POND MEASUREMENT
DETERMINING AREA IN ACRES, VOLUME IN ACRE-FEET AND AVERAGE DEPTH

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1 *Square or Rectangular Pond*

FORMULA: Area = Length x Width

Example: Pond is 200' x 350' = 70,000 square feet
70,000 ÷ 43,560 = 1.6 surface acres
Average depth = 3.2 feet

1.6 acres x 3.2 feet = 5.1 acre feet of water

2 *Triangular Pond*

FORMULA: Area = ½ x Base x Height

Hint: **Base** = shoreline length along the dam and **Height** = distance from centerpoint of shoreline along dam to the upper end of pond

Example: Pond averages 4.2 feet and is 200' along the dam and 500' to upper end from dam

½ (200' x 500') = 50,000 ÷ 43,560 = 1.1 surface acres
1.1 surface acres x 4.2 feet = 4.6 acre-feet of water

- 1 surface acre contains 43,560 square feet of surface area
- 1 acre-foot of water contains 43,560 cubic feet of water or 326,000 gallons of water

(continued on other side...)

3 *Circular Pond*

FORMULA: Area = 3.14 x $(\text{Radius})^2$

Hint: **Radius** is ½ of the pond's diameter

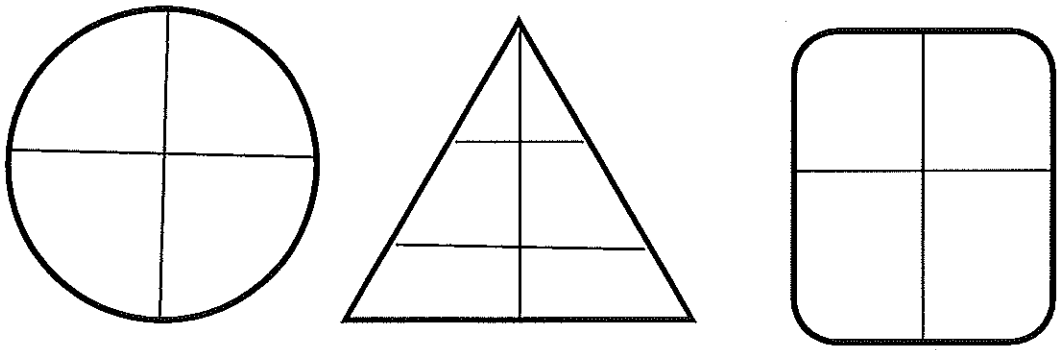
Example: Pond averages 3.9 feet deep and is 150' Across the middle (diameter)

$3.14 \times (75')^2 \div 43{,}560$

$17{,}662.5 \div 43{,}560 = 0.41$ surface acres

0.41 acres x 3.9 feet = 1.6 acre-feet

CALCULATING AVERAGE DEPTH



The lines shown within each pond shape are suggested transect lines to take depth soundings along.

FORMULA: Sum of All Soundings ÷ No. of Soundings

Hint: Measure depth in feet using a calibrated rope and anchor or pole marked in feet. Begin each transect at the bank with a zero and end on the far bank with zero. The more transects and the more soundings taken along each transect, the more accurate your depth estimate will be!

Example: Circular pond has depths (in feet) of 0, 3, 3, 6, 7, 4, 2, 0 for Transect 1 and 0, 3, 6, 6, 4, 4, 1, 0 for Transect 2.

49 ÷16 = 3.1 feet

Average depth of pond is 3.1 feet

My Fish Are Dying!

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Fisheries biologists and county Extension Agents will hear these words countless times throughout the year, especially during the summer months. As a general rule, small ponds intensively managed for catfish are the most susceptible to die-off problems. How do you determine the cause? In most cases, asking the right questions will lead you to the cause or causes. Here are the questions I ask and the assessments made based on answers received to help a frantic pondowner:

1) ***How many different species are dying?*** What you are trying to determine with this question is that if more than one species of fish is dying, you probably are faced with a water quality problem (i.e., oxygen, ammonia, nitrites). If only one species of several species present are dying, it *may* be a disease/parasite problem, but not always because different species may have different tolerance levels for water quality parameters. If only one species of fish is in the pond and a die-off is occurring, you need more information.

2) ***Have any pesticides been used recently that were introduced into the pond?*** This could include pasture insecticides washing into ponds or even cattle that were treated with an insecticide standing in the pond to escape the summer heat. Some herbicides washing into a pond may also lead to untimely vegetation die-offs.

3) ***How big is the pond?*** The pondowner usually thinks the pond is 2x to 3x larger than it really is! Walk them through the process of estimating surface area in acres by dividing square footage by 43,560. Remember, excessive depth *does not* make up for lack of surface area when it comes to fish production!

4) ***How many pounds of fish are present?*** Once you know the surface acreage, try to determine the pounds of fish present by asking: (1) ***for an estimate of fish stocked*** (minus those caught out) and (2) ***the average weight of the fish present.*** This will help you estimate the total poundage of fish present.

STOP RIGHT HERE — if the total pounds of fish exceed 1,000 pounds per surface acre (that's only 100 pounds in a 0.10 acre pond), you are probably dealing with an oxygen depletion. This accounts for about 85% of all fish die-offs in Texas farm ponds!!!

When the fish standing crop exceeds the 1,000 lbs/acre carrying capacity during the hot months, the stage is set for a die-off. Why the summer months? Because warm water cannot hold as much oxygen as cool water, yet the fish need more because their metabolism (and therefore their oxygen requirements) increases as water temperature increases. A farm pond that could easily carry 2,000 to 3,000 pounds of fish per surface acre through the winter months won't stand a chance once the dog days of summer arrive. Remember, oxygen is usually lowest right at

daylight, so that's a good time to check and see if fish are swimming at or near the surface. In many cases, the larger fish will be the first to exhibit signs of oxygen stress. Now that the "hammer is cocked", additional events that could "pull the trigger" and further contribute to an oxygen depletion include:

1) A couple of hot, still, cloudy days in succession that reduce photosynthesis and therefore oxygen production,

2) Aquatic herbicide treatments in hot weather that kill too much vegetation in too short a period of time resulting in an oxygen debt and,

3) Overfeeding/overfertilization resulting in nutrient decomposition or phytoplankton die-off.

So, how do you correct for low oxygen?

1) Reduce the fish load present to well below 1,000 lbs of fish/acre,

2) Aerate by backing a boat on a trailer into the pond and running the motor in a fixed position to circulate the water and increase oxygen,

3) Add fresh well water, but aerate it well before it enters the pond, and

4) Circulate water with a pump, but set the intake near the pond surface (pumping water off the pond bottom and spraying it back over the surface only compounds the problem!).

Other Common Water Quality Problems

Ammonia can also kill fish and can occur in ponds with heavy loads of fish (near or over 1,000 lbs/acre). Heavy fertilization in the watershed followed by run-off rains washing into the ponds can cause toxic levels of ammonia. This includes chicken litter. Ammonia becomes more toxic as pH and temperature increase. A water test is required to determine if ammonia is present. The only cure is to add fresh water, remove dead water from the bottom and reduce the load of fish present.

Nitrites are converted from un-ionized ammonia by the Nitrosomonas bacteria. Nitrites can cause brown blood disease, so called because the fish affected have chocolate colored blood. If nitrite poisoning is suspected, cut open an affected fish and observe the blood color—instead of the normal bright red color, the blood appears dark or brownish. Nitrites bind to the blood's hemoglobin and form methhemaglobin, which is ineffective at removing oxygen from the water - resulting in the fish's inability to breathe. The fish exhibit the same signs as when an oxygen depletion occur by swimming lethargically at the surface—but this may be observed even during mid-day when oxygen production should have improved. Ponds suffering from nitrite poisoning are usually heavily fed catfish ponds, and nitrites usually don't show up until late summer or early fall. Heavy pasture fertilization with run-off into a pond can also cause elevated levels of

nitrites. Nitrites can be "neutralized" by adding stock salt. The amount to add varies with the level of nitrites but typically 200 pounds per surface acre is sufficient to adequately increase the chloride levels in most ponds and negate the impacts of nitrites. However, blanket recommendations of "adding salt to the pond," without the benefit of a water test tends to give pondowners a false sense of security. If possible, remove some bottom water from the pond to reduce organic loads.

Diseases/Parasites

So, what if it's not a water quality problem killing my fish?

Well, then your pondowner is in the vast minority. Even many disease problems are triggered by stress brought on by poor water quality. Diseases and parasites normally only affect one species, even if there are many species present. Proper identification is a must, but typically the most common diseases are:

Fatal – Common Parasites/Diseases

1) Ich - typically occurs when water temperatures are below 70-75° F. Fish may have tiny white pimples covering the surface of the skin - only a problem between November and March. Consult a specialist for verification and control options.

2) Bacterial Disease - occurs during periods of transition (summer to fall or winter to spring) when water temperatures are changing or any time fish may be subject to stress. Fish may have eroded fins, irregularly shaped discolored areas on their backs and sides or even eroded holes in their heads or backs. Consult a specialist for verification and control options.

Non-Fatal – Common Parasites/Diseases:

1) Grubs - Once fishing season arrives, anglers catch a few fish and during cleaning (normally filleting) notice white, yellow or black "worms" encysted in the skin or flesh. These grubs have an interesting yet complex life cycle involving fish, snails and wading birds, but seldom kill fish by themselves. Breaking the cycle can be difficult, although some pondowners achieve success by controlling plants (food for snails), or stocking redear sunfish (feeds on snails).

2) Contracaecum - This roundworm looks like a watch spring and is often found attached to the mesentery outside various internal organs. It's more of a curiosity to anglers cleaning fish than anything else.

For more detailed information on diseases/parasites, consult a copy of the "Inland Aquaculture Handbook" issued to each county office. You can also refer pondowners to the TVMDL at the TAMU-Vet School by calling 1-888-646-5623. They no longer offer fish disease services to