



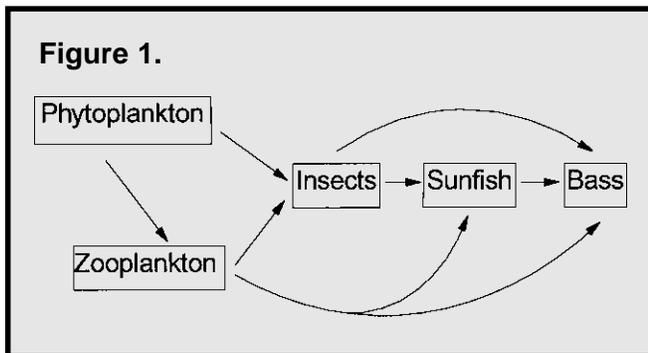
Farm Fish Pond Management

South Carolina Department of Natural Resources

Farm Pond Fertilization and Liming

The fish productivity of any farm pond begins with the base of the food chain, the phytoplankton population. Phytoplankton are microscopic plants that often give the pond's water a green or olive color. Microscopic animals, which feed on the phytoplankton, form the next rung of the food chain and are known as zooplankton. A "plankton bloom" is the term used for the color change produced when these microscopic plants and animals are in sufficient abundance.

Because plankton are the base of the food chain, there is a close relationship between plankton abundance and fish production (Figure 1). The plankton are the food source for aquatic insects and other aquatic invertebrates. Fry and



fingerling largemouth bass and bream, in turn, feed on these organisms. The pond's ultimate predator, the adult largemouth bass, feeds on and controls the large population of smaller bream.

Nutrients are the vital first step in the pond's food cycle, since they are used by phytoplankton in the production of food. The use of inorganic fertilizers containing the nutrients, nitrogen-phosphate-potassium (N-P-K), is necessary to sustain large populations of harvestable size bass and bream. Ponds in South Carolina that are properly stocked, fertilized and managed can support the harvest of 25-30 lbs of bass, and 80-120 lbs of bream per acre per year.

Fertilization

Fertilization of a pond stimulates and expands the plankton population. The "bloom" produced is usually in the upper three feet of the pond and if maintained during the spring, summer and early fall will effectively shade out and prevent the establishment of rooted aquatic weeds. Fertilization will *not* eliminate aquatic weeds that are already established or prevent the growth of such weeds in ponds that have shallow shoreline edges or control floating plants such as duckweed and watermeal. Aquatic weeds that are already present, must first be eliminated (usually through the use of an approved aquatic herbicide or with biological control), before a fertilization program should be implemented.

In general, there are three fertilizer formulations that may be used effectively in South Carolina. Granular fish pond fertilizer (20-20-5 formulation) is the most widely used and has been found to be effective in producing moderate to heavy blooms in most ponds. It is moderately expensive (\$6-\$9/40 lb), and a fertilizer platform is recommended for application. Liquid ammo-



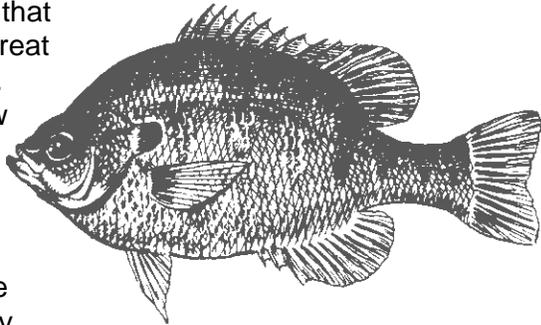
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niium polyphosphate (10-34-4 or a similar formulation) has gained in popularity among pond managers and it is comparable to granular formulations in price (\$4-\$6/gal). It is generally sold in 5 gal cans. It is also fairly easy to apply.

Some other ponds may require only super (0-18-0) or triple superphosphate (0-44-0) to produce a good bloom. Since it is usually applied in smaller amounts, it is cheaper (varies around \$7/bag) than the 20-20-5. It is applied in the same manner as other granular types.

Recent research at Auburn University has led to the development of a slow release fertilizer that shows great promise.

The slow release formulation would eliminate or greatly reduce re-



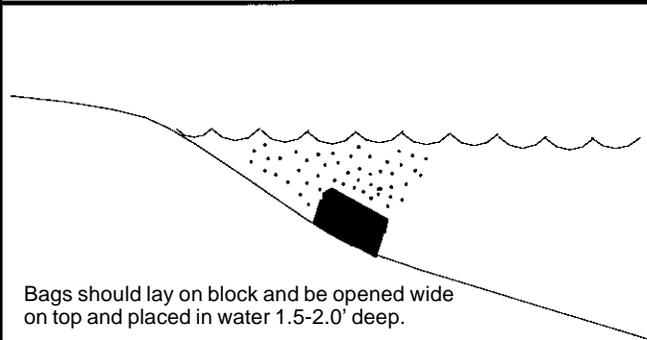
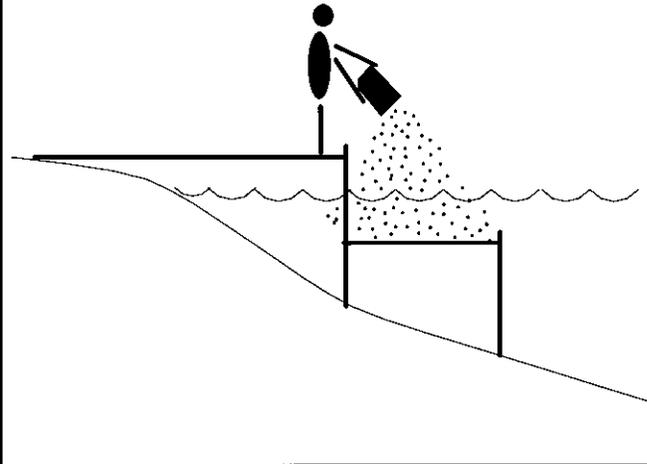
peated fertilizer applications during the growing season. This formulation should be available through farm supply companies soon.

GRANULAR FERTILIZERS

Granular fertilizers may be applied several ways. The material may be broadcast over shallow areas of the pond, but this method is not recommended by Department biologists because much of the mineral content is wasted as it is tied up in bottom sediments. The most efficient way is to use an underwater platform similar to the one shown in Figure 2. It need not be elaborate, and the design is limited only by individual imagination. The platform should be about 5' x 5' square and 1'-2' below the surface of the water. One platform is sufficient for five acres of pond. This method will keep fertilizer nutrients from being tied up and wasted by bottom muds, and can reduce fertilizer costs by 25%. Simply pour the fertilizer on the platform and water currents will distribute the nutrients as they dissolve. If a platform is not available, concrete blocks may be situated approximately 1' below the water's surface and the opened fertilizer bag placed on this structure. A second less effective way is to slit the fertilizer bag widely using a "X" cut on one side and place it in shallow (1'-2' deep) water with the slit side up so that the fertilizer can

Figure 2. Methods of applying inorganic pond fertilizer.

The use of a submerged platform is the most effective and economical means of fertilization. One 5'x5' platform is adequate for 5 acres of pond. It is *important* that the platform be submerged 1'-2' under the water's surface. Platform should be 8-15' from shoreline edge.



dissolve. This method will not disperse the nutrients as well as a platform.

LIQUID FERTILIZERS

Liquid fertilizers are best applied by mixing one part fertilizer with ten parts water and pouring the mixture out behind a boat. Better dispersal from a boat is achieved if the mixture is poured into the propeller agitation of a small outboard motor.

Organic fertilizers (manure, cottonseed meal, etc.) are not recommended for use in South Carolina ponds. They are low in nutrients and huge quantities are needed to produce the same bloom as chemical fertilizers. They can easily cause oxygen depletions if not used very carefully. In addition, there may be a link between the use of organic fertilizers and increased fish disease.

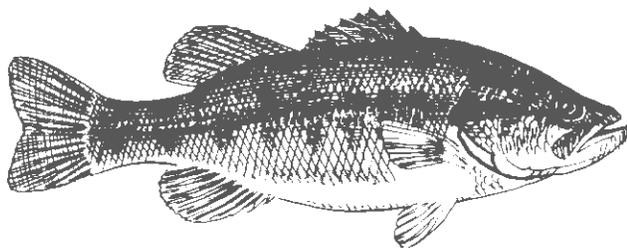
Fertilization programs in South Carolina

Farm Pond Fertilization and Liming

should begin when pond water temperatures reach 65°F. This is usually sometime in April. A *sample* schedule is as follows:

1. When the water temperature has reached 65°F, apply 40 lbs/acre of 20-20-5 or 1 gal/acre of liquid polyphosphate. Follow with two additional applications at two-week intervals.
2. Make three more applications at three-week intervals.
3. Continue applications at monthly intervals *or* whenever the water clears enough so that a white object can be seen 18" below the surface. Another quick method to determine fertilization need is to immerse your arm to a depth at your elbow. If you can see your fingertips at this depth, it is time for another fertilizer application.
4. Discontinue applications at the end of October, or when water temperatures drop below 65°F, whichever comes first.

Not all ponds can be managed as the above example. More or less fertilizer may be required. Some ponds may be well served with only an occasional application of superphosphate. New ponds will usually require heavier rates than old ones. Pasture ponds will likely require fewer applications than those in wooded areas. Since each pond is different, the owner must experiment until he finds the most economical way to produce an adequate bloom. Do *not* over fertilize. Overfertilization produces undesirable

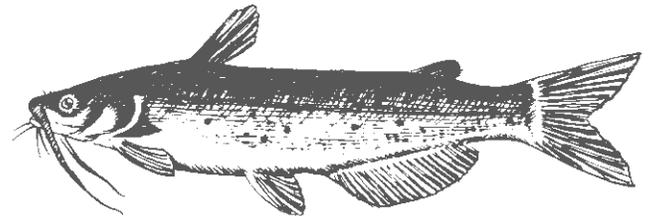


surface scums and can contribute to low dissolved oxygen levels and subsequent fish kills. There are instances when a pond should *not* be fertilized:

1. If the water is frequently muddy, turbid, or very darkly stained with humic acids so that a white object cannot be seen at a depth of 18".
2. If the pond has a heavy growth of aquatic

weeds. Those weeds will use the fertilizer intended to produce the "bloom." The weeds will grow well and the pond will remain clear.

3. If the retention time of the water in the pond is not at least three weeks, then the fertilizer will be flushed out before it can do its job. Occasionally a bottom-draw design drainpipe can overcome this problem.
4. If fish in the pond receive their food primarily from artificial feeds, and weed control is not a problem, as is the case in some ornamental or culture ponds.



Liming

Many of South Carolina's farm ponds annually experience problems in obtaining a phytoplankton "bloom" when fertilized at the recommended rates. Often this problem can be traced to poor water quality. Pond sites, with acid bottom soils, usually have a drastic effect on the impounded pond water. This effect can be seen in three important water quality parameters: pH, total water hardness, and total alkalinity. All three of these parameters play a very important part in the production of sport fish in farm ponds.

Liming of soft, acid waters in South Carolina ponds can correct water quality deficiencies and improve the pond's bass-bream production. The addition of lime has several beneficial effects:

1. Increases the pH of bottom mud and, thereby, increases the availability of phosphorus nutrients in the fertilizer.
2. Increases bottom plant-animal production in fertilized ponds.
3. Increases the availability of carbon dioxide for phytoplankton photosynthesis.
4. Buffers pond water, preventing extreme fluctuations of pH levels that can be harmful.

Fisheries biologists with the South Carolina Department of Natural Resources can check to determine the total hardness and alkalinity of pond water.

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Ponds having an alkalinity and a total water hardness below 20 ppm CaCO_3 should be limed. The amount of lime added will depend on the acidity of the pond mud and the total hardness.

Application of Lime

The most common liming material in South Carolina is simple, agricultural limestone - CaCO_3 or $\text{CaMg}(\text{CO}_3)_2$. This is the same form of limestone farmers use on their agricultural fields and can be purchased in bulk or bag form. Bulk limestone costs approximately \$25-\$35/ton.

Lime spreader trucks can be used in new pond sites prior to impoundment, if the terrain is suitable. In older pond sites or ponds already impounded, the limestone should be spread by boat evenly over the entire pond's surface. **Even distribution is important, since the pond owner is actually trying to lime the bottom mud and not the water.**

Effects from the addition of lime are variable but usually last from 2-3 years depending on the amount of water passing through the pond.

Over 80% of South Carolina's farm ponds need to be limed for maximum sport fish production. Through the addition of lime, the pondowner can increase his sport fish production 25% - 50%.

Additional information on private pond management may be obtained by contacting the district fisheries office of the South Carolina Department of Natural Resources in your area.



South Carolina Department of Natural Resources
Freshwater Fisheries Section

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