You Can Grow Fish for Fun or for Profit

By Robert Waters, H. Dave Kelly, and W. Mason Dollar

You can grow fish for either fun or profit on a few acres—in fact, on fewer acres than you can grow many other crops.

But growing fish is not easy. It requires clean water, a site suitable for a pond, raceway, or other facility, a good bit of planning, and frequently a great deal of knowhow. Some fish-growing operations require lots of managerial ability, a fairly large investment, and a great deal of time, especially operations for commercial purposes.

Yet growing fish on a few acres can be fun. Some operations can furnish high-quality fishing for you and your family and friends at little cost. Other operations can supplement your income without taking a great deal of your time.

Fish farming as a major source of income, however, can be a time-consuming, high-risk business in which you can lose a large investment in a short time. And you can lose it through no real fault of your own. So, before you go into commercial production, give plenty of thought to the venture.

Growing fish can be classified into two broad types—raising fish for your own recreational use, and to sell for profit.

The goal of most noncommercial fish raising is to provide high-quality sport for a few people at minimum effort and cost. Fish for these purposes are raised mainly in farm ponds, of which there are more than 2 million. These ponds generally provide many hours of good fishing.

Resource Appraisal

The first step in establishing a pond for recreational use is to assess your resources. Soil, water, topography, and other resources will influence your success in raising fish and sometimes may limit the possibility of growing fish at all. Get help

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in determining the adequacy of your resources from the Soil Conservation Service of the U.S. Department of Agriculture.

Your land must contain a site suitable for impounding water. On most farms and ranches, topography is such that water can be impounded at reasonable cost if a dam is properly located.

The soils of your property must be capable of holding water. This is true not only for soils used in building the dam but also for soils on the pond bottom.

In some sandy or limestone areas, seepage through the soil or material under which water is impounded may result in water loss at a rate faster than it is received. Many dry ponds have been constructed because this important factor was not considered.

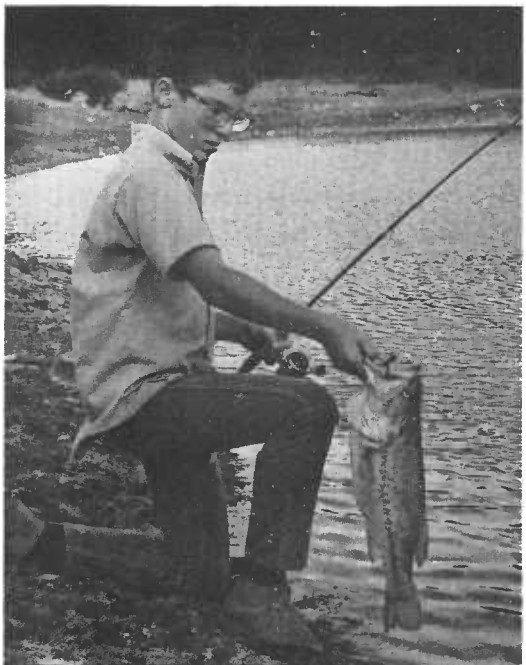
A good fishpond must have enough spring flow, well water, or runoff to fill the pond in a year or less and to replenish water lost from seepage and evaporation. Also, water quality must be adequate for the species you intend to grow. Most species are adapted to either warm or cold water.

Fish can be grown in ponds of any size; however, desirable fish populations are not easily maintained in extremely small ponds. Warm-water ponds managed for bass and bluegill for recreational purposes should be an acre in size or greater. Trout ponds should be at least one-third acre.

Generally, the time and costs involved prohibit adequate management by individuals on ponds greater than 15 acres.

Where the pond is covered with ice for a month or more and winter fishkills are frequent, water depth may need to be as

Russell Tinsley



A farm pond bass.

much as 20 feet. If your pond depends on seasonal rains for its water supply, water should be at least 10 or 12 feet deep over a fourth or more of the pond area. Throughout most of the South an average depth of 3 to 4 feet is adequate for fish growth; no more fish can be grown by providing additional depth.

The emergency spillway to prevent floodwater from going over the dam should be designed to keep the flow shallow. This prevents big fish from swimming out and unwanted fish from swimming in.

To prevent unwanted fish from entering the pond from downstream, a 24- to 36-inch vertical overfall in the emergency spillway should also be used.

A drainpipe is useful, and required by law in many states. It should be large enough to drain the pond in 5 to 10 days.

An overflow pipe or trickle tube connected to the drainpipe keeps the normal water level a few inches below the spillway. This reduces erosion of the spillway and prevents drowning of its grass cover. A trickle tube also helps prevent excessive loss of fingerlings soon after the pond is first stocked.

A device to take outflow from the bottom rather than the top helps warm the pond early in the spring, may save fertilizer, and may permit fertilizing in spring when the flow is heaviest.

Most trees and brush should be removed from the area to be covered with water. If possible, remove stumps and snags from the pond bottom. This leaves the bottom smooth for seining, which may be required for good management.

Clearing trees and brush from a strip 20 to 30 feet around the pond reduces the amount of leaves that falls into the pond. Leaves discolor water and encourage growth of algae. And decaying leaves may cause oxygen depletion in the water. A cleared strip also provides a grassy bank for fishing.

Shallow water is troublesome because weeds grow in it. In ponds stocked with bass and bluegill, weeds protect small fish from the bass. Shallow water may also cause mosquito problems. A pond is easier to manage if it has no shallow water.

Either deepening or filling eliminates shallow edges, but usually a combination of the two is best. A minimum depth of 2 feet is good, but 3 feet is better.

Stocking Fish

After considering fish species best adapted to your water, select the species to stock. Either a single species (for example, trout) or a species association (for example, bass-bluegill) may be appropriate depending on your resources and objectives.

A number of trout species may be considered for stocking

if your water is suitable. Generally, rainbow trout and brook trout are stocked in ponds because of their availability and because they are relatively easy to manage and to catch. For variety, rainbow and brook trout may be stocked in the same pond.

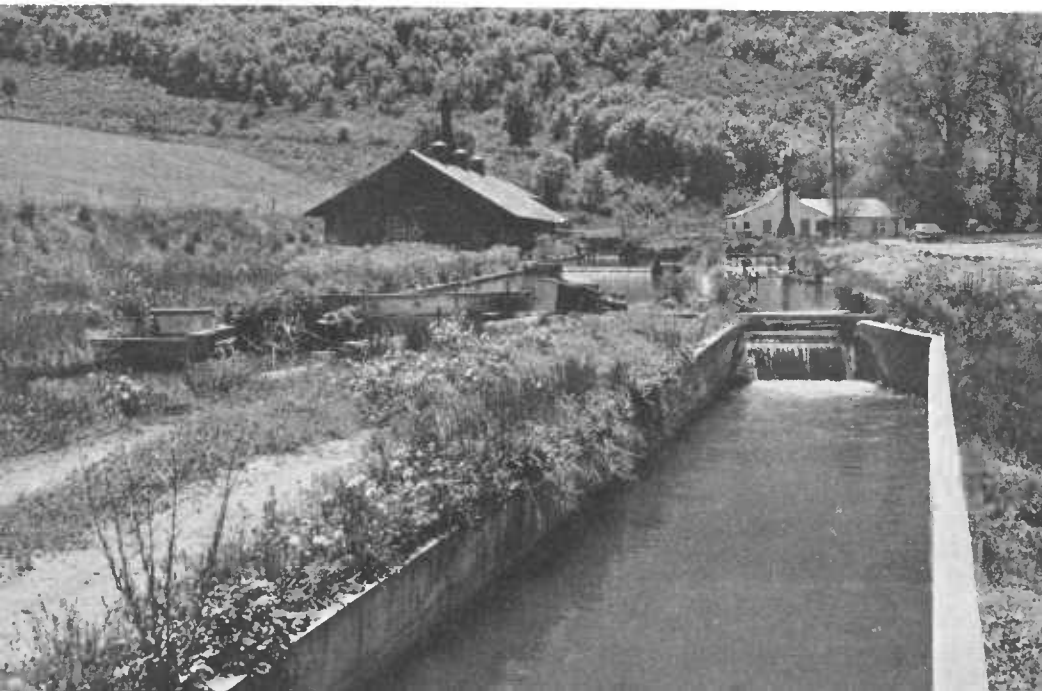
When stocking trout, exclude all other species of fish. If your pond contains 50 pounds of other kinds of fish, it will likely have 50 pounds less trout.

Largemouth bass and bluegill are the most commonly stocked species in warm-water ponds. Frequently, redear sunfish are mixed with this combination to provide variety and reduce chances of the fish population becoming unbalanced. In this species combination, bluegill and redear sunfish provide food for the bass. If the population is properly managed, it will provide good fishing for many years.

Before stocking, eliminate all wild fish from your pond and drainage area as they will compete with stocked fish for space, oxygen, and food. You can remove these fish by draining the pond or applying a fish toxicant. If you plan to use a chemical to remove undesirable fish, be sure it is approved for such purposes and applied with the supervision of a licensed applicator or other appropriate personnel in your state.

Private and certain state and federal hatcheries provide

Commercial trout ponds, with water running a complete cycle about twice an hour, maintain a fairly constant temperature.



fish for stocking. Information on sources of fish for stocking can be obtained from the Soil Conservation Service, Extension Service, Fish and Wildlife Service, and your state fish and wildlife agency.

Stocking rates depend on the species selected, natural water fertility, and willingness of the pond operator to supplement the pond with either fertilizer or fish feed, or both.

In Alabama, ponds with average natural fertility are generally stocked with 50 bass and 500 bluegill per surface acre.

Ponds maintained at high fertility levels by the periodic ap-

Fish commonly used for recreation and commercial purposes

Species	Recreation	Commercial							Summer Temperature Range
	Sport Fishing	Human Food	Bait Fish	Fee Fishing	Fingerling	Brood Fish	Ornamental	Eggs	
Blue catfish		•		•	•	•			Warm > 80°F
Bluegill	•			•	•	•			Warm > 80°F
Brook trout	•	•		•	•	•		•	Cold < 70°F
Buffalofish		•			•	•			Warm > 80°F
Carp		•		•	•	•			Warm > 80°F
Channel catfish	•	•		•	•	•			Warm > 80°F
Crappie	•			•	•	•			Warm > 80°F
Fathead minnow			•			•			Warm > 80°F
Golden shiner			•			•			Warm > 80°F
Goldfish			•			•	•		Warm > 80°F
Hybrid sunfish	•				•				Warm > 80°F
Largemouth bass	•				•	•			Warm > 80°F
Mudkellunge					•				Cold < 70°F
Northern pike					•				Cold < 70°F
Rainbow trout	•	•			•	•		•	Cold < 70°F
Redear sunfish	•				•	•			Warm > 80°F
White catfish		•			•	•			Warm > 80°F

> means greater than. < means less than.

plication of commercial fertilizer are stocked with 100 to 150 bass and 1,000 to 1,500 bluegill per surface acre.

In cold-water areas, ponds with average fertility usually produce enough natural food to support only 500 half-pound trout per surface acre annually. But with supplemental feeding the same waters can produce 2,000 half-pound trout in a year.

Management Levels

Fishing success in your recreational pond will be determined largely by the management of your water and by your fish population.

Intensive management can produce exceptional fish production. However, the cost of fertilization, feeding, chemical controls, supplemental stocking, and other management is often more than most people are willing to pay for a few hours of good fishing. The amount of effort involved in carrying out intensive management is also prohibitive in many cases.

Before you select a species for stocking and decide on stocking rates, determine a level of management best suited to your time and pocketbook.

One way to increase fish production is fertilization. Fertilize before the growing season for warm-water fish. In the extreme South, fertilizer may be applied year-round; however, the fish growing season decreases progressively toward the North.

Effectiveness of fertilization is greatly reduced in the northern States and may not be recommended as a fish management practice. The increased organic production resulting from fertilization may contribute to oxygen depletion and fishkills, especially in areas with long periods of ice cover.

Where fertilization is applicable, ponds need refertilization any time during the growing season that a white object can be seen 18 inches or more below the water's surface. If the pond is fertile enough, the resulting algal bloom will obscure the object at that depth. As many as 12 fertilizer applications per year are needed for proper fertility.

A mineral fertilizer is best for fishponds—organic fertilizers often stimulate growth of undesirable algae and vascular aquatic plants. The amount depends on the fertilizer analysis. In warm-water ponds managed for bass and bluegill, 8 pounds of nitrogen, 8 pounds of phosphate, and 2 pounds of potash per surface acre (100 pounds of 8-8-2 fertilizer or equivalent) is commonly recommended for each application.

Fish production can also be increased by supplemental feeding. In trout ponds, production can be raised from 100

pounds per acre to 1,000 to 2,000 pounds per acre by supplemental feeding.

Other management which may influence the ability of your pond to produce harvestable-sized fish include waterweed control, maintaining a balanced fish population through either harvest or partial removal of fish by drawdown or chemicals, controlling fish diseases, and ensuring good water quality.

Fish for Profit

The most popular commercial enterprises involve raising fish for human food, bait, stocking, and fee fishing. Other enterprises produce brood fish, eggs, and ornamental fish.

As a rule, commercial enterprises require a larger investment and more know-how than raising fish for your own recreation. Generally it's best to start on a small scale, expanding the operation as you gain knowledge and experience. In most operations, fish are raised at densities far exceeding what nature provided for.

A dependable supply of good quality water is essential for raising commercial catfish and trout. Water from wells, springs, streams, or runoff ponds is suitable if you take necessary precautions.

Most commercial trout are raised in raceways that have a reliable year-round flow from springs, wells, or streams. The number of trout that can be raised each year is determined by the volume of water available. A minimum flow of 450 gallons per minute is needed.

The best source of water is a well. Using well water avoids problems of unwanted fish, flood hazard, pesticides, and muddiness. Your well should provide enough water to fill the ponds in a week or so, replace water lost through evaporation, and

Fishing for channel catfish in a fee-fishing pond.

Robert E. Waters

supply water needed to replenish oxygen. Where underground water sources are unknown or questionable, drill a test well.

Springs are a good source of water but may contain undesirable fish. The flow in dry seasons must be known to determine spring adequacy. Oxygen level is usually adequate for your fish, but it's a good idea to check. If oxygen is not adequate, aerate the water. Kill undesirable fish with an approved fish toxicant or remove them by filtering the water.

Water taken from a pond, stream, bayou, canal, or other surface source usually contains undesirable fish. They will get into ponds and compete with desirable fish unless you take steps to keep them out.

If your operation requires a pond, your land must contain a site suitable for impounding water. The topography must be such that water can be impounded at reasonable cost and the soil must be capable of holding water.

If raising fish in raceways is your goal, the site should be such that a raceway can be built and operated at reasonable cost.

Put your raceway near the water supply. Whenever possible locate it so water can flow by gravity from the source throughout the raceway.

Soil Conservation Service technicians can help you decide if your water supply is of the quality and quantity required by your operation and by the fish you plan to grow.

Labor, capital, electrical power, and many other resources may be needed. Consider these needs carefully.

Design and Layout

Proper design of the facility can often reduce costs and make your operation more efficient—for example, designing raceways in which water flows by gravity, thus reducing or eliminating pumping costs.

Facilities should be no more elaborate than required to do the job efficiently and economically. Storage space for fertilizer and feed is called for in many cases. Earthen fishing piers are desirable in large ponds for fee fishing. All-season roads may be needed.

Other facilities and equipment that may be needed include feed bins, automatic feeders, pumps, concession stands, scales, mechanical aerators, fish-cleaning facilities, large freezers, thermometers, water-analysis kits, cages, bait, fishing tackle, and holding vats. Some of these are expensive.

Species of fish for your operation will be determined

mainly by the quality and quantity of your water, the region where you live, and your type of operation.

You may stock more than one species of fish, especially when growing fish in a pond. In many cases, results are satisfactory only when several species are stocked.

Sometimes an additional species is stocked to provide variety or increase fishing success. White catfish are stocked frequently in fee-fishing ponds with channel catfish, because the whites bite better during daytime than channel catfish.

In many enterprises, one or more species are stocked for purposes other than direct fish production. Largemouth bass and fathead minnows frequently are stocked in commercial catfish ponds, especially in ponds likely to become infested with unwanted fish or fish that prevent maximum catfish production. The bass feed for the most part on the minnows and grow large enough to control unwanted fish. Thus, they help ensure maximum production of catfish.

Stock only the species and numbers recommended in your area for your kind of enterprise and for the quantity and quality of your water. Exclude all others.

Managing Water and Fish

Management of water and fish will depend upon the size of your operation, the species you plan to grow, the density at which you stock the fish, and the source, quantity, and quality of your water.

A dependable year-round well is an excellent source of water. But well water frequently contains little dissolved oxygen and large amounts of carbon dioxide and nitrogen—a combination deadly to fish. You can dispel the harmful gases and add oxygen by splashing well water over a hard surface or by spraying it into the air before it enters the water where the fish are raised.

In most cases it is easier and less expensive to prevent unwanted fish from entering your operation than to control them after they enter. Here are some ways to prevent their entrance:

When possible, use a dependable, year-round source of water that is free of fish. If surface water must be used, filter it before it enters your operation.

Locate, layout, and construct your operation and facilities so overflows from streams and other bodies of water cannot enter. Entrance of such water is a sure way of introducing unwanted fish and, frequently, diseases and parasites.

When you drain a pond or raceway, let the bottom dry out

completely before refilling. This, of course, eliminates fish that are present. It also destroys many parasites and disease-causing organisms.

Diseases and parasites can be real problems, especially when fish are stocked at high densities in impoundments. You can avoid many disease and parasite problems by taking these precautions:

- Use water that is free of parasites and disease-causing organisms
- Bring only fish that are free of diseases and parasites into your operation. Make sure they are treated before stocking
- Use no feed material which may introduce diseases and parasites

Supplemental feeding is required in most commercial operations. Use only the kind and amount of feed recommended in your area and for the density at which your fish are stocked. Check frequently to see that all feed is being eaten.

Oxygen Deficiency

Oxygen deficiency is a major cause of fishkills, especially in operations stocked at high densities.

Some ways to help prevent oxygen deficiencies are:

Avoid excessively deep water. Use a dependable source of high-quality water. Stock only the recommended number and species of fish. Feed only the recommended amounts of feed.

If fertilizer is needed, use only inorganic fertilizer. Allow no runoff water from feedlots, poultry houses, pig parlors, and dairy barns to enter your enterprise. If fish are stocked at high densities and a supplemental feed is applied, check the dissolved oxygen content frequently, especially at daybreak during warm weather.

The time and method of harvesting will be determined to a great extent by your operation, the species of fish you grow and the volume of your business.

Fish may be harvested during any season if facilities are available for handling them. Frequently, facilities for dressing and storing large volumes are required. Usually it is best to harvest fish from a commercial enterprise during cool weather, especially if large quantities are involved.

Restocking is another key part of management. Some operations need complete restocking every year, others periodically. Still others require almost continuous restocking with adult fish during the fishing season.

Other important aspects of management include care of

the watershed, livestock exclusion, treatment for diseases and parasites, weed control, and controlling nuisance wildlife such as beaver and muskrat.

Market Demand

Economics and market demand can make or break you. Give them a good bit of thought before investing your money and labor in fish production. Unfortunately, less information is available on these factors than on other aspects of growing fish. Here are a few things to keep in mind:

Your initial costs in commercial enterprises may include ponds, raceways, wells, drainpipes, fences, roads, seines, boats, motors, special trucks. Some of these costs are high.

Yearly maintenance is another cost. Generally, the bigger the operation, the greater the cost of maintenance. There are yearly production costs, too. These may include pumping, stocking, feed, fertilizer and chemicals, labor, taxes on land, telephone, interest on operating capital, and harvest costs.

Generally, the cost per unit of production (usually per fish or per pound of fish) is lower in enterprises that produce large quantities of fish. If there is little or no demand for large quantities, you can lose money in a hurry even though your cost per unit of production is low.

Your best bet, of course, is to produce a high-quality product at the lowest possible cost per unit. Then, have a guaranteed market for the fish you produce, especially a market that ensures a reasonable return on your investment and labor.

Market demand is influenced a great deal by location. Fee-fishing enterprises should be near population centers, preferably within an hour's drive.

High-volume commercial operations, especially those producing fish for human food, should be near plants equipped to process and store large volumes of fish.

You can obtain technical assistance and information from many sources, among them the Cooperative Extension Service, Soil Conservation Service, your state game and fish agency, and the U.S. Fish and Wildlife Service.

Personnel from these agencies can give information you need in deciding whether your water, land, and location are suited for a particular operation. They also can give you the latest information on managing your enterprise. Turn to them first for advice.

Other information sources are trade magazines and private organizations. Some universities and colleges have experts in fish production on their staffs—contact them.