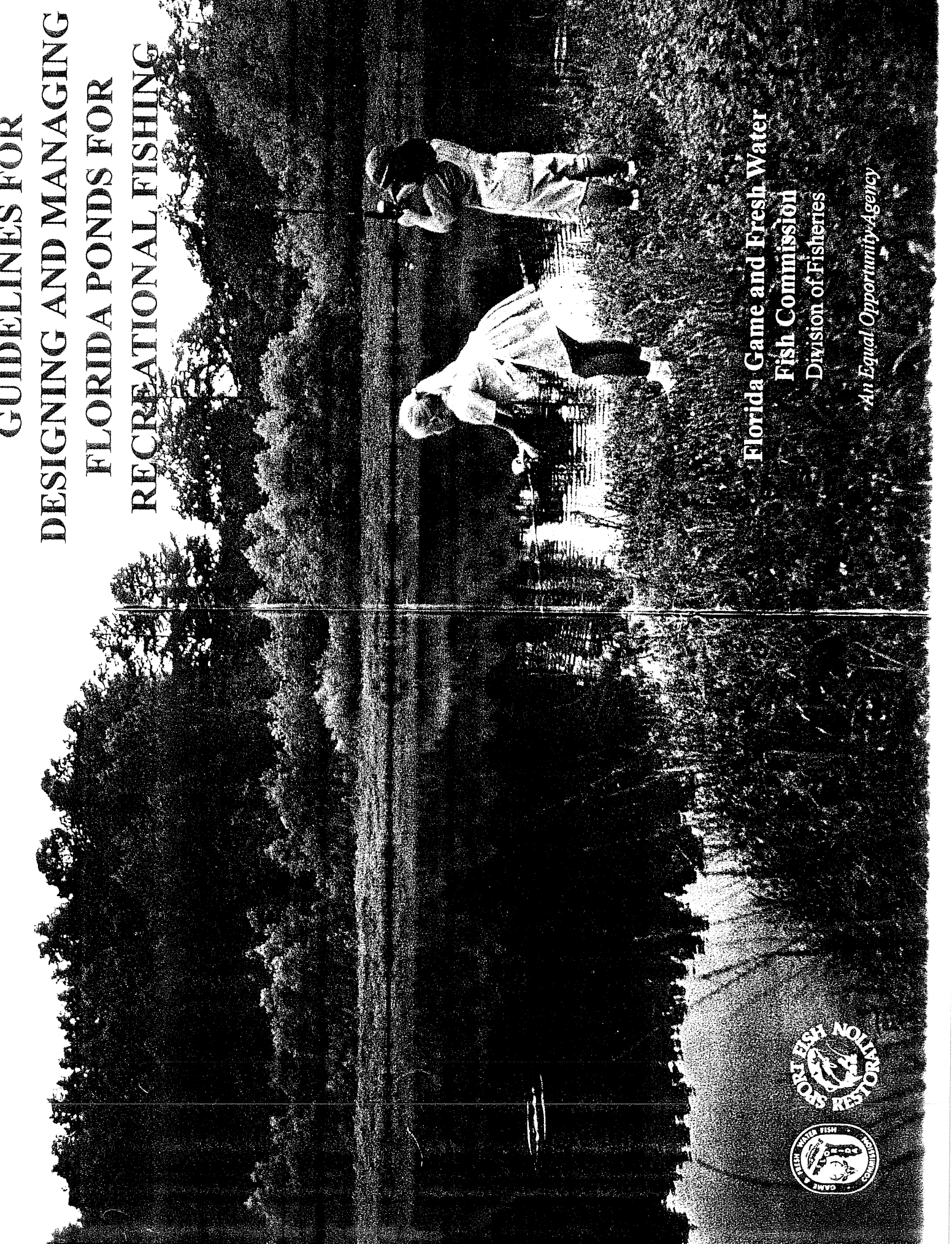




GUIDELINES FOR DESIGNING AND MANAGING FLORIDA PONDS FOR RECREATIONAL FISHING

Florida Game and Fresh Water
Fish Commission
Division of Fisheries

An Equal Opportunity Agency



INTRODUCTION

Fishing is one of the most popular recreational activities in Florida. The state has many small natural and man-made ponds that, if managed properly, can provide excellent fishing. Largemouth bass, bream (bluegill and redear sunfish) and channel catfish are raised in Florida fish ponds. Ponds can be managed intensively for high fish production (aquaculture) or commercial pay-to-fish operations. Often, ponds are constructed or managed for a variety of uses such as swimming, residential development, drainage, irrigation, livestock watering and mining. Some of these uses can be incompatible with fish pond management. Identifying conflicting uses must be a primary concern when developing a fish management program.

This brochure was prepared to help pond owners develop a sound program for managing a recreational fishing pond. It covers such topics as water quality, aquatic vegetation and fish population management. A reference section is located on pages 16-17 to provide additional sources of information on these subjects.

Whether you are constructing a new pond or improving an existing one, if you need further assistance after reading this bulletin, feel free to consult a fisheries biologist. The Game and Fresh Water Fish Commission has biologists at each of its five regional offices. Addresses and telephone numbers are printed on page 18 of this brochure. If your goal

is fish farming (aquaculture) and not recreational fishing, please contact the regional office in Lakeland and seek the advice of an aquaculture biologist. Reference material and permit information are distributed through the aquaculture office there.

ECOLOGY

It is necessary to understand basic aquatic ecology in order to manage a pond properly. Ecology is the study of relationships living things have to each other and their environment. These relationships frequently operate at a complex level, where a change in one factor can influence many different organisms and their habitats in a variety of ways.

Figure 1 shows a simplified food pyramid which depicts the interdependence of various aquatic organisms.

The bottom level represents various species of algae. Algae are microscopic plants that use nutrients in combination with sunlight to produce food -- a process called photosynthesis. Some algae are eaten by small, free-floating animals called zooplankton, located at the second level of the food pyramid. Organisms in the top four levels generally consume other organisms in the level shown immediately below them. A pond's ability to support a large number of organisms in the upper levels of the pyramid is dependent upon the strength of its food base as depicted by the lower levels.

In ponds, largemouth bass are the top consumers (predators) that feed on

insect-eating fishes such as bream, shiners and minnows. Some ponds may support shad populations. Shad feed on plankton and are important prey for bass. The objective for most ponds is to establish a simple predator-prey relationship using large-mouth bass, bluegill and redear sunfish.

Algal production is limited in waters by the availability of nutrients, mainly nitrogen and phosphorus. Ponds with low nutrient concentrations are described as infertile and produce limited quantities of aquatic life. These waters are usually extremely clear and support a low number of fish.

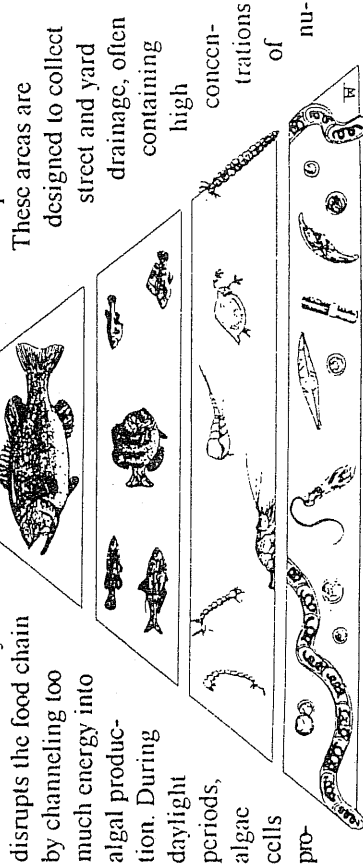
Moderate nutrient levels result in fertile waters that possess the potential for significantly greater fish production than infertile waters. Sport fish can be more numerous in fertile ponds due to the abundance of available food organisms. Fertile waters usually appear green as a result of high algal concentrations.

Excessive fertility disrupts the food chain by channeling too much energy into algal production. During daylight periods, algae cells pro-

duce oxygen required for respiration by fish. When sunlight is not present (night or overcast skies), oxygen production by algae is reduced. Dense algal blooms will deplete dissolved oxygen during periods of limited sunlight, and fish kills may result. Fish kills caused by low dissolved oxygen levels are most common during warmer months when algal concentrations are highest and extended periods of calm weather reduce exchange of atmospheric oxygen at the pond's surface.

Water bodies can receive nutrients from many sources within a watershed. Many of these are the results of human activity (e.g. agricultural practices, lawn fertilizer and urban development), while others occur naturally (e.g. nutrient-rich soils, decaying vegetation). Therefore, some pond owners may have to eliminate or divert nutrient sources to prevent excessive fertility.

Stormwater retention ponds are mandatory in new residential and industrial developments in Florida.



[Figure 1. The aquatic food pyramid]

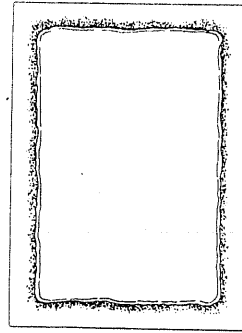
trients that would lead to excessive algal production, if allowed to enter natural waters. Prospective homeowners should realize the water quality in many retention ponds is not conducive to sport fish production. Consequently, fish management potential is extremely limited.

POND DESIGN AND CONSTRUCTION

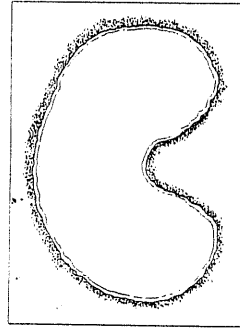
The first step in determining a design is to consider the purposes for which the pond will be used. A pond built for drainage or watering livestock is not necessarily the best design for a fish pond. If the pond serves more than a single purpose, construction should reflect its primary purpose. Ponds used primarily for agricultural purposes such as water storage or watering animals should be

designed to minimize adverse impacts that farming activities may have on water quality. Livestock access should be limited to a small area to reduce erosion and prevent high turbidity levels. Runoff from crop fields should be diverted with swales or berms to prevent excessive nutrient loading, siltation and contamination by pesticides. Information on planning, design and construction of ponds is available from the United States Department of Agriculture. Contact your local Soil Conservation Service agent and ask for Agriculture Handbook Number 590.

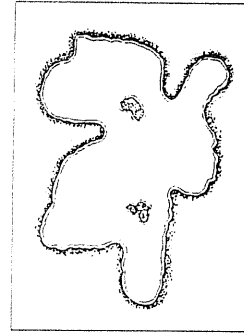
Most ponds constructed in Florida consist of a hole excavated in fairly level ground and require minimal site maintenance. A second type is constructed where ground elevations vary significantly and requires an embankment to impound water.



POOR

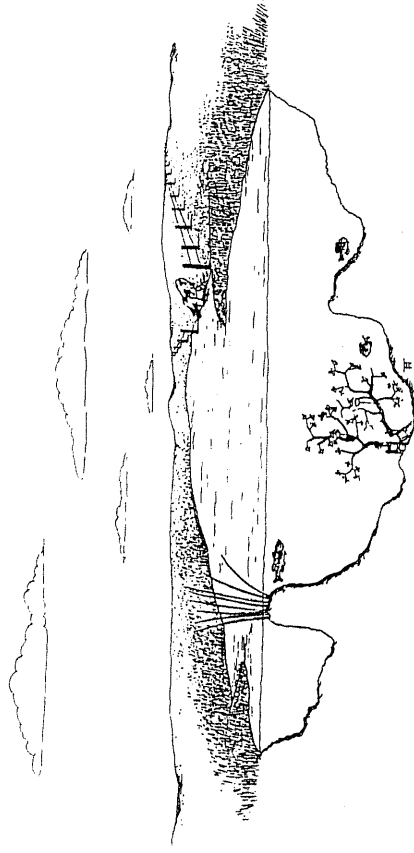


GOOD



EXCELLENT

[Figure 2. Example of various pond configurations]



[Figure 3. Recommended profile and design for a manmade pond]

Safety concerns and maintenance requirements are described in Agriculture Handbook Number 590.

Your local Soil Conservation Service agent can provide detailed pond construction information about site selection, soil permeability, whether a plastic liner is needed and locations for soil analysis. This information is essential in determining a pond's natural fertility, pH and ability to retain water.

If possible, design your pond to allow complete draining. Dewatering is accomplished easily in embankment ponds through a standpipe/spillway system, while a water pump can be used in excavated ponds. The ability to dewater allows for fish population renovation, bottom improvement and vegetation management.

Ponds designed primarily for fishing should incorporate as much shoreline as possible (Figure 2). The amount of available shoreline can be

increased by use of peninsulas and islands in construction. Such construction increases the "edge effect," which results in concentration of sport fish and improves fishing success.

Ponds should be constructed with steep slopes (20- to 30-degree grade) to a depth of 8-15 feet. Steep shorelines will naturally limit the growth of aquatic plants. A narrow band of vegetation benefits the pond by providing fish habitat and preventing shoreline erosion. However, excessive plant growth can cause problems. Sodding or stabilizing the land adjacent to the pond immediately after construction also will reduce erosion. Digging ponds deeper than 15 feet does not increase fish production, and deep ponds can develop serious water quality problems if thermal stratification occurs.

Figure 3 shows a cross-section of a well-designed fish pond. Notice the bottom contours are irregular,

creating what fishermen call "structure." Fish tend to congregate in these areas, making it easy for anglers to catch them. You can create structure during pond construction by leaving elevated outcroppings or rock piles or by installing fish attractors made of tree limbs.

AQUATIC PLANT MANAGEMENT

Aquatic plants growing in a pond provide many benefits. They help maintain good water quality by reducing erosion and absorbing nutrients. Plants provide cover for fish and a substrate for the colonization of minute organisms used by small fishes.

Properly designed ponds with a narrow fringe of vegetation seldom develop problems. You can maintain access sites simply by removing excess vegetation by hand. Planting desirable species will allow you to maximize the biological, aesthetic and recreational potential of the pond.

Species recommended for "aquascaping" are giant bulrush, lilies, soft-stem bulrush, knotgrass, maidencane and pickerelweed. When established, these plants may out-compete problem species such as cattails and torpedo grass. Planting around islands will provide excellent habitat that will not interfere with bank angling. You may need to obtain a permit from the Department of Natural Resources (DNR) prior to any collection or transplanting activities. DNR also can provide information pertaining to

private companies who specialize in aquascaping and aquatic plant control.

Gradual slopes, shallow ponds and introduction of problematic exotic plants such as hydrilla and water hyacinth can lead to overgrowth of vegetation. When plants become too abundant, recreational use is restricted and the ability of predators (bass) to feed on prey (bluegill) is reduced. Growth rates of both bass and bluegill will decrease, and fishing quality will decline. In some instances, excessive plant growth will deplete dissolved oxygen and cause fish kills.

DNR, the Florida Cooperative Extension Service or any Commission regional office can assist you with aquatic plant identification and management advice.

Department of Natural Resources
Bureau of Aquatic Plant Management
3900 Commonwealth Boulevard
Tallahassee, FL 32399-3900
Tallahassee (904) 488-5631
Lake City (904) 758-0464
Floral City (904) 726-8622
Tampa (813) 626-5143
Orlando (407) 423-6037
West Palm Beach (407) 793-5666
Bartow (813) 534-7074

The three methods for controlling nuisance plants are mechanical (removal by hand or machine), chemical (herbicides) and biological (triploid grass carp and hyacinth weevil).

Hand removal is the safest method

and is preferred over either chemical or biological control. When a biological agent can provide adequate vegetation control, it is usually recommended before the use of chemicals. The least desirable method is herbicidal, but occasionally chemical control is less expensive or the most practical method. Before applying any herbicide or mechanical control, contact DNR to determine whether any permits or inspections are required.

Contact the nearest regional office of the Game and Fresh Water Fish Commission if you have a pond with an aquatic plant problem.

Triploid grass carp can be effective for control of certain plant species. Since triploid grass carp are exotic fish and importation of all such species is strictly regulated, you should contact the appropriate regional office of the Commission if you have a pond with an aquatic plant problem. A biologist will inspect the pond, and if appropriate, issue a permit to allow you to purchase a specified number of triploid grass carp. You may be required to install a fish barrier to prevent the triploid grass carp from escaping to another water body. Only certified triploid grass carp are allowed for use, since these fish are sterile.

WATER QUALITY

Maintaining good water quality is critical to fish pond management. Proper levels of pond productivity are required to sustain a fish population. Poor water quality is the most common cause for poor fishing.

Turbidity

Turbid or muddy water should not be confused with stained or colored water. Turbidity is caused by clay and silt particles held in suspension in the water column. Colored water is clear, but resembles tea. Tannins and lignins leached from certain upland soil conditions cause colored water. Ponds that are highly colored are capable of producing good fish populations. Muddy water can seriously reduce sunlight penetration, which will disrupt biological production. Newly dug ponds will usually experience temporary turbidity; however, if the pond fails to clear within three or four months, take corrective measures.

The most common source of turbidity is erosion from barren shorelines and upland areas. Sodding, seeding and aquascaping will eliminate this source. Resuspension of clay and silt can result from high winds, livestock wading along the shoreline, and the burrowing actions of crayfish and certain fishes. Planting trees to buffer winds and fencing livestock to restricted areas of the pond should be effective. If crayfish are the suspected cause, the establishment of large-mouth bass and bream will reduce crayfish populations. Avoid introduc-

ing undesirable fishes such as common and ornamental carp, bullheads, chubsuckers, mullet, gizzard shad and tilapia (nile perch). If these species become established, it may be necessary to kill out the entire pond by chemical renovation.

If sources are controlled and the water remains turbid, it can be cleared by several methods. The easiest and safest method to reduce turbidity is to apply green hay to the pond's surface. Green hay attracts and neutralizes charged soil particles, causing them to settle on the pond's bottom. Apply four to six bales of hay per surface acre. Tear the hay apart and distribute it evenly across the pond. The decaying hay will also promote the growth of microscopic plants and animals that provide food for small fishes. Another way to reduce turbidity is to apply gypsum at a rate of 125 pounds per surface acre. Spread it as evenly as possible across the entire surface of the pond.

Gypsum is usually available from farm supply dealers who sell fertilizer in bulk quantities.

Controlling pH

Ponds constructed on acidic soils can have low pH (highly acid), which restricts the biological productivity of the pond. Fish growth, reproduction and survival can be affected by pH. Ideal pH should range from 6.0 to 8.0. You can increase low pH by liming. A county agricultural extension agent can assist you in determining how much lime your pond requires. One ton of finely ground agricultural limestone will generally raise the pH

of a 1-acre pond by one pH unit. Apply lime to the pond bottom (if dewatered), pond surface or along the shallow edges of the pond. Response time and frequency of treatments will depend on local soil conditions, pond flush rate and rainfall.

Ponds located near septic drain fields, fertilized lawns, cultivated crops and livestock are often overloaded with nutrients.

Managing Pond Fertility

You can manage your pond at different levels of fertility depending on your desires and objectives. Infertile ponds produce low fish crops; more fertile ponds produce higher yields. Artificial methods to increase production include fertilization and supplemental feeding. In many ponds, however, nutrient inputs are excessive and problems develop from overenrichment.

One way to determine a pond's fertility for recreational fishing is to measure water transparency during spring and summer. You can devise a simple tool to do the job. Cut a 2-inch square of white plastic from a bleach bottle and fasten it to the end of a wooden yardstick. Push this apparatus into the pond vertically until the white plastic cannot be seen. Note the depth at which the plastic first disappears.

If the plastic disappears at between

16 and 36 inches, your pond has a desirable productivity level. Visibility greater than 36 inches indicates low production. In this situation, fertilization can increase fish production. By adding nutrients to the water, you will stimulate algal growth and strengthen the food chain. Fertilization is an expensive, time-consuming and complicated process. If done improperly, undesirable effects will result. You should fertilize only if your pond is infertile and you strongly desire maximum fish production. Overfertilization will cause fish kills, so consult a Commission biologist before starting a fertilization program.

If visibility is less than 16 inches, it is important to distinguish whether turbidity or abundance of microscopic algae (phytoplankton) is to blame.

Healthy algae blooms give the water a green hue. If the pond is overenriched, sources of nutrient inputs should be identified and eliminated. Ponds located near septic drain fields, fertilized lawns, cultivated crops and livestock are often overloaded with nutrients. Consider these factors before pond construction. Fencing the pond from livestock, discontinuing use of fertilizers within 20 feet of the pond, and constructing swales or berms adjacent to the pond edge will help reduce nutrient inputs. Keeping domesticated ducks can result in water quality problems from fecal droppings in or near the pond. Do not allow lawn clippings, leaves or any other organic wastes to enter your pond. Retention ponds required for new developments are extremely

vulnerable to poor water quality since, by design, they collect runoff from streets, parking lots and lawns.

Fish Kills, Disease and Parasites

Most fish kills result from low dissolved oxygen conditions that overfertil ponds commonly experience. Algae and aquatic plants using oxygen in the absence of sunlight (nighttime or cloudy days), decaying vegetation or the input of runoff containing organic matter can deplete oxygen levels. Ponds located near coastal areas may experience saltwater intrusion from surface or groundwater sources. Rapid changes in temperature, dissolved oxygen, salinity and pH can stress the fish population and cause a fish kill resulting from a secondary bacterial or viral infection. Disease outbreaks will also occur in crowded populations that compete for space, food or reproductive advantage. Spawning stress occurs because fish are expending a lot of energy, feeding less and are in close proximity to each other. Nothing can stop a fish kill once it begins. It is best to let the kill run its course and count your losses.

The best way to prevent fish kills is to maintain good water quality. If you begin an intensive supplemental feeding program, sudden stoppage may create food shortages and stress. If dissolved-oxygen-related fish kills occur on a regular basis, you may want to install an aeration system. Paddle wheels, bottom airstones, fountains and other devices that create bottom-to-top vertical mixing of the water column can help maintain

adequate dissolved oxygen levels and prevent fish kills. Consult a Commission biologist before making a decision on aeration.

Parasitic animals can be found in most fish. They dwell in the gills, eyes, flesh, digestive tract, reproductive organs and skin. These organisms are a natural part of a fish's environment. Most parasites do not seriously affect fish mortality and rarely cause fish kills. Human consumption of fish containing parasites poses no health threat if the fish is properly cooked.

The input of toxic pesticides, such as mole cricket insecticide, is another cause of fish kills. Exercise extreme caution when applying any chemicals near the pond.

FISH MANAGEMENT

Once you have designed your pond and addressed water quality and aquatic plant management concerns, the next step is to determine fish management strategy. Evaluate your desired species, level of management intensity and realistic expectations. Then design and implement a sound fish management program. Seek the advice of a Commission fisheries biologist before making any decisions on stocking. He also can provide a list of fish suppliers in your area.

Establishing a Fishery

There are three reasons to consider stocking: (1) the pond is new with no fish population; (2) undesirable species have invaded the pond prior to stocking; or (3) an established fish population has reached an unbalanced

state where prey species (bream) have overpopulated and interfered with predator (bass) reproduction.

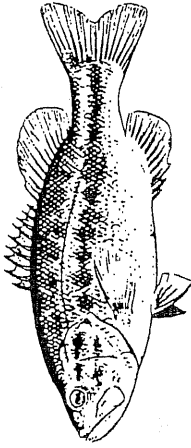
An unbalanced population may be the result of fish kills, improper fish harvest, incorrect stocking ratios, poor water quality or a combination of these factors. Stocking fingerling game fish into an existing fish population is a waste of time and money. Survival of supplementally stocked fingerlings is low, and stocking them will not improve fishing success.

Renovation (killing out) and restocking is usually the most feasible method of correcting an unbalanced or undesirable fish population. Proper methods to kill out a pond are covered in the renovation section. Whether your pond is newly dug or renovated, stock fingerling fish soon, before a fish population becomes established inadvertently.

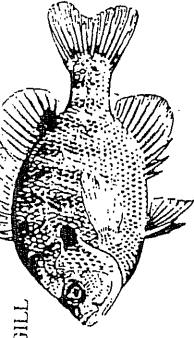
Ponds less than one surface acre in size generally will not provide a good largemouth bass/bream fishery for a substantial length of time. Channel catfish are recommended for stocking, since natural reproduction is limited in small ponds. This allows a pond owner to have a fishery he can maintain without fear of overpopulation or unbalance.

If you want to begin fishing immediately, stock adult catfish. The disadvantage of stocking only channel catfish is that they require feeding to achieve good growth. Keep accurate harvest records so that, as the population becomes depleted, you can stock more fish. A catfish pond is very

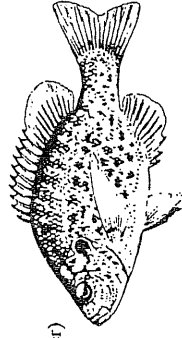
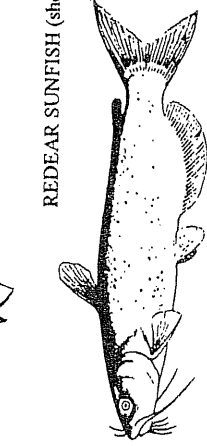
LARGEMOUTH BASS



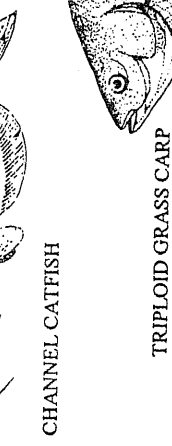
BLUEGILL



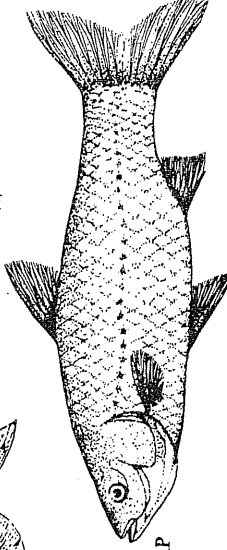
REDEAR SUNFISH (shellcracker)



CHANNEL CATFISH



TRIPLOID GRASS CARP



These species are desirable for stocking ponds. The largemouth bass is one of the most popular game fishes but requires large numbers of prey for good growth. The bluegill provides food for largemouth bass and is a good panfish. The channel catfish is a popular food and sport fish and can be stocked alone or with other species. The redear sunfish may be stocked with bluegill as food for bass and as a sport fish for the angler. The triploid grass carp can be stocked (with a permit) to help control aquatic vegetation.

[Figure 4. Fishes managed for recreational fishing]

simple to manage and provides good fishing and an edible crop.

You can establish a largemouth bass/bream fishery in a new pond by stocking 250-500 bream fingerlings per acre in the fall, followed by 50-100 largemouth bass fingerlings per acre the next spring, depending on fertility. The bream stocking should consist of approximately 70 percent bluegill and 30 percent redear sunfish.

This stocking schedule will allow bream to grow and reproduce. Their offspring are then eaten by developing bass. You can begin bass fishing 18 months after stocking largemouth bass fingerlings. Bluegill and redear sunfish harvest should begin eight

months after stocking. Restocking is not required, since bass and bream reproduce naturally. In some ponds that are infertile or acidic, bass fingerlings should be stocked again one year following the initial stocking. This is needed when bass grow slowly and fail to reproduce after their first year. If properly managed, a largemouth bass/bream fishery can sustain itself indefinitely.

You can stock catfish along with bass and bream. Stock fingerling catfish (100-500 per acre) with bass in the spring. Once bass have established and grown, it is necessary to stock larger catfish, since bass will consume fingerlings.

In fertile ponds that support gizzard or threadfin shad, it may be desirable to stock hatchery-bred sunshine bass. These fish are a cross between striped bass and white bass. They will not reproduce, so you will need to restock them. Overstocking sunshines or introducing them into infertile waters will create competition with largemouth bass and should be avoided. Shad cannot be stocked as prey; however, they often migrate into many ponds from nearby lakes when direct connections exist.

Fishes you should not stock are common carp, brown bullhead, black crappie (speckled perch), nile perch (tilapia) and any aquarium pets. While black crappie are a popular game fish in lakes, they have a tendency to overpopulate and cause unbalanced populations in smaller ponds.

Fishery Maintenance

The main objective for managing a bass/bream fishery is to maintain a properly balanced population. Many times, bass are fished more than bream. When bass are harvested (removed) from small ponds, the balance established with the initial stocking can become disturbed. Overharvest of bass is the greatest cause of population imbalance and poor fishing.

Stunted bream are a good indication of imbalance. Stunted bream are usually between 3 and 5 inches in total length and have abnormally large eyes which appear too large for a small fish body (Figure 5). Stunted bream will constitute a large percentage of a pond's total fish population, and few bream will be larger than 6 inches. Bream reproduce at high rates and stunting occurs when reproduc-



[Figure 5. Bluegill sizes indicative of balanced (above) and unbalanced (below) populations]

tion exceeds predation. A stunted bream population adversely affects largemouth bass reproduction and results in poor fishing success.

A practice of restricting bass harvest coupled with heavy fishing pressure and high removal of bream will help prevent stunting. All bream caught should be kept, regardless of size. As a general rule, remove 10 pounds of bream for each pound of largemouth bass. Take care not to remove too many largemouth bass, particularly in ponds less than 5 acres.

If you notice many small bass two to three years after stocking, it may be appropriate to harvest some bass that are less than 12 inches in length. But this can be done only from private, man-made ponds after obtaining a special-use permit from the Commission. Contact the nearest regional office to apply for a permit. A bass population overcrowded with small bass will exhibit slow growth, and you will catch very few quality-size bass. While thinning smaller bass, maintain a practice of catch-and-release for those greater than 12 inches.

Once a pond becomes unbalanced with stunted bluegills, only the addition of adult bass may help restore proper prey/predator ratios. This measure is practical only in small ponds where the owner can acquire enough adult bass. Bass should be at least 10-12 inches long if purchased, or of legal harvestable size if taken while fishing in public waters. They should be stocked at 10 to 15 per acre. Stocking fingerling bass will not work.

Renovation

If supplemental stocking of adult bass is not possible, the only way to restore the fishery is to kill out the existing population and restock with fingerling fish.

Rotenone is the fish toxicant labeled for aquatic use in Florida and kills by preventing fish from using oxygen present in a pond. We recommend using 5 percent emulsified liquid rotenone for pond renovation, due to the difficulty of applying powdered rotenone properly. Drain the pond to the greatest extent possible prior to application to reduce the amount of chemical needed for renovation. Rotenone is available at major chemical and farm supply stores.

Seek the advice of a Commission biologist when planning a pond renovation. Read thoroughly and follow the instructions supplied on the chemical container. Rotenone is not harmful to warm-blooded animals when applied properly and at recommended application rates. Water temperatures lower than 70° F reduce rotenone's effectiveness and prolong its toxicity. The best time to renovate is late summer. Restocking fingerling bream should then occur in fall followed by bass during spring.

To determine how many gallons of rotenone you need, multiply surface acreage by average pond depth; then multiply by 0.7. (For a 2-acre pond with average depth of 6 feet: 2 x 6 x 0.7 = 8.4 gallons required.)

Be certain all outflows from the pond remain closed for at least three

weeks after rotenone application to prevent killing fish in areas outside of the pond. Mix a ratio of one gallon liquid rotenone to five gallons water prior to application. Uniform distribution of the fish toxicant is essential to obtain proper results. Collect and bury all dead fish. Do not stock fish until at least one month after rotenone application.

Feeding

Fish-feeding stations are excellent for attracting bluegill and channel catfish to a location where they can be caught easily. Fish food can be used to supplement their natural diet, and if fish are fed at adequate levels, growth rates will increase significantly. Do not feed in ponds where triploid grass carp have been stocked to control vegetation. Triploid grass carp will stop eating vegetation and consume the fish food.

Commercially prepared fish food is available at most farm supply stores. Pellets are available in various sizes and in either a floating or sinking form. The advantage of using floating pellets, rather than sinking food, is that the pond manager can more accurately determine how much food the fish are eating. This prevents excessive feeding, which can lead to oxygen depletion in the pond. With floating food, it is easy to observe feeding fish, allowing you to determine sizes of bluegill to evaluate population balance. The primary disadvantage of floating pellets is that the food can drift into shallow water, making it difficult for the fish to feed. Regardless of the type of fish food

used, dispense only enough so that all is eaten within 15 minutes.

Dispense food at the same time and location every day to train fish rapidly to eat pellets. You can feed fish as often as you desire, but twice daily is usually enough for recreational fish ponds. Initially, dispense only 2 pounds per surface acre per day. If food is consumed rapidly, then gradually increase the amount dispensed, up to a maximum of 20 pounds per surface acre daily.

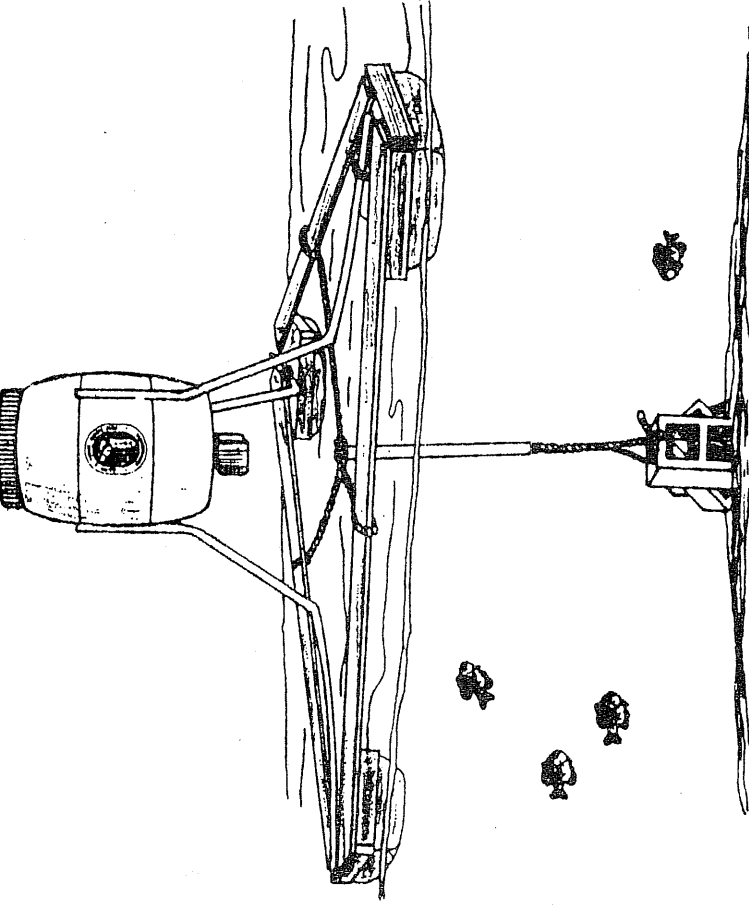
Discontinue feeding when water temperature is below 60° F because fish usually become less active then.

Implement intensive feeding programs only when you desire maximum fish production (aquaculture or fee fishing). High fish density can increase the frequency of disease outbreaks, and sudden stoppage of feeding can stress the population.

Heavy feeding can deplete dissolved oxygen levels, and aeration is often required to prevent fish kills.

Automatic feeders relieve the pond manager from the daily duty of feeding. Figure 6 shows an automatic feeder the Commission uses in pond enhancement. The amount of feed, frequency of discharge and time of feeding are controllable. Prices for various models vary from \$200 to \$800 depending on the capabilities of the units.

Some pond owners suspend a bug-zapping light over their pond. At night, the light attracts and kills many flying insects. Bugs dropping on the water surface are eagerly consumed by bluegills and even bass.



[Figure 6. Automatic fish feeder]

Fish Attractors

Brush attractors will help concentrate fish where anglers can catch them easily. Fish are attracted to brush piles in search of food and protection from predators. Christmas trees, oak and citrus are all good attractor materials. Green trees with numerous small limbs are best and sink with a minimum of weighting material. Used tires, rock piles, plastic pipe and wood boxes also can provide shelter areas. Placing attractors in lakes owned by two or more parties or connected to public waters requires a

permit from the Florida Department of Environmental Regulation (DER).

LICENSE REQUIREMENTS AND FEE FISHING

License requirements, rules and regulations that pertain to all ponds are available at any Commission office. Some pond owners generate income by charging a fee for fishermen to fish in their pond. Short-term and long-term leases are common. Contact the Commission for more information.

WILDLIFE MANAGEMENT

The availability of water, food and cover may attract many types of wildlife to your pond. Many species add to the natural beauty and enjoyment of the pond while others may cause problems.

Most birds are an aesthetic asset to ponds. Wading birds such as herons, egrets, ibis and even wood storks may visit your pond to feed. These birds eat small fish but will not affect the fishery. Cormorants and anhingas swim underwater in pursuit of small fish. An osprey or eagle may grab a large game fish, but their effects are normally insignificant. Bird boxes may attract many desirable species such as insect-eating purple martins, blackbirds and swallows. Discourage domesticated ducks from using your pond. Their droppings can cause poor water quality.

Most people are afraid of snakes, and the feeling is mutual. Pond owners should learn to identify venomous snakes. Non-venomous water snakes are much more common, and they feed on a variety of animals including rats and mice. Most snakes prefer overgrown banks, so routine mowing should eliminate their desired habitat.

Frogs are very vocal at night when pond owners are trying to sleep. Frog density in the pond will be very low when bass are managed properly.

Many people incorrectly assume turtles are harmful to a fish population. The diet of most turtles consists primarily of vegetation and dead

animals. A few species such as alligator snapping and softshell turtles do feed primarily upon fish, but their predation is not detrimental to the total fish population. Turtles can be caught for food. Contact a Commission office for information concerning the taking of turtles.

Wading birds such as herons, egrets, ibis and even wood storks may visit your pond to feed. These birds eat small fish but will not affect the fishery.

Alligators are migratory at times and will find your pond sooner or later. Their presence is of little concern unless they lose their fear of humans. Feeding alligators is dangerous and strictly prohibited by state and federal laws. They do not affect recreational fisheries and will usually leave the pond in search of mates. If you observe an alligator more than 4 feet long that displays bold or aggressive behavior, call a Commission office to request its removal.

Otters are cute and fun to observe, but unfortunately, they can harm the fish population of a small pond. Details concerning otter removal are available from any Commission office.

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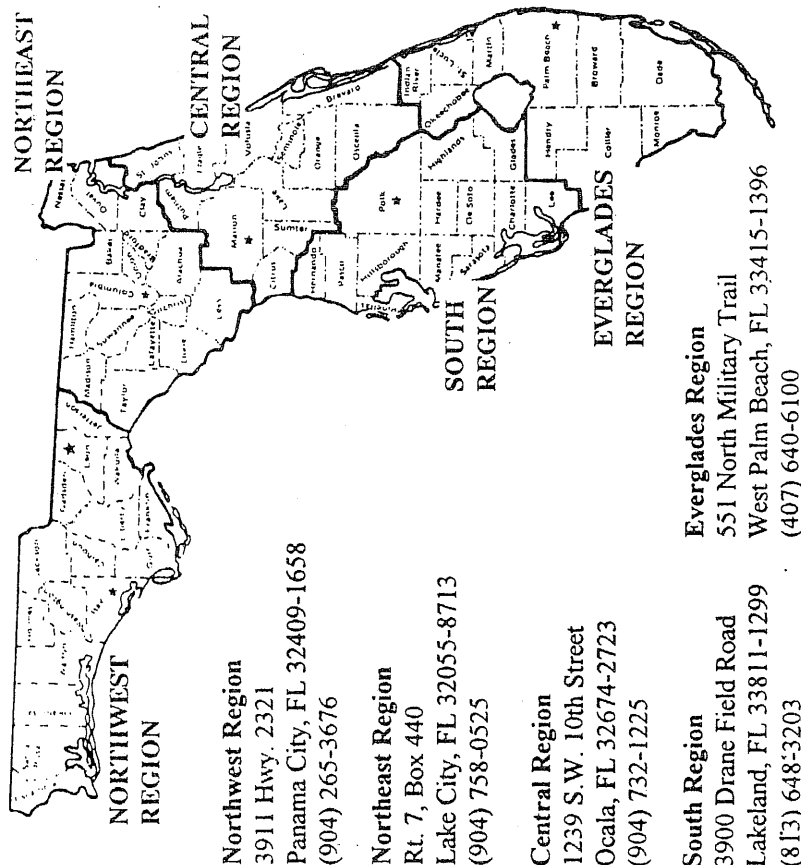
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*available at all county extension offices



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