# Managing Fish Ponds During Drought

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Dry weather tests pond design limits for water retention, watershed area and depth. Without adequate rainfall, ponds and the property around them lose value and the pond owner can lose the fish or have to spend substantial amounts of money for weed control or pond renovation. Over the past decade, drought conditions have been the normal weather pattern across the southeastern United States. Pond design and water management options should be considered each year to plan ahead for drought effects.

## Pond Design

Designing a pond to hold water and keep a high water level involves considering soils, compaction, watershed area, water source and pond depth.

### Watershed Ponds

1. **Soils** - Soils for pond construction should contain at least 25 percent clay and 35 percent clay for the core of dams. No gravel or rock out-cropping should be in the pond area.
2. **Compaction** - Clay cores for dams must be compacted properly, using moist soil, wide cores and layered compaction. Pond bottoms should also be examined for sand, gravel or rock, and clay liners should be considered.
3. **Watershed area** - Generally, in Georgia, 10 acres of watershed are required for each acre of pond, but 20 acres of watershed would improve pond water supply during droughts.
4. Water source - Supplemental water can be obtained from nearby springs, streams or wells. Water withdrawal permits may be required. Seepage should be controlled before pumping.
5. **Pond depth** - Allow for at least 2 feet of water loss from evaporation and seepage during the drought, and plan on a minimum depth of 3 feet of water during the drought, for a minimum of 5 feet total depth over a majority of the pond area.

### Excavated Ponds

Excavated ponds are dug into the ground to a point below the water table and allowed to fill as the ground water seeps into the pond. No compaction is practiced when building these ponds. The soils of these ponds usually contain sand or gravel and to not retain water. The water level is determined by fluctuations in the ground water level at the pond location. During a drought, many of these ponds lose most or all of their water. Fish should be harvested before the pond depth falls below 3 feet. If the pond bottom is too rough to allow seining, harvest the fish by trapping or by hook and line. In some cases, these ponds are dug deeper during dry seasons, but there is a practical limit to deepening a dug pond. Ponds that are excavated to great depths may be hard to approach from the shore due to steep banks.

## Pond Water Level

During a drought, pond water levels continue to drop, exposing the shoreline and reducing pond volume. The combination of these events causes fish crowding and encourages aquatic plant growth. Fish harvest should be increased as the drought

begins. If you and your family are not able to make more frequent and longer fishing visits to the pond, invite others to catch fish. Some fish species, particularly catfish, can be caught using traps or trot lines. Your goal should be to remove as many large catfish as possible, catch at least 50 pounds of bream per acre, and catch an additional 5 pounds of largemouth bass per acre (up to 35 pounds per acre).

Aquatic plants begin growth in shallow water that results from evaporation or seepage of a pond's stored water. Properly constructed ponds have little, if any, area less than 3 feet deep. Because plants grow quickly in warm water, you should have an aquatic plant management plan in place before the drought progresses very far. If grass carp are not already in the pond, stock at least five per acre using sterile triploid. As unwanted plants begin to grow, contact your local UGA Extension agent for the proper herbicide to control specific plants.

Deepen the shallow areas by dredging or by adding to the elevation of the spillway. If dredging is performed, the muddy water caused by the dredging may adversely affect the fish in the pond. Limit the amount of dredging that is done at one time to the amount that will only affect one-third of the pond. In cases where the pond depth is extremely low, drain the pond completely before deepening the shallow areas, then refill and restock. To change the elevation of a spillway, consult the National Resource Conservation Service for an inspection of the soil used to build the dam and the ability of the pond to hold more water. In some cases it will be necessary to add soil to the width and height of the dam before the spillway is altered.

Seepage of water out of the pond can exceed the amount of water entering the pond from runoff or springs. Seepage is commonly caused by low clay content of soils, a gravel or rock outcropping, water piping through root holes, pipe holes or animal holes, or in rare cases from fractures in heavy clay soils. During long periods of drought, the shallow water table falls below the normal elevation of the pond, increasing the seepage rate and leaving the pond bottom dry.

Most seepage problems can be reduced by the addition of bentonite or other heavy clay to the pond soil. The clay should be mixed into dry pond soil and re-packed. A pond must be empty when adding bentonite. In some cases, a source of organic matter, such as chicken litter or fish feed, can be applied to a filled pond to reduce seepage. This method may work if the seepage rate is slow but will not improve the seepage rate when sandy or rocky soils make up the pond bottom. Clay soil may be used to cover up gravel or rock outcroppings. Use about 8 feet of clay to line the pond, then compact the clay before refilling the pond. Root holes and fractures may be fixed by lowering the pond water and reconstructing that area of the pond using at least a 30-percent clay soil. Compact the soil used for pond lining and dam reconstruction by using a "sheep's foot roller" on every 12 inches of soil.

## Aeration and Pond Oxygen

Danger of oxygen depletion in the pond water increases during dry, hot weather. Warm water holds less oxygen than cool water. Algae and aquatic plants become more abundant in warm, shallow water. Although plants produce oxygen during daylight hours, they consume oxygen at night and during cloudy weather. Sunlight, when intense, may cause algal blooms to die, creating oxygen depletion. Fish become more concentrated as the pond water level drops and will increase the demand for oxygen in the reduced water volume.

Aeration devices can protect fish in ponds during a drought. The simple solution is to purchase an electric aerator that provides about 3/4 horsepower of efficient aeration per acre of pond area. Operate the aerator as needed or with a timer set to operate during the night. Other aeration solutions may include pumps, bush hog mowers and outboard motors. Pumps can also be used to circulate pond water, which can be splashed over a diffuser to increase the oxygen content.

Remember that a drop of at least 2 feet, from the diffuser to the pond water, is needed to allow time for the water to pick up oxygen from the air. Pumps are efficient in moving water, but usually move less water per horsepower than pond aerators (a 3/4 HP pump may move 50 gpm but a 3/4 HP aerator may move 400 gpm). So, use a pump to create a sanctuary area for fish to gather rather than try to aerate the entire pond. Bush hogs and outboard motors can be carefully positioned to stir and splash pond water; however, use these methods only in dire emergency and always follow safety precautions. Driving boats or jet skis in open water provides less positive effect than operating them in a stationary position.

## Warning Signs for Oxygen Depletion

1. **Check the pond first thing in the morning.** This is the time of lowest dissolved oxygen.
2. **Watch for a change in pond color.** A change from green to brown or grey may indicate algae death, and oxygen depletion will occur in 24 to 48 hours.
3. **Cloudy weather** reduces the amount of light available for oxygen production from plants. Two or three days of cloudy weather may cause oxygen depletion the following day.
4. **High winds** may cause shallow ponds to "turn over" and mix low oxygen water throughout the pond water column. This is especially dangerous when dense blooms of algae are present.
5. **Watch your fish feeding behavior** for signs of low oxygen or fish disease. When fish are being fed a floating pellet, they stop feeding when oxygen is low.
6. **Fish will come to the surface** in the morning and gulp air when oxygen depletion is beginning. Take action to aerate the pond immediately.

## Muddy Ponds

Wind action creates waves that erode exposed shoreline and mix soil with pond water. Muddy water changes the food web in ponds in a way that reduces pond productivity. Fish that are dependent on the algae bloom will not grow as well in muddy ponds. Dissolved oxygen will be lower in muddy ponds. Ammonia and nitrite may accumulate in muddy ponds due to the absence of algae that use these sources of nitrogen and convert them to a non-toxic form. Bacterial pathogens and protozoan pathogens can use the suspended soil particles as a sheltered place to multiply to levels that may cause fish diseases. Therefore, muddy water should be cleared up, if possible.

Muddy water is caused by suspended clay or silica in most cases. The suspended particles have an electrical charge that keeps them from attracting each other and becoming heavy enough to sink to the pond bottom. Controlling muddy water involves the management of the electrical charge on the surface of suspended particles. Alum, gypsum and organic material have been used successfully to change the pH of water and thereby change the electrical charge on the surface of suspended particles. Agricultural lime and hydrated lime have also been used. More recently, polymers and iron chloride have been used to reduce turbidity. Alum is the best practical method for muddy water control in ponds; however, the pond water becomes very acidic, even if temporarily, when alum is added. A combination of alum and hydrated lime treatment can be made, which allows settling of suspended particles and also prevents acidic conditions in the pond water. A variety of muddy water treatments are presented in Table 1.

**Table 1. Treatments for muddy pond water.**

| Substance | Treatment Rate | Comments |
|---|---|---|
| Alum + Hydrated Lime | 200 lb: 50 lb per surface acre | Alum may be expensive and hard to locate. Apply uniformly to pond surface. |
| Gypsum + Hydrated Lime | 500 lb: 50 lb per surface acre | Add lime first, then gypsum. Repeat gypsum application if needed. |
| Hay bales* | 500 lb per surface acre | Fix bales in place in shallow water and remove after water clears to avoid oxygen depletion. |
| Cotton Seed Meal* | 75 lb per acre-foot of water | May need to repeat to clear water. **May promote filamentous algae growth or cause oxygen depletion.** |
| Chicken Litter* | 2,000 lb per surface acre | Repeat to clear water. **May promote filamentous algae growth or cause oxygen depletion.** |
| *The danger of dissolved oxygen depletion caused by some treatments may prevent their use during a drought when the danger of dissolved oxygen depletion is already high. | | |

## Fertilization and Feeding During Drought

Nutrients added by fertilizer and feeding may increase the danger of oxygen depletion during a drought. Therefore, fertilization programs should be cut back, using care to keep pond visibility just under 18 inches. Restricting feed to fish is helpful to reduce the danger of oxygen depletion, and a good rule of thumb is to feed less than 30 pounds of feed per acre per day. As pond size and volume become smaller during the drought, remember to cut back on feeding. Also, as fish are harvested, the total weight of fish in the pond is reduced and the feeding rate should also be reduced. Carnivorous fish will benefit from the smaller pond volume when forage fish become easier to catch. However, if aquatic weeds are allowed to grow, forage fish will be more difficult to catch.

Aquatic plant infestations usually cause clear water by depressing the algae bloom. Do not fertilize during a weed infestation. Kill the aquatic plants first with herbicides or grass carp. Nutrients will be released from the decomposing aquatic plants and should stimulate a new algae bloom. Before fertilizing, assess the pond depth in the area of the aquatic plant infestation. The pond water level may need to be increased to prevent future aquatic plant infestations.

## Fish Diseases

Drought conditions increase the danger of some fish diseases. Diseases of warm temperatures include Columnaris, *Aeromonas*, ESC and viral diseases. Any stressor will make these diseases more likely to occur. Parasitic diseases including gill parasites and grubs may become a problem as fish are crowded into smaller pond volumes, and as predators visit the pond and bring disease with them.

Columnaris disease is more frequent above 70ºF than at lower temperatures. This bacteria is present in the soils of most ponds and becomes pathogenic when fish are stressed or crowded. Pond pH may be increased by liming to make columnaris infections less dangerous. Avoid moving fish in hot weather to prevent stress. If fish must be moved, use calcium chloride, calcium carbonate or sodium chloride to harden the fish before transport. Feed a medicated feed at the first signs of columnaris infection.

Other soil-borne bacteria belong to the genus *Aeromonas*. This is a disease of overcrowded fish populations and occurs as a result of stress to the fish. Partial oxygen depletion is often the cause for *Aeromonas* infection. If *Aeromonas* is observed in catfish, feed Romet medicated feed immediately, as many Terramycin-resistant strains of Aeromonas exist. It is important to feed medicated feeds for the specified time at a quantity that will deliver the proper dose to the fish. If you are currently restricting feed to your fish, when feeding medicated feed you should increase the feeding rate to the amount that the fish will consume in 20 to 30 minutes.

ESC, or Enteric Septicemia of Catfish, is caused by *Edwardsiella ictalluri*, a bacteria that is carried by most catfish in the U.S. Most ESC infections occur between 75 and 82ºF and are the result of a stressor. Common stressors in ESC infections are low dissolved oxygen or a rapid change in temperature. Romet medicated feed may be a possible treatment for ESC, but a new antibiotic, Aquaflor, can be prescribed for this disease in catfish. So far, Aquaflor use has been limited in Georgia to large commercial catfish operations.

Channel catfish virus, like ESC, is carried by most catfish populations in the U.S.; however, resistance to the disease has apparently developed over time. It is less common in Georgia than it once was. Now, severe stress to populations of catfish fingerlings may cause the disease. If catfish develop swollen bellies and pop-eyes, you may suspect channel catfish virus. Water temperature above 77ºF increases the frequency of channel catfish virus epizootics. Other viruses infect largemouth bass and catfish, but are less common.

Shallow water and crowded fish attract wading birds and other wildlife that may be vectors for diseases. Yellow grub infestations have increased in Georgia over the past few years, possibly due to summer drought conditions. Controlling access to predators and controlling snails in ponds may prevent severe infestation by yellow grub. The practice of including the red ear sunfish as one of the bream species when stocking ponds may help reduce the danger of grub infestation. Red ear sunfish eat snails and other pond invertebrates that are disease vectors.

## Summary

Drought will cause the pond to change. A quick reaction to the change may allow you to save your fish or reduce the cost of treatment. Properly designed ponds may weather a longer drought than ponds with seepage or small watersheds. Remember that the water will be hot, and heat makes everything happen faster in ponds. Plan ahead so that you know what to do when a problem is identified.