in the breakdown of organic material present on the bottom. This process removes oxygen that would normally be available for fish to utilize.

- (3) **EXCEEDING THE CARRYING CAPACITY OF THE POND** - This simply means too many pounds of fish in too little water. A good rule of thumb is to never exceed 1000 pounds of fish per surface acre during the warm months. This will seldom be a problem except in some ponds that are heavily stocked with catfish being intensively fed. It is not implied that a die-off due to low oxygen cannot occur in a pond with only 50 pounds of fish/surface acre, but high poundages increase the risk and warrant closer attention by the pondowner.

A rate of 1000 fish/surface acre does not have to be stocked in order to feed everyday. This figure is a maximum which should not be utilized unless the pondowner has (1) use for a large poundage of fish, or (2) the pond can be efficiently harvested (seined) to crop off a portion of the population present. It is doubtful that a pondowner who stocked 1000 fish/surface acre in an unseivable pond could harvest enough fish after the first growing season to prevent going over the 1000 pounds/surface acre rule of thumb. The answer is not to stop feeding to slow weight gain, but rather to stock fewer fish so the pondowner's needs and desires can still be met.

Pondowners contribute to overcrowding by encouraging mature catfish to spawn. This is not a good idea unless predator species are present or the resulting hatch can be transferred to another pond. In ponds where natural spawning cover is available, attempts should be made to harvest fish before they reach maturity (three years of age).

Pondowners should also keep in mind the lowest water level their ponds reach during a typical summer. If the pond is one surface acre when full (or during the wet season), but only one-half surface acre during the summer, the pond should be stocked for one-half surface acre. This will help prevent crowding of fish during dry weather.

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\*Wildlife and Fisheries Specialist, Cooperative Extension Program, Prairie View A&M University.

In some cases, a pond is stocked properly and the fish are fed correctly, but an oxygen depletion results. Often this is due to **underharvesting** the fish. Catfish on a good feeding program can weigh over two pounds during the second summer after stocking. If 500-1000/surface acre were originally stocked and not many were caught out, the total poundage/surface acre could easily exceed 1000. Keep records on the number and weight of fish harvested so determinations can be made on future harvest needs. Restocking should usually not occur until one-half of the original stocking is removed. A variety of harvesting gear is available, including hook and line, traps, gillnets, and seines.

- (4) **IMPROPER AQUATIC WEED CONTROL** - Most pondowners wait until aquatic weeds hamper recreational activities before they decide to make herbicide applications. This is usually too late! Herbicides should be applied when new growth begins, usually April or May for most submersed plant species. Better control will be gained at that time than when the plants mature in July and August.

Treated aquatic weeds sink to the bottom and decay. Remember that this decomposition process removes oxygen and if the treatments are made when water temperatures have peaked, oxygen content is already marginal.

If a heavy enough growth of weeds is killed in a short period of time (single application) during the warm months, then an oxygen depletion is likely to occur. A pond that must be treated in late summer should be treated in three or four different sections, a week or so apart. The herbicide you choose should be in a formulation that lends itself to the sectional or spot treatment mentioned for summer applications if fish are an important resource. Also, never use a herbicide that does not have a label for aquatic use, as this can further complicate matters.

- (5) **OVERFEEDING/OVER FERTILIZATION**-Occasionally ponds become "too rich" due to an overabundance of nutrients available for excessive phytoplankton growth. The sources of these nutrients are usually waste products from the fish, overfertilization, and/or decaying uneaten feed. A deep green or blue-green color often develops as a result. To prevent overfeeding, give the fish 3% of their body weight per feeding. If this cannot be easily calculated, feed only what the fish will clean up in 15 minutes (not to exceed 15-18 pounds of feed/surface acre). A floating ration is recommended throughout the year so observation of the fish during feeding is possible. On days when fish are "off feed" (due to weather changes, etc.) a small portion of feed can be offered to determine if feeding will take place. If no feeding occurs, feed is not wasted and water quality deteriorated.

Rapid growth of phytoplankton can result from nutrient overabundance, but the sudden die-off of these plants (often due to cloudy weather conditions) will remove oxygen from the water similar to the decay of herbicide-treated aquatic plants. The resulting removal of oxygen is often great enough to cause fish die-offs.

## SIGNS

Small ponds managed intensively for catfish are the most susceptible to oxygen depletions, but larger sportfish ponds are not exempt from their occurrence. If the fish appear at the surface and swim sluggishly, this may be a sign that an oxygen depletion is occurring, although fish with diseases or toxicity poisoning may exhibit similar symptoms. Oxygen is normally at its lowest level at daylight, therefore pondowners suspecting oxygen depletion are advised to observe fish early in the morning. A change in water color from a greenish hue to a brown or coffee color may also signal the possibility of an oxygen loss due to a phytoplankton die-off.

## CORRECTION

Unfortunately for many pondowners, an oxygen depletion is not discovered until it's too late. The old adage of "an ounce of prevention is worth a pound of cure" is certainly true in this case. Learn to watch for the signs indicative of an oxygen depletion. Normally, the problem is correctable if the pondowner acts quickly.

Aeration of the pond to increase oxygen content is the best technique for relieving an oxygen depletion. To increase oxygen levels, pond water must be brought in contact with air. Pulling water from near the surface and spraying it back over the pond will increase oxygen content. Outboard motors can also help increase oxygen by running in a fixed position (boat against the bank or on the trailer). Running back and forth across the pond with a boat and motor contribute little toward increasing oxygen. Remember, the idea with a pump or motor is to create a pronounced circulation pattern in the pond.

If a bottom release drainpipe is present, low quality water should be removed. Fresh water from near the surface of another pond or from a well can also lessen the effects of an oxygen depletion. Supplemental water from these sources should be aerated before releasing into the pond.

These corrective measures are usually only temporary and help little if the cause of the oxygen depletion is not corrected. While the season or weather conditions cannot be controlled, the pounds of fish present, timing of aquatic weed control applications and amount of feed or fertilizer utilized are dependent upon the management decisions of the pondowner.

By being aware of the causes, signs and corrective measures of oxygen depletions, the pondowner can reduce the risks of fish losses.

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Issued in furtherance of Cooperative Extension Work, Act of September 29, 1977, in cooperation with the U. S. Department of Agriculture and the Texas Agricultural Extension Service. Hoover Carden, Administrator—1890 Cooperative Extension Program, Prairie View A&M University, Prairie View, Texas.