Managing Sport Fish Ponds to Lessen Nutrient Discharge to Streams

by Claude Boyd, Julio Queiroz, and Russell Wright

Sport fish ponds are especially important in the Southeast where many owners fertilize their ponds and some also apply feeds to promote fish production and improve fishing. Sport fish pond owners often are interested in conserving natural resources and in practicing good environmental stewardship. Many pond owners are not aware that fertilizing sport fish ponds can cause nutrient pollution of streams. Excess nitrogen and phosphorus in streams can produce nuisance algal blooms which degrade habitats for animals in the stream and reduce the quality of the water for human use. A few simple guidelines can help pond owners minimize nutrient inputs to streams and also conserve expensive fertilizer.

There are about 3 million acres of ponds in the Southeast. As a conservative estimate, we believe that 15% or about 480,000 acres of ponds are fertilized and around 5% of these, or 24,000 acres, also receive feed. Typically, sport fish ponds in the Southeast are fertilized about 10 times per year with 1 to 2 lbs/acre of nitrogen and 2 to 4 lbs/acre of phosphorus (4 to 8 lbs P_2O_5 /acre) per application (Boyd and Tucker 1998) or, on average, 15 lbs/acre of nitrogen and 30 lbs/ acre of phosphorus per year. If feed is applied at about 5 lbs/acre per day from May through September, this amounts to 610 lbs/acre of feed per year containing about 35 lbs/acre of nitrogen and 6.1 lbs/acre of phosphorus. The catch from ponds seldom exceeds 100 lbs/acre per year, and this quantity of fish contains about 2.5 lbs of nitrogen and 0.75 lbs of phosphorus (Davis and Boyd 1978). The remainder of the nitrogen and phosphorus either remains in the pond in plants, animals or sediment, enters the air as ammonia or nitrogen gas, or leaves pond in effluent. About 30% of nitrogen and 10% of phosphorus applied in fertilizer and feed is discharged in pond effluents. Given these rates the typical fertilized pond would discharge about 4.5 lbs nitrogen and 3 lbs phosphorus per acre each year. In ponds with feeding, quantities would increase to 15 lbs and 3.6 lbs, respectively.

The United States Environmental Protection Agency (USEPA) is developing regulations for pond aquaculture effluents, and the rules will become effective on 30 June 2004 (Federal Register 2000). Sport fish ponds operated for non-commercial purposes will be exempt from these regulations. Nevertheless, it is interesting to compare the potential of sport fish ponds and aquaculture ponds to discharge nutrients. There are about 180,000 acres of commercial channel catfish ponds in the Southeast (Harvey 2001). Each ton of feed added to a pond results in about 20 lbs of nitrogen and 2 lbs of phosphorus in effluent (Boyd and Queiroz 2001). At a typical feed input of 3.5 tons/acre per year, a catfish pond discharges about 70 lbs/acre of nitrogen and 7 lbs/acre of phosphorus annually.

The combined discharge from catfish ponds in the Southeast is around 6,300 tons of nitrogen and 630 tons of phosphorus annually, while sport fish ponds in this region discharge about 1,180 tons of nitrogen and 716 tons of phosphorus per year. Catfish ponds discharge more nitrogen than sport fish ponds to streams, but sport fish ponds discharge as much phosphorus. Because catfish farming is concentrated in a few areas, relatively few streams receive effluents from these facilities. Sport fish ponds, however, are spread over a much wider area and can potentially impact many streams.

Best management practices (BMPs) are likely to be the main feature in effluent regulations developed by USEPA for commercial aquaculture ponds. A BMP is considered to be the best economically feasible and technically practical method for reducing pollution to a level that protects water quality and is consistent with resource management goals (Hairston et al. 1995). A system of BMPs must be installed and regularly maintained to avoid environmental impacts.

Below are some BMPs for fertilized sport fish ponds.

Lime ponds with low alkalinity.

The total alkalinity of sport fish ponds should be 20 part per million or more for fertilizers to be effective (Boyd, 1982). Add at least as much lime as determined from a bottom soil sample analysis.

Agricultural lime should be spread uniformly over the water surface.

Apply fertilizer according to water clarity not a fixed schedule.

Usually, water clarity of 18 inches to 24 inches is adequate for good fish growth. Fertilizer application should be delayed when Secchi disk visibility is less than 18 inches.

Prevent fertilizers from sinking to the bottom.

Phosphorus is strongly adsorbed by sediment and limiting its availability to algae (Boyd 1981). Liquid fertilizers should be diluted 2-3 parts water per 1 part concentrate and poured in the prop wash of a boat. When using finely-pulverized water-soluble fertilizers, make sure there are no lumps that will sink to the bottom before dissolving. Apply time-release and granular fertilizers on underwater platforms to prevent contact with soil while they dissolve (Boyd and Tucker 1998).

Do not overfeed.

Feed only what the bluegill will eat in 10-15 min. More feed often sink to the bottom uneaten but increasing nutrient inputs.

Use fertilizers with nitrate as the source of nitrogen.

A pond fertilizer containing nitrate as a nitrogen source is more environmentally friendly than one containing ammonium or urea, which converts to ammonia which is toxic to many organisms (Tepe and Boyd 2001).

Fence cattle out of ponds.

Cattle contribute to pollution by increasing erosion, and adding wastes (urine and manure) to the water. Allow only a small area for access to water.

Reduce fertilizer for ponds with fertile watersheds.

Some ponds located on fertile watersheds may require little or no fertilization (Boyd 1976). Use of Secchi disk visibility as a fertilization guide will prevent unnecessary fertilization.

Match pond size to watershed size.

Watershed area should be matched to pond size for new ponds to prevent excessive runoff from entering ponds flushing the nutrients downstream. Where possible, excessive runoff should be diverted from existing ponds (Yoo and Boyd 1994).

Do not fertilize when heavy rains are expected.

Overflow after heavy rains will flush nutrients from ponds.

Do not fertilize during winter months.

Winter fertilization of ponds in Alabama does not increase fish production (Yuehua and Boyd 1990). Low water temperature and reduced light prevent efficient use of nutrients by phytoplankton. Also, heavy winter and early spring rainfall flushes nutrients downstream. In spring begin fertilization when water temperature is about 60°F.

Fertilizers with high nitrogen:phosphorus ratios should not be applied to sport fish ponds.

Fertilizers containing a 1:3 or 1:4 ratio (for example 10-38-0) of nitrogen to phosphorus are adequate for ponds in the Southeast, and some ponds respond well to phosphorus-only fertilization (Boyd and Tucker 1998). Excess nitrogen contributes to pollution of streams.

Store fertilizer in a dry place and avoid spills.

Careless storage or handling of fertilizers can result in spills that contaminate soil and water.

Pond owners who apply BMPs will be managing their ponds in an environmentally responsible manner and will save money on fertilizer. Although the USEPA will exempt sport fish ponds from federal regulations, states will have the authority to regulate sport fish ponds if necessary to prevent nutrient pollution of public waters. It is possible that effluents from sport fish ponds could be regulated by states to minimize nutrient input to streams. Voluntary adoption of nutrient BMPs in sport fish pond management reduces possible environmental damage and may help avoid governmental regulation.

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