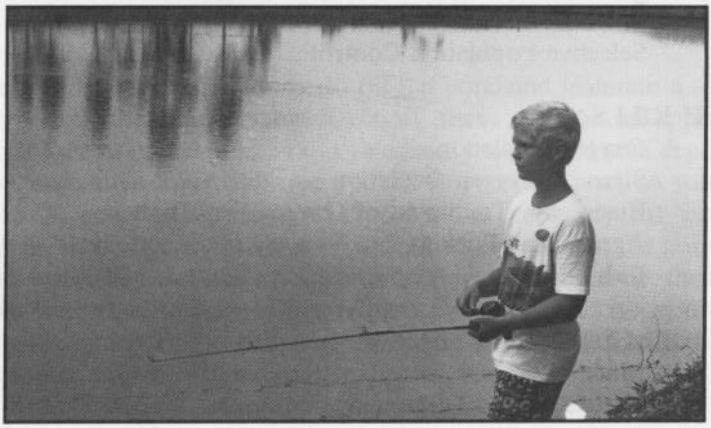
Management of Georgia Sportfishing Ponds



Cooperative Extension Service/The University of Georgia
College of Agricultural and Environmental Sciences/Athens

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Management of Georgia Sportfishing Ponds

The over one million ponds in the United States are ii significant and valuable sportfishing resource. Forty percent of the recreational fishing in Georgia is o.the estimated 90,000 ponds across thestate. Some ponds are used solely for fishing. while others provide water for livestock. irrigation and swimming. Proper construction, maintenance and management enhances the value and utility of ponds

In the southeastern United States, two management practices, fertilization and proper stocking. increase the carrying capacity in sportfishing ponds from about 100 to between 300 and 400 pounds per surface acre. The management practices described in this booklet are appropriate for ponds throughout the southeastern United States.

POND CONSTRUCTION

There arc three common types of ponds in the southeast. The first type, a natural pond, is often associated with swampy areas or wetlands. This type is difficult to manage without physical alteration. A second type is an excavated pond dug in a relatively level area. The third type is an embankment pond created by building a dam across a small stream or depression. Because of Georgia's topography, many ponds are combinations of embankment and excavated types.

Careful selection of a pond site prevents many management problems. The site should have adequate clay soil to prevent excessive seepage. Do not build sportfishing pond:, directly on flowing streams because it is difficult to eliminate undesirable fishes from these ponds. Also, excessive flow prevents economic fertilization and liming. To reduce introduction of pollutants, avoid sites with cultivated fields, barn lots or septic tanks in the watershed.

Have an adequate water source to fill the pond and maintain a constant water level. If the water source is runoff, there must be an appropriate watershed area to pond volume ratio. Necessary watershed area depends on land use, vegetative cover, soil type and the slope of the land. A watershed of 10 to 20 acres per surface acre of pond is necessary for woodland watersheds, while five to 10 acres of watershed is sufficient for ponds with pastured watersheds. Sites on constantly flowing streams or those with excessive watershed-to-pond ratios require a diversion ditch. A diversion ditch allows control of flow through the pond and makes fertilization and elimination of wild fishes practical.

After locating a suitable site, clear the area to be flooded of all plants, debris and boulders. Clearing a 15 to 20 foot strip above the shoreline allows easy access to the pond. Have a qualified engineer design the dam and construct it of well-compacted clay. The clearing of the pool area and disposal of excess material must conform with applicable federal, state and local regulations. Make sure the pond has a drainage system large enough to handle expected flow. Two types of drainage systems are commonly used in Georgia sportfishing ponds: a standpipe overflow with an outside sleeve (Figure 1) or a syphon drain (Figure 2). Either type works well; however, the syphon drain is less expensive and easier to maintain. These drains are designed to draw water from beneath the surface because this is the least productive water. If the drainage system draws surface waters, nutrients and phytoplankton are washed away before they can benefit fishes.

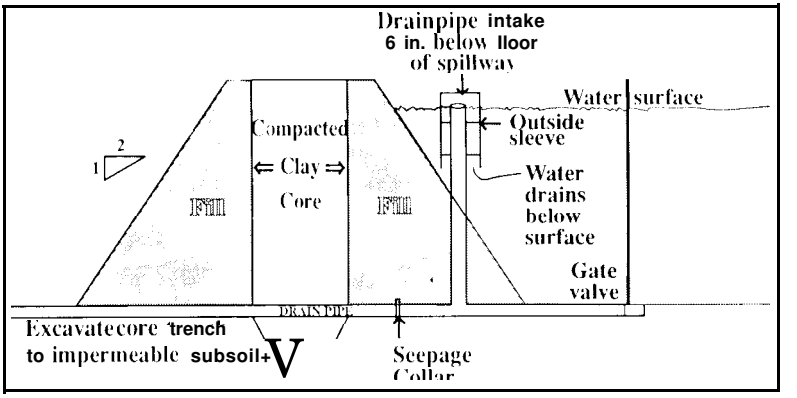

Figure 1. Features of an embankment pond dam with a standpipe drain

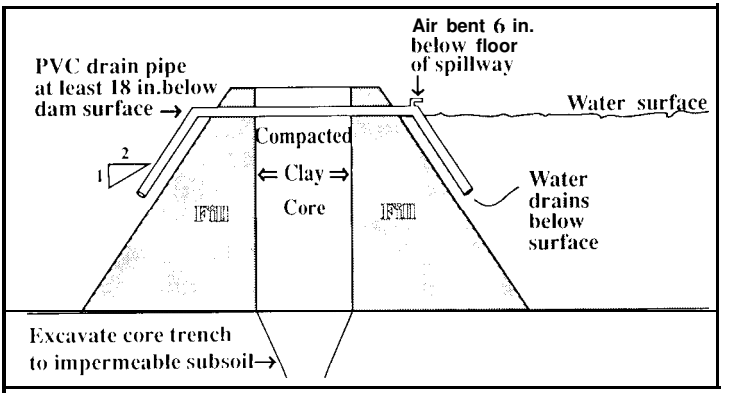

Figure 2. Features of an embankment pond dam with a syphon drain.

Pond construction and associated movement and disposal of fill material which affect wetlands may require U.S. Army Corps of Engineers permits under the Clean Water Act, Section 404 Regulatory Program. Wetlands are areas that are periodically or permanently inundated by surface or ground water, and support vegetation that lives in saturated soil. Wetlands include swamps, marshes and bogs. The Corps has adopted a "no net loss of wetlands" policy. For additional information, contact:

U.S. Army Corps of Engineers
Savannah District
Regulatory Branch
P.O. Box 889
Attention SASO P-F
Savannah, GA 31402-0889

Phone: 1 800-448-2402
912-944-5347

STOCKING

Proper initial stocking of new or renovated sportfishing ponds produces maximum numbers of harvestable fishes. Proper stocking is one of the best management tools available to fish pond owners. Using a combination of recommended species, appropriate stocking rates and controlled harvest produces a fish population with the correct predator to prey balance. A balanced population provides long-term satisfactory fishing.

Pre-stocking procedures

Eliminate all existing fishes before stocking. If there are fishes in the pond before stocking, it is difficult to achieve the desired balance of predators and prey. Treat the pond water, as well as small streams flowing into the pond, with a fish toxicant. This eliminates undesirable fishes, such as carp, golden shiners, bullheads and minnows. Even desirable fishes, such as bream (bluegills and redear sunfish), must be eliminated. If they reproduce before predators are stocked, the bream become overcrowded and stunted.

Rotenone is the most commonly **used** fish toxicant. It is widely available and inexpensive. Apply rotenone at least two to three weeks before stocking fishes. There should be no water flowing through the pond at the time of treatment. If the pond has partially filled, draw it down to ensure the toxicant does not leave the pond. Treating less water also reduces costs. Apply rotenone at a rate of two to three parts per million (ppm, or milli-

grams per liter). Three ppm equals about one gallon of liquid rotenone, or five to six pounds of five percent emulsifiable powdered rotenone, per acre foot. An acre foot is one surface acre covering a depth of one foot. For example, a two acre pond with an average depth of four feet contains eight acre feet of water. It would need eight gallons of liquid rotenone or between 40 and 48 pounds of powdered rotenone to achieve a concentration of three ppm. In streams, begin treatment upstream and treat the entire length of the stream at a rate of one quart of liquid, or one and one-half pounds of powdered rotenone, per 300 linear feet of stream. Rotenone is more effective at higher water temperatures. If possible, apply it when surface water temperatures are over 70 degrees Fahrenheit. Rotenone detoxifies after three to five days at higher water temperatures but takes longer in cooler water. Place a small cage containing a few fishes in the treated water for at least 24 hours to determine if the rotenone has detoxified.

Apply rotenone to water less than six feet deep by pouring a diluted solution into the propwash of an outboard motor or by spraying it over the surface with a hand sprayer. Organic material decreases the effectiveness of rotenone, so disturb the bottom as little as possible. In deeper water, apply rotenone with a pump and a weighted, perforated hose.

Obtaining Fishes

The Georgia Department of Natural Resources provides largemouth bass, bream and channel catfish at no charge for new or renovated ponds. The Department requires the elimination of all existing fishes before stocking. Obtain applications for free fishes from county Extension and Georgia Department of Natural Resources regional offices. Return completed applications to the appropriate Department of Natural Resources regional office.

Applications must be accurate and filled out by the pond owner. Obtain the estimated surface area of existing ponds from local Natural Resources Conservation Service or Farm Services offices. For new ponds, surface acreage is available from the design engineer or contractor. Accurate estimates of surface acreage are essential in determining the proper number and ratio of fishes to stock. If the surface area is overestimated, too many fishes will be stocked for the available food supply, and few will grow to a harvestable size. If the pond size is underestimated, available food supplies will be underutilized, and an incorrect ratio of predators to prey will become established.

Fishes are distributed almost exclusively from public hatcheries from fall through spring in the order that applications are received. Although fishes are made available for several months, ponds stocked earlier in the fall are more likely to achieve a desired balance; therefore, pond owners should complete and return applications as early as

early as possible. Bream and catfish fingerlings are available from fall through early winter. Bream stocked early in the fall quickly grow to a size large enough to reproduce. This in turn provides food for bass stocked the following spring. Do not stock bream after January because there is not enough time for them to reach sexual maturity by early summer. You can purchase fishes from commercial hatcheries any time of the year; however, it is best to follow the previously described stocking schedule.

Stocking Rates

To produce the best fishing possible, use an appropriate ratio of largemouth bass, bream and channel catfish. The stocking rate is 400 bluegill, 100 redear sunfish, 50 largemouth bass and an optional 50 channel catfish per surface acre. Pond depth is unimportant, because natural food is produced within the top few feet of water. State hatcheries also provide catfish fingerlings to stock ponds already containing fishes. The channel catfish stocking rate for ponds containing bass and bream is 100 per pond or 50 per acre, whichever is greater. up to 1,000 fish per applicant. In ponds containing bass, raise the catfish fingerlings in cages until they are about 10 inches long. This prevents predation by larger bass. The Department of Natural Resources does not provide large channel catfish for restocking but you can purchase them from commercial sources.

Very small ponds are difficult to manage for bass-bream fishing. In ponds smaller than one acre, stock only channel catfish at a rate equivalent to 500 fish per acre. In ponds larger than one acre, the rate is 500 catfish per pond or 50 per acre, whichever is greater. Channel catfish do not usually reproduce in sportfishing ponds and have to be restocked periodically.

Do not stock species other than largemouth bass, bluegills, redear sunfish, hybrid bream. channel catfish, hybrid striped bass, triploid grass carp or rainbow trout in sportfishing ponds. Other species are difficult to manage and often become overcrowded and stunted. It is not necessary to restock bass and bream in balanced populations. At recommended stocking rates, channel catfish production does not reduce bass and bream production.

Picking Up and Stocking Fishes

Pick up fishes from the Department of Natural Resources at the regional fish hatchery. Bream and channel catfish are available in late fall or early winter, and largemouth bass are picked up the following spring. You must provide transport containers. Use clean containers that are large enough to prevent fishes from suffocating, such as large coolers. plastic garbage cans or tubs. Water to fill the containers is available at the hatcheries. Cover open containers with burlap to prevent fishes and water from sloshing out.

Transport fishes directly to the pond. At the pond bank, slowly add water from the pond to the containers until the temperature in the containers equals that of the pond water. Do not add more than one-fifth to one-third of the volume of the container at a time. Proper stocking greatly increases the chances of achieving balanced fish populations and producing long-term, satisfactory fishing.

STOCKING ADDITIONAL FISHES

Hybrids

Hybrid bream and hybrid striped bass offer additional stocking options. Hybrids require special management considerations. For example, ponds containing hybrid bream need to be periodically drained or poisoned and then restocked. Do not stock fingerling hybrids smaller than five inches long into existing bass-bream or bass hybrid bream populations because they will not survive bass predation. If draining and restocking hybrid bream is not practical, grow fingerlings in cages, raceways, or separate ponds, and stock when they are of adequate size. Hybrid bream need to be at least five inches long and hybrid striped bass at least eight inches long. Growing hybrids in cages or raceways requires daily feeding.

Hybrids are not available from state hatcheries but can be purchased from private hatcheries. The most common hybrid bream sold in Georgia is the green sunfish and bluegill cross. The hybrid striped bass commonly sold is a striped bass and white bass cross. Hybrid bream grow rapidly and appear to be more aggressive than either parental species. They reproduce in ponds, leading to crowding and stunting. After a few years, hybrid bream reproduction results in fishes which externally resemble parental species, and their long-term advantages are questionable. Hybrid striped bass are usually introduced as a novelty or to control excessive reproduction of forage species, such as bluegills or golden shiners. Hybrid striped bass smaller than eight to ten inches rarely survive in ponds with existing largemouth bass. Additionally, bluegills which often remain in sheltered areas near the shore, are not a preferred food item of hybrid striped bass; therefore, it is difficult to correct an overcrowded bream population with hybrid striped bass. Because of the expense of hybrids and the doubtful long-term benefits, exercise caution when considering their use.

Do not stock other species without consulting a fisheries biologist because other species do not usually produce a large harvestable population and can create problems. For example, common carp muddy the water. Crappie and bullheads compete with bream, creating overcrowding and stunted populations. Shiners and other minnows can grow too large for bass to eat and use available nutrients that could promote bass and bream production.

State regulatory agencies prohibit the introduction of several undesirable, exotic species. Diploid grass carp, piranha and walking catfish are some of those prohibited in Georgia. Obtain approval for introducing any non-native fishes from the Georgia Department of Natural Resources.

SINGLE SPECIES STOCKING

Stock channel catfish alone at a rate of 100 to 200 fingerlings per surface acre in an unfertilized pond, or 300 to 500 fingerlings per surface acre in a fertilized pond. If fed daily, they can be stocked at 1,500 to 2,000 per surface acre, but this rate is recommended only for commercial production. Ponds which are smaller than one acre and are stocked with only channel catfish provide excellent fishing with minimum management. Because catfish normally do not reproduce, periodically restock to replace the harvested fish.

Rainbow trout can be stocked alone in ponds when water temperatures do not exceed 70 degrees Fahrenheit. The normal stocking rate is 300 per surface acre. If fed daily, they can be stocked at 1,500 to 2,000 fish per surface acre. Trout can be stocked and harvested for the portion of the
year that water temperatures do not exceed 70 degrees Fahrenheit.

FERTILIZATION

Fertilization increases the pond's carrying capacity. In bream-bass-catfish ponds, carrying capacity increases from about 100 pounds per surface acre in unfertilized ponds to between 300 and 400 pounds per surface acre in fertilized ponds. Fertilization promotes a phytoplankton (microscopic plants) "bloom" which is in turn eaten by zooplankton (microscopic animals) and insects. These are in turn eaten by bluegills, which are eaten by bass (Figure 3). The green color associated with fertilized ponds results from an abundance of phytoplankton.

Use granular or liquid fish or slow release pond fertilizers. The most common granular fertilizer is a 20-20-5 formulation. Liquid fertilizers come in a variety of formulations. Two commonly used are 9-30-0 and 10-34-2.

Begin fertilization in February or early March when surface water temperatures stabilize above 60 degrees Fahrenheit. Apply 40 pounds of 20-20-5 granular fertilizer per surface acre at two-week intervals until proper color develops. If liquid fertilizer is used, apply one gallon per surface acre each application. Slow resease pond fertilizer is applied once in the spring. It's formulation will slowly relese fertilizer during the summer months. If visibility exceeds 18 inches, proper color has not developed. If proper color has not developed after the third application, have the pond water tested for lime deficiency by your county Extension agent or a Department of Natural Resources biologist.

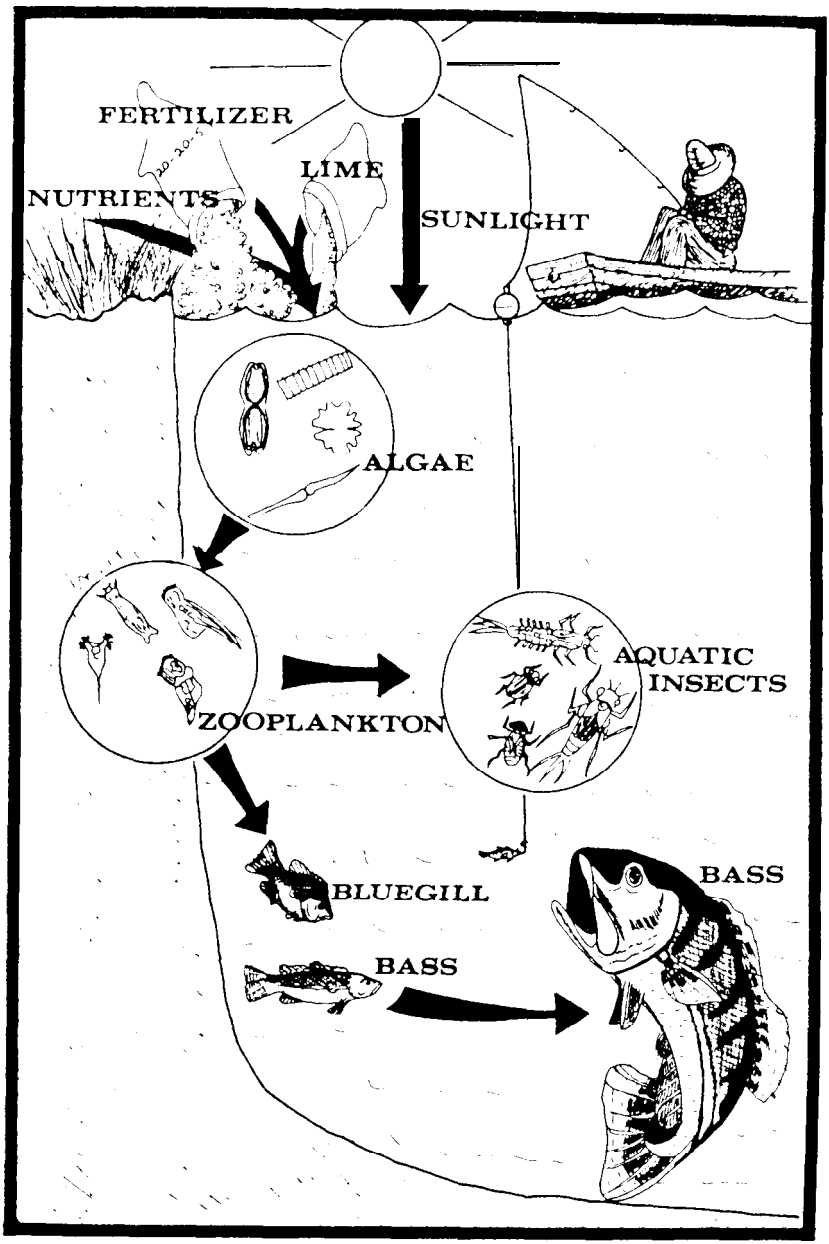

Figure 3. Fertilization and liming increase fish production.
Adapted from *Alabama Fish Ponds* by J. H. Crance.

Maintain proper color through spring and summer with proper fertilizer applications. Apply fertilizer when visibility exceeds 18 inches. Cease fertilization immediately if visibility is less than 12 inches because the pond is over-fertilized. The number of applications varies from pond to pond. Those surrounded by fertilized lawns or pastures require fewer applications than those in wooded watersheds. Continue fertilization until October or November when water temperatures stabilize below 65 degrees Fahrenheit. Renew the fertilization program each spring.

Substitute Fertilizers

In weed-free ponds which have been fertilized properly for at least five years, superphosphate can sometimes be substituted for complete (those containing all three nutrients) pond fertilizer. In older ponds, adding nitrogen and potassium may not be necessary. Begin fertilization each year in February or early March by applying 40 pounds of 20-20-5 or one gallon of 34-10-2 liquid fertilizer per surface acre. After the initial proper color has developed, apply 40 pounds of superphosphate or 18 pounds of triple superphosphate per surface acre to maintain proper color. Superphosphate fertilization reduces cost but is not successful in all ponds. Resume fertilization with complete pond fertilizer if proper color cannot be maintained using superphosphate or other substituted fertilizers.

To determine the amount of substitute fertilizers to use, look at the middle number in the analysis. This represents the amount of phosphorus, which is usually the limiting nutrient. Use the following formula to calculate the amount of substitute fertilizer equivalent to a given amount of 20-20-5:

$$\frac{\text{8 pounds} \times 100}{\text{middle number in substitute fertilizer analysis}} = \text{pounds of substitute fertilizer equal to 20-20-5}$$

Example: Forty pounds of 20-20-5 contains eight pounds of phosphorous (20 percent multiplied by 40 equals eight). To calculate the amount of 10-10-10 containing an equal amount of phosphorous use:

$$\frac{8 \times 100}{10} = 80 \text{ pounds of 10-10-10}$$

Once a fertilization program is started, it must be continued properly. Fertilizing once or twice a year does more harm than good. If fertilization is discontinued after a few applications or even after a few years, the pond will have more fish than it can support and a stunted population of small

fish will develop. Not all ponds should be fertilized. Fertilization increases the carrying capacity of the pond, not the average size of each fish. Do not fertilize ponds which receive little or no fishing pressure or ponds which are fed. Over-fertilization produces heavy phytoplankton blooms, which lead to dissolved oxygen depletions and fish kills. Reduce fertilization rates during droughts.

Fertilization is one of the best management tools available to pond owners; however, haphazard fertilization does more damage than no fertilization.

Applying Fertilizer

There are several ways to apply liquid or granular fertilizers. Detailed instructions are usually printed on the label. Spread liquid fertilizers over the entire pond surface. Some must be diluted before application, while others can be poured directly into the pond. Most liquid fertilizers are heavier than water and if they are poured at one spot, the nutrients sink to the bottom and become bound in sediments. When applying granular fertilizers, keep the granules from contacting the bottom. If this happens, phosphorus becomes trapped and is unable to promote bloom development.

Use the following technique to apply granular fertilizers:

- Slit one of the flat sides of the bag in the form of the letter "H."
- Peel the flaps back.
- Lay the bag in shallow water with the open side facing the surface.
- If several bags are used, spread them out as much as possible.

Another way to apply granular fertilizer is to use a submerged platform (Figure 4). Fertilizer placed on a platform dissolves slowly as water washes over it, and the platform prevents granules from reaching the bottom. Place the platform 10 to 15 feet from the shore and submerge it 12 to 18 inches below the surface. Locate it in the upper two-thirds of the pond in a place where it will receive maximum wind exposure. A platform three feet square is adequate for a three acre pond. Construct a proportionately larger platform for larger ponds. Ponds up to 15 surface acres can be fertilized with one platform.

LIMING

Many ponds in Georgia have very soft (low total hardness) water. Adding lime increases fish production and aids bloom development in soft waters. Lime requirements are determined by your county Extension agent, Soil Conservation Service specialist or a Department of Natural Resources biologist. If total hardness is less than 10 ppm, liming will be needed for a successful fertilization program. Pond waters with total hardness of 10 to

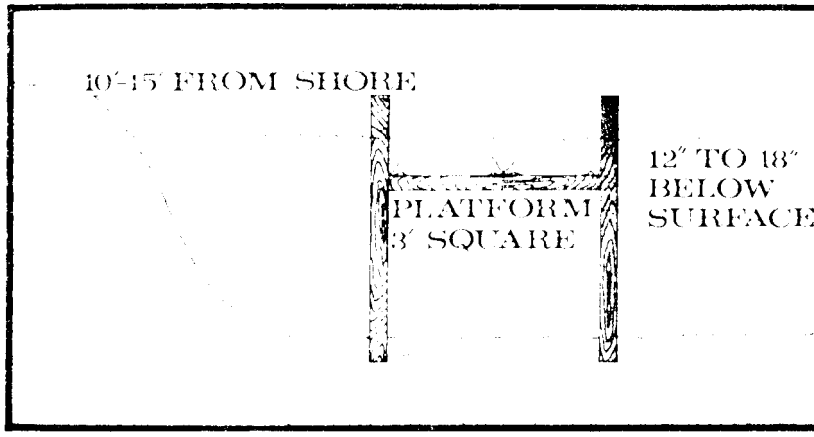

Figure 4. A platform is an efficient way to apply fertilizer.

15 ppm may require liming. If total hardness is over 20 ppm, liming is not required. Determine lime requirements when proper bloom cannot be developed or maintained with proper fertilization, three years after liming with agricultural lime, and before using weed control agents. Some chemicals are more toxic to fishes in water with low total hardness.

Most ponds need at least one ton of agricultural lime every three to five years. Spread lime throughout the pond. Do not pile it in one area. Because most southern soils are deficient in lime, spreading and lightly discing one to three tons of agricultural lime per surface acre over the pond bottom during construction is advisable. It takes about three months for agricultural lime to go into solution.

Builder's (hydrated) lime can be used to temporarily raise total hardness. It is more soluble than agricultural lime; however, it must be added every six to eight weeks to maintain a high total hardness. Apply it at a rate of 50 pounds per surface acre, and use it only when agricultural lime is not practical. **WARNING: HYDRATED LIME CAN BE TOXIC TO FISHES. DO NOT EXCEED RECOMMENDED APPLICATION RATES.**

FEEDING

Pelleted feeds increase the carrying capacity of bass-bream-catfish ponds to over 1,000 pounds per surface acre, but the chances of fish kills also increases. Use a feeding program for bass-bream-catfish ponds only where an extremely heavy demand for fishing exists. Fed ponds must be harvested to prevent exceeding the carrying capacity of the pond leading to fish kills.

If fishes are fed a prepared diet, you can stock up to 500 catfish per

surface acre. It is not necessary to increase the numbers of bass and bream stocked because they reproduce in the pond. Begin feeding floating pellets at a rate of two pounds per surface acre per day when water temperatures exceed 60 degrees Fahrenheit. Scatter pellets around the shoreline because bream do not usually concentrate in one feeding location. As fish learn to take feed, increase the rate to between 10 and 12 pounds per surface acre per day. Do not feed more than the fishes will consume in 15 to 20 minutes. Do not feed when water temperatures are below 55 degrees Fahrenheit because bass, bream and catfish do not actively feed at low water temperatures.

If only channel catfish or rainbow trout are stocked at over 1,000 fish per surface acre, a feeding program is essential. Begin feeding at a rate of five pounds per surface acre per day and gradually increase the amount as the fish become larger. Do not feed more than two to three percent of the estimated weight of fish in the pond per day.

Maximum feeding rates should not exceed 30 pounds per surface acre per day or more than the fish consume in 15 to 20 minutes. Uneaten feed sours the water and increases the chance of a fish kill because of oxygen depletion. If fish drastically reduce feeding activity when water temperatures are within normal feeding ranges, determine the problem immediately. Cessation of feeding is often a sign of poor water quality or diseases.

Although a feeding program means a much higher poundage of fishes, it also increases costs and fish kills. When considering a feeding program think about costs, risks and harvesting. Stopping an established feeding program creates an overcrowded population. Unless you need high harvests, feeding is not worth the time, cost or effort.

WEED CONTROL

Aquatic weeds are undesirable in sportfishing ponds for several reasons. They provide cover for small bream, which results in overcrowding. Weeds use nutrients and prevent proper bloom development. They can become so abundant that boat traffic or fishing becomes difficult. Extensive weed coverage reduces dissolved oxygen levels during warm, cloudy weather.

In properly constructed ponds, fertilization is often the best control for rooted aquatic weeds. All green plants must have sunlight to grow. In fertilized ponds with a minimum depth of three feet, sunlight cannot penetrate to the bottom; therefore, rooted aquatic weeds do not become established (Figure 5).

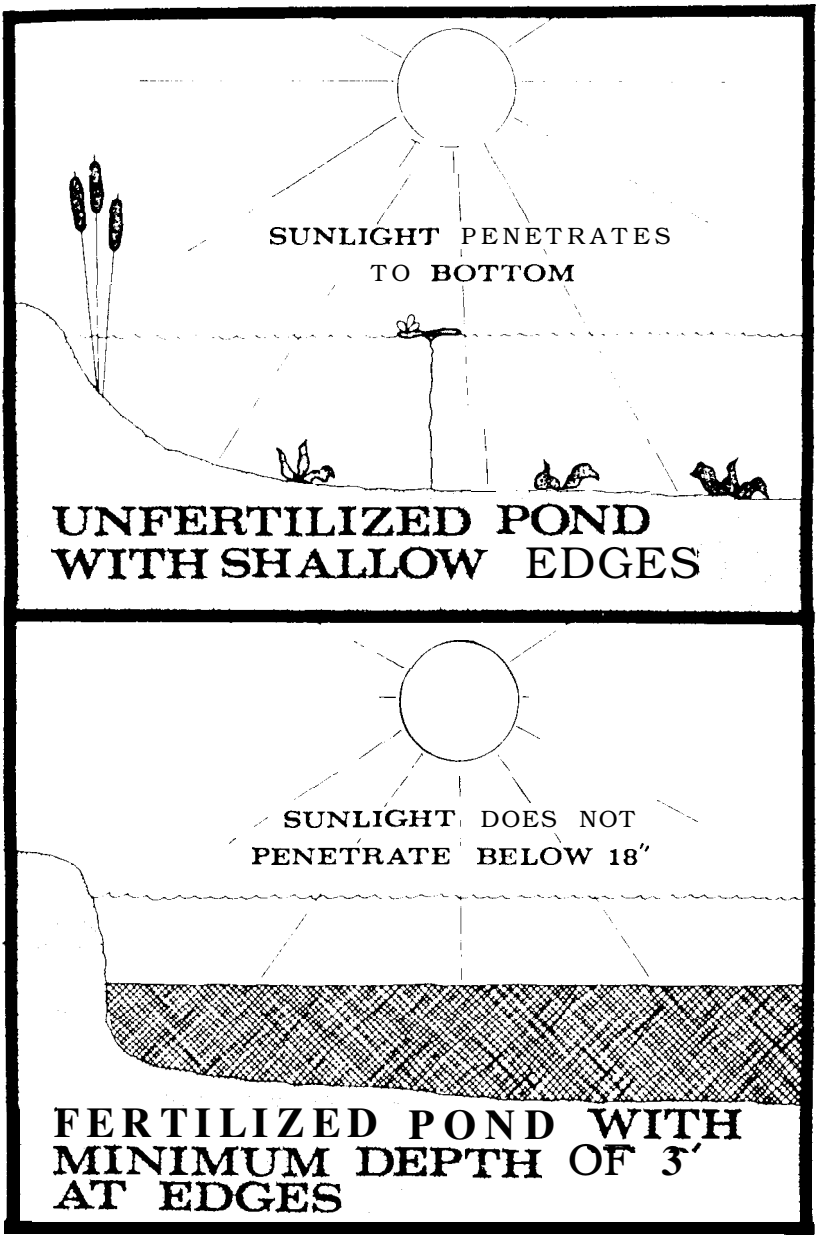

Figure 5. How fertilization works to control aquatic weeds.

In ponds with shallow edges or excessive water flow, fertilization **will not** prevent aquatic weed growth. Deepening pond edges and constructing ditches to divert excess water are possible corrective measures.

Winter drawdown helps control aquatic weeds by exposing them to drying and freezing. Lower the pond three to four feet in late fall. Reduce surface acreage by at least one-third but not more than **one-half.** Allow the pond to remain low until February or early March. To be effective, use a drawdown for at least two successive years. The water source must be sufficient for complete refilling by early summer.

Control aquatic weeds temporarily with herbicides. If it is necessary to use herbicides, follow treatment with a fertilization program to prevent weed re-establishment. For specific herbicide recommendations, consult your county Extension agent or a Department of Natural Resources fisheries biologist. Chemical treatments are most effective in the spring when aquatic weeds are actively growing. There is less danger of dissolved oxygen depletions if treatments are done before plant growth covers the entire pond. Summer herbicide treatments often result in an oxygen depletion. Therefore, treat only a portion of the pond at time.

Triploid grass carp are an effective and economical way to control certain aquatic weeds. They are ineffective in regulating tough, woody vegetation such as cattails or water lilies; however, they control tender vegetation such as submersed weeds and floating duckweeds. The Georgia Department of Natural Resources does *not require a permit* for using grass carp if the pond owner meets the following criteria:

- Sterile triploid grass carp are purchased from a source authorized by the Department of Natural Resources. Lists of currently approved dealers are available from your county Extension agent and the Department of Natural Resources.
- The pond owner retains the bill of sale as proof of legal purchase.
- The pond is privately owned; in other words, a body of water which is clearly and entirely within the title of one owner. Community lakes or those managed by an association are usually considered to be within the title of one owner.
- The pond is constructed so that grass carp cannot travel upstream or downstream directly into a body of water not owned by the person purchasing the carp.

If unsure whether the above criteria can be met, consult a Department of Natural Resources fisheries biologist.

Recommended stocking rates for triploid grass carp vary, depending on the weeds to be controlled and the degree of infestation. Suggested rates are usually between 10 and 20 fish per surface acre. Triploid grass carp do not reproduce in ponds and must be restocked periodically.

FISH HARVEST

The goal of sportfish pond management is good fishing. This cannot be maintained without controlling and managing fishing pressure. A harvest plan is an integral part of the overall management program.

First, do not begin fishing until June of the year following stocking of fingerling largemouth bass. This allows bass to spawn once before fishing begins. Second, remove four to five pounds of bream for every pound of bass removed in balanced populations. This maintains the proper ratio of bass to bream. Third, do not return small bream to the pond. Overcrowding is associated with an overabundance of small bream.

Ponds have a limited carrying capacity. This capacity and the appropriate harvest plan are determined by the management program. An unfertilized pond produces no more than 40 pounds of harvestable bream (about 120 fish) and 10 pounds of harvestable bass (eight to ten fish) per surface acre per year. During the first year of fishing a fertilized pond, do not remove more than 80 pounds of harvestable bream (about 320 fish) and 20 pounds of bass (15 to 20 fish) per surface acre. In succeeding years, a fertilized pond should produce 150 to 160 pounds of harvestable bream (600 to 700 fish) and 30 to 35 pounds of harvestable bass (25 to 30 fish) per surface acre per year. In fed ponds, up to 500 pounds of harvestable bream (about 3000 fish) can be removed, but do not remove bass at rates higher than those suggested for a fertilized pond. Harvest channel catfish, hybrid bream and rainbow trout at whatever rate desired because their numbers are maintained by restocking rather than reproduction.

Finally, do not remove an excessive amount of adult fishes in a short time. Spread the fish harvest over as long a span as possible. Excessive removal, particularly of bass in the spring. results in small bream overcrowding.

FISH POPULATION ANALYSIS

Sportfish pond populations become unbalanced for a variety of reasons. When sufficient bass are not present to control bream or wild fishes, the bream become overcrowded and stunted. Individual bream will be small, but the relatively few bass will be robust. If bream become extremely overcrowded, they reduce the reproductive success of bass and bream. If bass become overcrowded, the bass reduce bream survival rates. Bream that do survive have an abundant food supply and reach a large size. Overcrowded bass populations typically have bream that weigh one to two pounds.

If wild fishes are not eliminated or have access to the pond before stocking, they become so abundant that the bass cannot control them. Then there is not enough food for bream to reach a harvestable size, resulting in

a pond full of small unusable fishes. Common causes of unbalanced fish populations include:

- removing excessive numbers of bass
- excessive removal of adult fishes in a short time period
- discontinuing fertilization or feeding programs
- excessive weed coverage which prevents bass predation
- improper pond construction or stocking
- failure to eliminate fishes before stocking.

Analysis of the angler catch indicates the condition of sportfish pond populations. If fishing pressure is sufficient and catch records are available, use Table 1 to determine the population's condition. If fishing is poor and imbalance is suspected, ask a fisheries consultant or state game and fish biologist to do a population balance check. These are made between June and October and are based on observed reproductive success and relative numbers of various sizes of bass and bream collected in seines. If the fish population is unbalanced, it can be corrected by draining and restocking, winter drawdown, weed control or selective population control.

Table 1. Pond Population Analysis from Angler Catch

Catch	Population Condition
a. Bluegill six inches and larger	Desirable
Bass - all sizes caught (average one to two pounds)	Balanced
b. Bluegill three to five inches	Overcrowded
Bass - few two pounds and larger	Bluegill
c. Bluegill exceed one third pound average	Bass
Bass less than one pound	Heavy
d. Small crappie, sunfish, bullheads carp, suckers, golden shiners	Species competing with desirable bream

Draining and Restocking

Draining and restocking results in the loss of 18 months of fishing; however, it is often the only reasonable way to correct unbalanced populations. Treat and restock drained ponds as recommended for new ponds. If the imbalance resulted from faulty pond construction, renovate the pond before restocking.

Winter Drawdown

Winter drawdown helps control mildly overcrowded bream populations. Drawdowns are particularly effective in unfertilized ponds because they force small fishes away from protected shoreline areas, making them available to predators. Lower the water level so that the surface area is reduced by at least one-third but not more than one-half, from November until February or March. Drawdown a pond for at least two successive years. Use this method only with ponds that have sufficient water sources to refill in the prescribed time. Do not lower water in the spring or summer because this increases the chances of dissolved oxygen depletions.

Weed Control

Dense aquatic weed growth, especially submersed rooted plants, uses nutrients and reduces food available for fishes. This results in excessive numbers of small bream and a stunted population. If aquatic weeds are abundant, use the control measures described in this publication.

Selective Population Control

Selective control removes small fishes without killing large fishes. Do not attempt selective population control without the assistance of an experienced fisheries biologist. Remove at least 80 to 150 pounds of small fishes per surface acre from fertilized ponds and 40 to 70 pounds per surface acre from unfertilized ponds. It is difficult to determine the exact amount of toxicant to use, and attempts to kill only small or undesirable fishes are seldom successful. Attempt this only when no other options are available.

FISH KILLS

Fish kills result from a variety of factors, such as dissolved oxygen depletions, diseases, toxic substances or a combination of factors. When a fish kill occurs, call your county Extension agent or a state fisheries biologist. First, determine the cause of the kill. Unfortunately, pond owners often do not report a kill early enough for the biologist to determine the cause of mortality or to prescribe treatments. If a kill is discovered, collect several live fishes showing signs of distress and immediately get them to a fisheries biologist. If help is not immediately available, freeze five or six specimens that show symptoms and forward them to the biologist as soon as possible.

Oxygen Depletion

Dissolved oxygen depletion is a common cause of fish kills and is usually the result of mismanagement. The dissolved oxygen level is the balance between oxygen production and demand. The major oxygen sources in water are photosynthesis and diffusion. Oxygen is used by aquatic plants and animals for respiration and breakdown of organic material. Under certain conditions, production and demand become unbalanced, causing an oxygen depletion.

Conditions leading to dissolved oxygen depletion include: overcrowded fish populations; decomposition of organic matter induced by overfeeding, excessive fertilization, organic pollution, chemical treatment of aquatic weeds or fish kills; and failure to produce enough oxygen through photosynthesis to meet demand.

Water density varies with temperature, and deep ponds often stratify into three distinct layers (Figure 6). The upper layer, or epilimnion, is warm and contains most of the oxygen-producing phytoplankton. The middle layer, or thermocline, is a thin mixing layer characterized by sudden drops in temperature and dissolved oxygen concentrations. The bottom layer, or hypolimnion, contains the coldest and heaviest water. It receives little sunlight and produces little or no oxygen from photosynthesis. Decomposition of organic material uses the available oxygen, resulting in low oxygen concentrations. Certain climatic conditions can cause a sudden mixing of the layers, or a "turnover." Cold, severe rains put a layer of cold water on top of the warm epilimnion forcing it to the bottom and mixing the layers. If there is not enough oxygen in the upper layer to maintain sufficient levels throughout the mixed water column, an oxygen depletion and fish kills can occur. Strong winds blowing in one direction for extended periods and sudden cooling in the fall can also create turnovers.

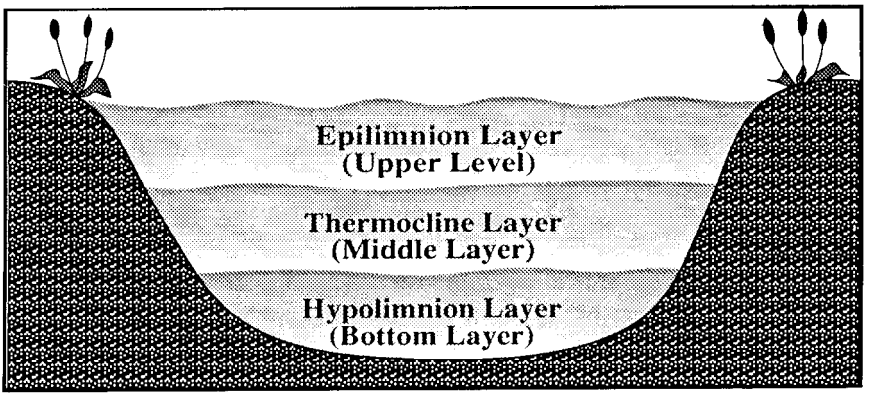

Figure 6. Pond stratification_

Cloudy weather can also promote a dissolved oxygen depletion. Aquatic plants need a lot of sunlight to produce enough oxygen for respiration and decomposition. Several consecutive days of overcast weather can cause aquatic plants to produce less oxygen than they consume.

Signs of Oxygen Depletion

- Fishes swim to the surface and gulp air. If disturbed, they dive but quickly return to the surface.
- In fed ponds, fishes stop eating or normal feeding behavior changes noticeably.
- If oxygen depletion has not reached a lethal level, fishes are at the surface in the early morning, but return to deeper water as dissolved oxygen builds up during the day.

Emergency Treatment of Oxygen Depletion

Take immediate action to prevent disastrous losses because the entire fish population can be lost in a few hours. If help is needed in setting up emergency treatments, contact county Extension or Department of Natural Resources offices. Effective emergency treatments are as follows:

- Place an aerator in the pond.
- Flush the pond with fresh aerated water.
- Spray pond water from a two to three foot depth into the air with an irrigation or sump pump.
- Mix, circulate and spray water into the air with bush hog or an outboard motor.
- Treat water with six to eight pounds of potassium permanganate per acre foot as soon as the problem is observed. Treat again at one-half the above rate if the purple color disappears within one hour. About mid-day add 50 to 100 pounds of triple superphosphate per surface acre. At dusk add 50 pounds of builder's or hydrated lime per surface acre.

Agricultural Poisons

Many chemicals used in agriculture are toxic to fishes. Take extreme care when applying chemicals to crops in the pond watershed. Some chemicals remain in the aquatic environment for considerable lengths of time, concentrating in fish flesh and causing other problems.

Fish Diseases

Fishes are constantly exposed to disease organisms. Disease outbreaks

occur when fishes are under stress from spawning, oxygen depletions 01 sudden changes in either water temperature or quality. To effectively treat a disease, you must know the cause. In most cases this requires professional assistance. Get help through your county Extension or the Department of Natural Resources.

OTHER POND PROBLEMS

Muddy Ponds

Ponds often become muddy after spring **rains.** If a pond remains muddy, especially during the summer, determine and eliminate the cause. Common causes of muddy ponds include bare soil in the watershed and livestock wading in the pond. Grass bare soil and divert runoff from these areas. Do not provide livestock with unlimited access to the pond. Use pond water for livestock watering by placing watering troughs below the dam or by fencing off small access areas. This will not interfere with sportfish management. Temporary clearing treatments include:

- adding 300 to 500 pounds per surface acre of gypsum (land plaster).
- adding five pounds per surface acre of commercial alum crystals.
- adding seven to ten bales of hay and 40 pounds of superphosphate per surface acre. Do not do this during hot weather because of the danger of an oxygen depletion caused by decomposing hay.
- adding one hundred pounds per surface acre of cottonseed meal.
- a standard fertilization program, in mild cases.

Turtles

Turtles are rarely a threat to fishes in a sportfishing pond because they are scavengers and move too slowly to catch healthy fishes. They are simply a nuisance to fishermen. Use traps, such as boxes made of wood and hardware cloth, fish baskets baited with meat, and baskets with pivoting boards. to remove turtles.

Muskrats, Beavers and Otters

Muskrats are a problem in ponds because their burrowing weakens dams. Beavers try to clog drains or spillways. Remove them through trapping. When fur prices warrant it, commercial trappers may by willing to trap them. Refer to Extension publications on beaver control for additional information. Otters eat a considerable amount of fishes and become a nuisance in ponds with large crops of fishes. Again, trapping is the only effective control.

ATTENTION!
Fish Toxicant Precautions

1. Observe all directions, restrictions and precautions on toxicant labels. It is dangerous, wasteful and illegal to do otherwise.
2. Store all toxicants in original containers with labels intact and behind locked doors. "KEEP TOXICANTS OUT OF THE REACH OF CHILDREN".
3. Use toxicants at correct label dosage and intervals to avoid illegal residues or unintended injury to plants and animals.
4. Apply toxicants carefully to avoid drift or contamination of non-target areas.
5. Surplus toxicant and containers should be disposed of in accordance with label instructions, so that unintended contamination of water and other hazards will not result.
6. Follow directions on the toxicant label regarding restrictions as required by State and Federal laws and regulations.

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C. Wayne Jordan, Director

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