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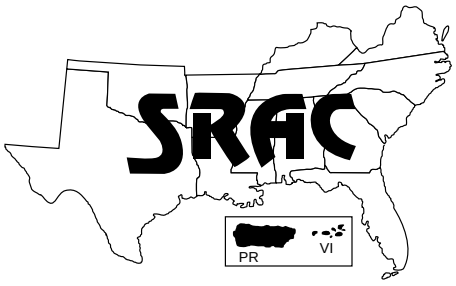

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Fertilization of Fish Ponds

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When ponds are fertilized, nutrients stimulate the growth of microscopic plants in the water (phytoplankton). Phytoplankton is food for other organisms (zooplankton and larger animals) that are eaten by fish. Abundant growth of these microscopic plants gives water a turbid, greenish color (called a "bloom") that can prevent light from reaching the pond bottom and reduce the growth of rooted aquatic weeds.

Fish farmers and recreational farm pond owners fertilize ponds to increase fish production and prevent rooted aquatic weeds from becoming established. Aquaculture ponds are fertilized to increase the available natural food (phytoplankton and zooplankton) for fry or larval fish, or for species that are efficient filter feeders. Recreational ponds also are fertilized to increase the available natural food organisms. A well-managed fertilized recreational pond can produce 200 to 400 pounds of fish per acre annually. This is three to four times the fish production that can be obtained without fertilization.

Not every pond should be fertilized. In many cases, increased fish production is not desirable. If a pond serves primarily for watering cattle or for wildlife habitat, fertilization is unnecessary. Pond owners who want clear water should not fertilize either. Unless a pond will be fished more heavily, fertilization to increase fish production is of little value.

Ponds are often fertilized to increase yields of bass and sunfish (bream). But if the bream population is too large or is otherwise out of balance with the bass population, that should be corrected before a fertilization program is begun. Ponds dominated by undesirable fish species also should not be fertilized until those fish are eradicated. It is usually not necessary to fertilize catfish ponds in which the fish are fed regularly, since uneaten feed is a supplemental nutrient source. Raising catfish with feed is an excellent choice for producing fish in ponds that have low alkalinity water (see next section) and where liming is not an option.

Before fertilizing

Before beginning a fertilization program, have the alkalinity, total hardness, and calcium hardness of your pond water tested. Your local Cooperative Extension Service office can help with water testing. Waters that are low in alkalinity or total hardness (below 20 mg/L) will need liming in order for fertilizers to be effective. Most ponds that receive runoff from watersheds with acid soils will have low alkalinity/low hardness water. Typical application rates for agricultural or dolomitic limestone are 1 to 3 tons/acre. The recommended liming rate is based on the lime requirement of the pond bottom soils, as determined by soil testing. Again, contact your local Cooperative Extension Service for assistance. Ponds should not be fertilized at the same time that lime is applied, as the calcium in lime will remove phosphorus from the water.

Ponds that are muddy, infested with weeds, or subject to excessive water flow should not be fertilized until the problem is corrected. Mud prevents light from entering the water, which inhibits phytoplankton growth. Weedy ponds should never be fertilized, as the nutrients will simply stimulate the growth of more weeds rather than phytoplankton. Excessive water flow (where the pond water volume is exchanged in less than 2 weeks) dilutes fertilizer nutrients and makes them ineffective. In addition, nutrients flushed from the pond can pollute downstream waters.

Although the plankton blooms that result from fertilization can be highly desirable, too much bloom can cause problems. Dense plankton blooms (Secchi disk visibility <12 inches) can lead to: 1) plankton die-offs that deplete dissolved oxygen; 2) critically lower dissolved oxygen readings in the morning; and 3) elevated after-

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noon pH levels which increase the concentration of unionized (toxic) ammonia in the water. All of these conditions can stress fish. In some cases, dense algae blooms even produce toxins. The pond manager should consider these possibilities when considering a fertilization program.

Types of fertilizer

The formulation of a fertilizer tells the percent by weight of nitrogen (N), phosphorus (as P_2O_5), and potassium (as K_2O) in the fertilizer. For example, an 11-37-0 fertilizer contains 11 percent nitrogen, 37 percent phosphorus (as P_2O_5), and 0 percent potassium (as K_2O). Phosphorus is the most important nutrient in ponds, but nitrogen and potassium may be needed occasionally. In new ponds, some nitrogen may be beneficial, while potassium is rarely, if ever, needed. Choose a formulation that is high in phosphorus.

Inorganic fertilizer comes in liquid, powdered or granular forms. Liquid fertilizer dissolves the most readily, followed by powdered, then granular forms. Powders are generally more expensive than liquid or granular forms, but are relatively easy to apply.

Time-release fertilizer is now available for pond owners, but it is more expensive. The resin-coated granules slowly release nutrients into the pond water, with the rate of release corresponding to water temperature and water movement. One application of time-release fertilizer in the spring should be sufficient for the entire growing season. If environmental factors cause reduced blooms or bloom die-offs, however, an additional application of a fertilizer with more readily available nutrients may be necessary.

Organic fertilizers, such as cottonseed meal, are used in combination with inorganic fertilizers to prepare larval fish ponds (see SRAC publication 469). Organic materials are generally not recommended for fertilizing recreational farm ponds, as excessive amounts may lower dissolved oxygen to a critical level, possibly killing fish. These fertilizers also can promote the growth of undesirable filamentous algae (commonly known as “pond moss” or “pond scum”).

Fertilizers are available through any farm supply dealer. Some are formulated specifically for ponds, but any fertilizer formulation with the appropriate nutrient levels can be used unless the product contains other ingredients that may be harmful to fish or other aquatic organisms. For example, do not use fertilizers intended for lawn or turf application that contain either herbicides or insecticides.

Applying fertilizer

Table 1 gives suggested fertilization rates for ponds based on water calcium hardness and type of fertilizer. Some phosphorus applied in fertilizers can be removed by calcium before it is taken up by plankton. This becomes a greater problem as hardness increases. For subsequent applications, rates should be adjusted based on the response of the individual pond. For example, ponds that receive runoff from active pastures are likely to require less fertilizer because nutrients enter the water from the surrounding watershed.

Applying fertilizer increases the risk of low dissolved oxygen somewhat, although the benefits of fertilizer probably outweigh the risks. Even unfertilized ponds have turnovers or bloom die-offs that lead to low dissolved oxygen. However, excessive fertilization should be avoided as it can produce such a dense bloom that the risk of oxygen depletion increases greatly. Allow at least 1 week (preferably 2) between fertilizer

Table 1. Suggested fertilization rates (per application). Use this as a starting point and modify for your pond conditions by adding more or less fertilizer per application. [1]

Fertilizer		Water Calcium Hardness [2]		
type	grade	low hardness	moderate hardness	high hardness
Liquid:	11-37-0 13-37-0 10-34-0	1/2-1 gallon/acre	1-2 gallons/acre	2-4 gallons/acre
Powder:	12-52-4 12-49-6 10-52-0	4-8 pounds/acre	8-16 pounds/acre	16-32 pounds/acre
Granular:	0-46-0	4-8 pounds/acre	8-16 pounds/acre	16-32 pounds/acre
	0-20-0	8-16 pounds/acre	16-32 pounds/acre	32-64 pounds/acre
Time-release:	10-52-0	25 pounds/acre	30-40 pounds/acre	50 pounds/acre
	14-14-14	75 pounds/acre	100-125 pounds/acre	150 pounds/acre

[1] If water alkalinity is less than 20 mg/L, lime must be applied before fertilization.

[2] For pond waters with calcium hardness below 50 mg/L, use the low rates. For water with calcium hardness between 50 and 100 mg/L, use the moderate rates. For waters with calcium hardness above 100 mg/L, use the high rates. Most recreational farm ponds will be low in hardness. After the initial application, apply one-half of the recommended rate. It is likely that high hardness waters will require more frequent fertilizer applications to maintain pond blooms.

applications to evaluate the result of each application. As pond water becomes warmer, the response to a fertilizer application will be stronger and more rapid.

Begin fertilizing in the spring when water temperature stabilizes above 60º F, usually after March 15 in the southeastern United States. Make three applications of fertilizer 2 weeks apart, then make additional applications whenever you can see your hand clearly with your arm underwater at elbow depth. A Secchi disk can be used (Fig. 1) for more consistent evaluations of the density of the pond bloom. Recreational ponds will require additional applications of fertilizer at intervals during the summer months and into the fall. In some cases as many as 10 to 12 applications may be needed during that time, depending upon the weather, rainfall amounts, and water hardness. In ponds where fish are fed a commercial ration, a few fertilizer applications in the spring may be all that is needed to establish a bloom.

Once fertilization is begun, it is important to follow a schedule, monitor the pond, and add fertilizer as needed. Especially in recreational ponds, the increased weight of fish produced as a result of the initial fertilizer applications cannot be sustained without maintaining a good bloom, and fish will lose weight and be in poor condition. Discontinue fertilization for the year when the water temperature drops below 60º F in the fall, usually after September 15 in the southeastern United States. Fertilizing ponds during the winter is ineffective, and can lead to excessive growth of undesirable filamentous algae the following spring.

Fertilizers are generally caustic materials. Be careful when applying them to avoid unnecessary exposure, and clean equipment thoroughly after each application. Always read and follow label directions for the product that you are applying. Protective eyewear and clothing are advisable when handling any fertilizer.

Methods for applying fertilizers vary with the form of the product. Mix one part liquid fertilizer with five to ten parts water and splash or spray over as much of the pond surface as is practical. Dilution is essential because liquid formulations are more dense than water and will sink to the bottom and become lost in the soils if not prediluted. In larger ponds, diluted fertilizer can be poured into the prop wash of a boat as it is driven around the pond. Broadcast powdered fertilizers over as much of the pond surface as is practical. Powders are highly water soluble and most of the fertilizer will dissolve before reaching the pond bottom.

Granular fertilizers, such as triple super-phosphate (0-46-0), are the least desirable choice for pond fertilization when a rapid bloom is needed because they dissolve slowly and sink rapidly to the pond bottom if they are broadcast. However, triple super-phosphate is also one of the least expensive pond fertilizers, and can be used with great success in recreational fish ponds. If a granular fertilizer is used, it must be applied in a manner that avoids soil contact. Granular fertilizers should not be broadcast onto a pond. Granules can be poured onto an adjustable platform maintained at a depth of 4 to 12 inches below the water surface. One properly placed platform will serve for a pond up to 5 to 6 acres. Although the design of a platform is not critical, and many shapes and configurations can be used, platform construction and placement can be difficult in existing ponds. Alternatively, fertilizer bags can be slit on the larger, flat side in an “x” fashion, corner to corner, so that one side of the bag can be removed. The bags can be slit before they are placed in shallow water, or placed in shallow water and then slit to reduce spillage. Controlled release granules also must be kept from contact with the mud and should be applied in the same manner as other granular fertilizers.

Troubleshooting

Individual ponds respond differently to identical fertilizer application schedules. The recommendations in Table 1 are suggested rates only. The number and frequency of applications necessary to obtain a satisfactory bloom will vary from pond to pond. In some situations fertilization is not effective. Those situations, and the corrective actions, are listed below.

If, after repeated applications, no bloom results, contact your local Cooperative Extension Service office for assistance.

Situation	Corrective Action
Water flow to pond is such that water is exchanged in less than 2 weeks.	Divert runoff or stream around pond.
Pond is excessively muddy (turbid).	See SRAC publication 460 for methods of controlling turbidity.
Pond is heavily infested with aquatic weeds.	Control weeds mechanically, biologically or chemically. See SRAC publications 360 and 361 for details.
Alkalinity of the water is low (<20 mg/L as $CaCO_3$).	Lime the pond. Contact your county Extension office for assistance.
Water temperature is < 60º F.	Wait until the water warms before applying fertilizer.
Pond is heavily shaded by surrounding trees.	Clear overhanging vegetation from the shoreline.

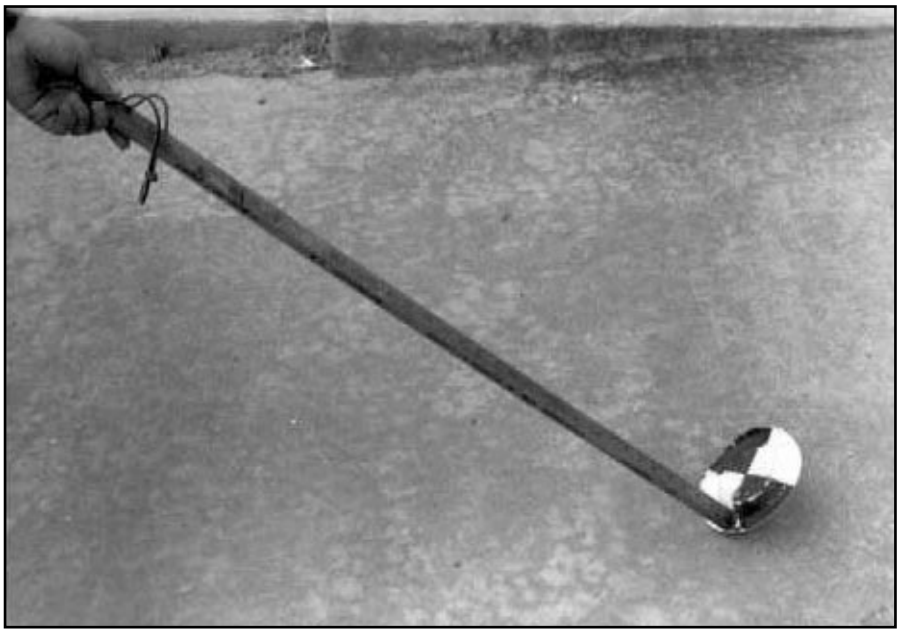

Figure 1. Secchi disk for evaluating pond blooms.

To construct a Secchi disk: Cut the bottom from a white plastic jug, or use a lid from a 1-gallon paint can and nail it to the bottom of a yardstick. The resulting white disk can be painted in alternating black and white colors, as shown, for better contrast.

To use a Secchi disk: Submerge the disk until it just barely disappears. Note the depth of the disk. Then lower the disk until it completely disappears. Raise the disk until it just barely appears. Note the depth. Add the two depth figures together and divide by 2. This is called the Secchi disk visibility and it is a measure of the relative amount of plankton in a pond. If the reading is greater than 24 inches, the pond should be fertilized again. If the reading is between 18 and 24 inches, this is ideal. Readings below 12 inches indicate excessive phytoplankton and the pond should be watched closely for possible dissolved oxygen problems.

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