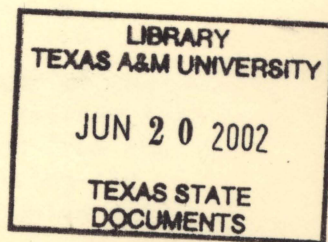
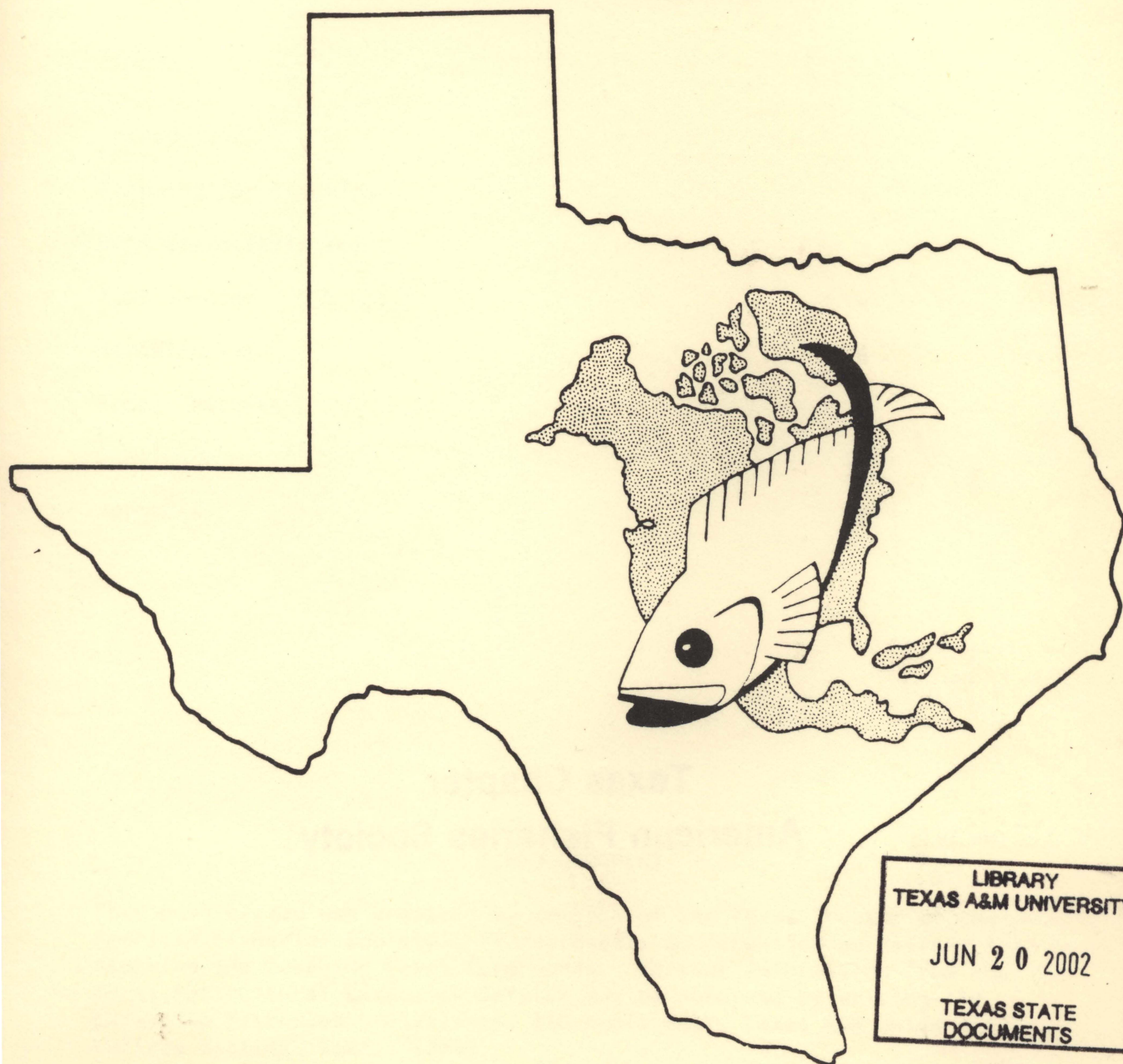


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Stocking and Management Recommendations for Texas Farm Ponds



The Texas A&M
University System



**Texas
Agricultural
Extension
Service**

Zerle L. Carpenter, Director
College Station

**Texas Chapter
American Fisheries Society**

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ACKNOWLEDGMENT

This publication was prepared by members of the Texas Chapter of the American Fisheries Society. It represents consensus on guidelines for stocking and managing Texas farm ponds. Further information from the Texas Agricultural Extension Service may be obtained by writing the Extension Fisheries Specialists, 110 Nagle Hall, Texas A&M University, College Station, Texas 77843.

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INTRODUCTION

Purpose

This publication is intended to present a concise set of guidelines on stocking and managing fish. The information has been developed primarily for ponds less than five acres. Much of the stocking and management information contained herein is usable in larger ponds, lakes, reservoirs and impoundments. Whenever possible, consult a fisheries biologist. In fact, professional advice is essential for large water bodies. Small pondowners can expect satisfactory results when using this publication, but a fishery biologist's assistance is preferable.

Need

Now, as never before, a need exists for this information. The U. S. Fish and Wildlife Service stopped delivering free fish to private ponds and reservoirs in Texas during 1975. The Texas Parks and Wildlife Department remained as the only public source of free fish. During 1977, the Department began charging for fish and reduced its delivery service. Then, in April 1980, the Department decided to stop its fish program to private water after the fall of 1980 deliveries.

The two public agencies provided stocking/management guidance to recipients of their fish. With the private fish producer remaining as the only source of fish to private Texas waters, the question is, "Do fish farmers need this publication in order to provide the public with proper stocking species, stocking numbers and management recommendations?"

Some do; some don't. However, all fish farmers will appreciate the Chapter's attempt to standardize stocking/management information based on qualified experiences and latest research findings. Employers of Chapter members will be encouraged to adopt recommendations in this publication. Ultimately, the Texas pondowner will be the recipient of pond management advice that will enable him to receive optimum benefit from his resource.

Format

The publication is designed to inform the reader about important characteristics of ponds and fish species to consider before making management decisions. For example, what size pond is to be stocked? Generally, ponds less than one acre receive different recommendations than larger ponds. The extent of water surface fluctuations, degree of expected fishing pressure and the muddiness of the water are a few of the traits which the pondowner needs to know--not only 'what' but 'why'.

Pros and cons of certain fish species are necessary. Crappie should not be stocked in ponds. Why? Fathead minnows are better forage for channel catfish than golden shiners. Why? Explanations to these and other important considerations about fish species are forthcoming. Some species have been intentionally omitted, primarily for two reasons. First, combinations of fewer species are easier to manage. Second, research and sound management information is available for a limited number of species.

A Stocking Key is provided. Species and numbers of individuals are recommended in accordance with pond characteristics and fish species discussed prior to the Key. The pondowner should find the Key very useful in organizing the principal considerations necessary for species and numbers selections.

Finally, harvest recommendations are discussed. Too often proper harvest of fish from ponds is completely disregarded. Proper harvest is as much a part of pond management as species selection, stocking rates, fertilization, shelter addition and aquatic vegetation control.

Scope

Several aspects of pond management are not incorporated in this publication. Aquatic weed control, pond renovation, habitat improvement, fertilization and pond construction are a few examples. However, previous material has been published about these and other important subjects of pond management. Appendix I list publications pertinent to pond management and sources from which they can be requested.

PLANNING FOR STOCKING

Small Ponds

Impoundments and reservoirs less than one surface acre in size are classified "small ponds" in this publication. Most ponds in Texas are less than one acre in size; in fact, many are less than one-half acre in surface area. These waters are almost always stored to serve livestock and fish management is not considered during construction. After the ponds are full of water the owner expresses an interest in fish stocking.

Unless the owner is interested in an intense, complex management effort, catfish only or catfish and fathead minnows (forage for catfish) should be stocked in small ponds. Adding sunfish and largemouth bass complicates the management effort beyond the desires of most landowners. Another important consideration is the availability of fish. Most Texas fish farmers produce catfish, relatively few sell bass and sunfish. Since catfish are more widely distributed and transportation costs of fish can be prohibitive, most small pondowners have only one practical alternative--catfish, either channels or blues.

Before stocking small ponds, remove existing fish populations. New ponds should present no problems. Older ponds may have many different combinations of fish that will interfere with catfish production. Avoid management hassles--clean out the pond.

Decide if the catfish will be fed. Commercial catfish feed is available from feed and seed stores or similar places. A good commercial feed is pelleted and contains at least thirty percent protein. Both floating and sinking feeds are available. Floating feeds are more expensive; but the fish can be observed while feeding, which reduces waste and provides entertainment.

Feeding catfish in small ponds means giving the fish every day the amount of feed they will eat in 10 to 15 minutes. Occasional feeding results in unsatisfactory production. A daily feeding program with a good quality commercial feed can result in one pound of fish gain for every two pounds of feed.

Do not encourage catfish reproduction by adding spawning devices/structures. Successful spawning will result in too many stunted fish. Keep account of catfish removed and when fifty percent of the original stocking is harvested, restock with the same number as removed.

Large Ponds and Impoundments

Ponds ranging in size from 1 to 5 surface acres are covered in this section. Proper management of largemouth bass is the key to managing these water bodies. Species stocked primarily to provide forage for bass are sunfish, forage minnows and possibly threadfin shad.

Channel or blue catfish can be stocked to provide additional sport and will not interfere with the critical balance between bass and forage. Spawning devices may be installed to encourage reproduction of catfish. Expect most or all of the reproduction to be removed by bass, particularly in clear ponds. In muddy or turbid ponds, more catfish will avoid bass predation. Stock catfish at least eight inches long into an established bass population. Manage catfish and fathead minnows alone in large ponds the same as in small ponds.

Maintaining a balanced bass-forage population is essential, yet very difficult. Two important factors are proper harvest of intermediate sized bass and proper stocking schedules. Proper bass harvest will be discussed in more depth elsewhere in this publication.

The stocking schedule depends principally upon the size of bass stocked. When 1- to 3-inch bass are planned, stock 1- to 3-inch sunfish and channel catfish larger than four inches in the fall followed by bass the next spring. This schedule assures: (1) forage and channel catfish are sufficiently large when bass are stocked that bass will not deplete the original stocking of forage and catfish, and (2) forage will have an opportunity to spawn creating a food supply for newly stocked bass.

When advanced bass (6 to 8 inches) are planned, all species may be stocked simultaneously. However, stocking forage species during the previous fall is advisable. Sunfish should be longer than three inches and channel catfish should be at least eight inches long in order to avoid predation from bass. Recent research in Texas indicates that the larger sunfish, particularly bluegill, will spawn and provide adequate forage for bass and their spawn.

POND CHARACTERISTICS

Pond Size

The size of your pond is one of the major factors that will determine what fish you need to stock, the intensity of pond management needed to maintain these fish and how many fish you can harvest each year. Most farm ponds in Texas are constructed for livestock watering purposes and are about one acre or less in size. Although small pondowners traditionally

want "bass in their tanks", these small ponds are not suited for good bass populations. Unless fishing is highly regulated, bass populations in small ponds typically become "unbalanced" and require renovation. Catfish stocked either by themselves or with fathead minnows provide excellent fishing recreation and meat for the table. Ponds larger than one surface acre are more suitable for bass populations. If these larger ponds are stocked, managed and harvested properly, the pondowner can expect many years of satisfactory bass fishing. Ponds which fluctuate considerably in surface area should be stocked on the basis of average annual low water surface area.

Muddy Water

Many Texas ponds have a tendency to stay muddy. This condition is caused by suspended soil particles in the water and should not be confused with turbidity resulting from a plankton bloom. Muddy waters hinder growth of fish food organisms and may affect reproduction and growth of fish. Suspended soil particles in pond water can be caused by wave action; large, rough fish populations; or cattle wading and stirring the mud. Correction of the problem will usually result in the material settling to the bottom of the pond. If, however, the suspended material is caused by clay particles, it will not settle out and organic material or chemicals must be added to the water to correct the situation. In muddy water, catfish perform better than bass which are primarily sight feeders. Forage usually becomes overabundant because bass are less capable of seeing and utilizing small fish.

Alkalinity

Ponds in different areas of the state have different water chemistry caused by such factors as soil type, water sources, watershed, etc. The water chemistry in a pond affects the primary productivity which in turn dictates the number of fish to stock. One chemical parameter that will give an indication of pond productivity is pH. Your county extension agent, local Soil Conservation Service office, or Texas Parks and Wildlife biologist can provide you with an estimate of the pH in your area. If your water has a pH less than 7.0, you have an acid condition; while water greater than 7.0 indicates an alkaline condition. Favorable pH's for fish production are indicated when readings range from 6.0 to 8.5.

Water Fluctuation

Ponds in different parts of the state are subjected to varying annual rainfalls and evaporation rates. While East Texas farm ponds are full for the majority of the year, South and West Texas ponds may experience drastic drawdowns during summer months. These drawdowns concentrate all the fish in small areas and can reduce populations either through predation or oxygen

depletion. Pondowners can minimize the impact of such drawdowns by providing deep water (10 to 12 feet) in part of the pond. Greater numbers of forage fish should be stocked in ponds subject to extreme water level fluctuation.

Fertilization

Commercial inorganic fertilizer can be used to greatly increase fish production in ponds. Fertilization will not only increase the basic productivity of a body of water but when properly managed will control aquatic vegetation in water deeper than two feet that could be detrimental. Too much fertilizer can create more problems than it will solve. There are several available publications (see list of references) that give detailed instructions for pond fertilization and individuals wishing to start such a program would be wise to consult them. The stocking rates listed in this publication can be doubled in ponds having an annual fertilization program with the exception of ponds stocked with catfish only and fed daily. Do not fertilize muddy ponds.

FISH SPECIES

Largemouth Bass

This species is probably the most sought after fish in Texas and in almost all pond environments is the primary predator. Information is still needed regarding the introduction of the "super" or Florida bass into small Texas ponds and researchers are working intensively on this subject. Exceptions will occur, but the Florida bass generally does not perform well in ponds less than three acres in size.

The Florida bass is also more sensitive than the native bass to rapid temperature fluctuations. Pondowners in the northwest portion of the state may not be able to establish Florida bass if their ponds are shallow (less than ten feet) and/or are windswept, resulting in a rapid cooling and turnover of the water column.

Until more research is available, it is suggested that Florida bass not be stocked in (1) ponds less than three acres in size, or (2) ponds in the northwest portion of the state which are less than ten feet in depth.

Channel or Blue Catfish

These species do well in most pond environments and can be stocked as a supplement to bass and forage populations in ponds larger than one acre.

Bluegill

Many pondowners are reluctant to stock ponds with bluegill because of the fish's tendency to overpopulate. Bluegill are, however, the only fish species which can sustain the large numbers needed to provide food for bass. Without them, a quality bass population will probably not develop. Bluegill are also a fine sport fish. You may feel that by stocking fewer bluegill, the fish will be less likely to overpopulate. Right? Wrong! Just the opposite may be true. Bluegill overpopulation usually occurs because too few are originally stocked resulting in an unusually large first spawn. The high production and survival rate is a result of little competition for available food and space. The problem is further intensified when bass are overharvested during the first season of fishing, leaving the young bluegill with no control. (See Proper Harvest section.)

Redear Sunfish

The eastern one-fourth of Texas and in situations where the water is not clear, redear sunfish should be stocked with bluegill. In turbid waters created by plankton or soil particles, bass cannot see their prey as readily which may result in the bluegill not being satisfactorily utilized. Because redear are not as prolific as bluegill and the young tend to compete, the addition of this species may help reduce total sunfish reproduction.

Golden Shiners

In clear alkaline waters, bluegill alone may not provide adequate forage for largemouth bass. For this reason, fingerling golden shiners should be stocked in addition to bluegill. Also, in South and West Texas, fish become crowded and forage is more available when water levels are reduced during summer months. Bluegill will probably not be able to withstand this type of predation and the addition of golden shiners is again suggested. (See Stocking Key).

Fathead Minnow

The fathead minnow is a relatively slow swimmer and will usually be rapidly eliminated from bass-bluegill populations. However, they are very useful when stocked with channel catfish which are not being fed, or to promote first year growth of largemouth bass.

Threadfin Shad

This species is an excellent forage species for bass but like the fathead, generally cannot withstand bass predation for an extended period of time in small ponds. They are also sensitive to cold temperatures and can be expected to perform best in South Texas. Experience has shown that this species can survive mild winters in North, East, and Central Texas.

Undesirable Fish

Many other species of fish have been stocked in Texas ponds but none have been as consistently successful as largemouth bass, channel and blue catfish, bluegill and redear sunfish, fathead minnow, golden shiner, threadfin shad, or combinations of these fish. While other species may do well in streams, lakes, or reservoirs, they often cause problems in ponds or are not suited for pond environments. Under no circumstances should the following or any other unlisted species be stocked without consulting a fishery biologist.

Crappie are very undesirable stock in ponds. They compete with bass for food, eat small bass and have a tendency to overpopulate and become stunted.

Carp, bullheads and green sunfish often are inadvertently stocked or gain access from the upper watershed or inflowing stream. Carp and bullheads are bottom feeders and stir up the pond causing muddy water. Bullheads and green sunfish are notorious for overpopulating, particularly if bass populations are reduced.

Flathead catfish are often stocked in ponds by the pondowner or well-meaning sportsmen. It is a mistake. This predator consumes large quantities of all species of fish. An unbalanced pond can seldom be corrected by the addition of this fish.

STOCKING KEY

The following key is divided into two major components. Twelve stocking considerations are listed. The Steps column provides the next consideration necessary in determining proper species and numbers to stock. Read Consideration 1, to determine which characteristic is most appropriate to your pond. Read the Step immediately to the right of that Consideration and proceed to the Consideration indicated under that Step. Keep following this sequence until you reach the Step -- "Stop."

Consideration

Step

1. Choose suitable species on basis of pond size
 - A. Ponds less than one surface acre Go to 12
 - B. Ponds greater than one surface acre Go to 2
2. Ponds greater than one surface acre
 - A. Only channel catfish (recommended for muddy ponds) Go to 12
 - or
 - B. Bass and channel catfish
Stock 100 channel catfish per acre (channel catfish must be larger than bass) Go to 2C
 - or
 - C. Bass (must also have forage species)
 - (a) Stock 20 (6 to 8 inch) bass per acre Go to 3
 - or
 - (b) Stock 50 (1 to 3 inch) bass per acre Go to 3
3. Select forage on basis of pond characteristics Go to 4
4. Pond muddy (less than 12 inches visibility) Go to 5
Pond clear (more than 12 inches visibility) Go to 6
5. Muddy ponds are less productive and forage tends to overpopulate.
 - A. Stock 15 adult bluegill sunfish and 15 redear sunfish (greater than 3 inches) per acre
 - or
 - B. Stock 250 bluegill sunfish and 250 redear sunfish fingerlings (1 to 3 inches) per acre.
 - or
 - C. Stock 500 golden shiners per acre Go to 11
6. Pond acid (pH less than 7) Go to 7
Pond alkaline (pH greater than 7) Go to 8
7. Acid water (typically East Texas)
 - A. Stock 15 adult bluegills and 15 redear sunfish (greater than 3 inches) per acre
 - or

- B. Stock 250 bluegills and 250 fingerling redear sunfish (1 to 3 inches) per acre
- C. 500 threadfin shad may be added to increase yields Go to 11
- 8. Alkaline waters
 - A. Rainfall less than 20 inches per year Go to 9
 - B. Rainfall greater than 20 inches per year Go to 10
- 9. Low rainfall areas
 - A. Stock 30 adult bluegill sunfish (greater than 3 inches per acre
 - or
 - B. Stock 500 bluegill sunfish fingerlings (1 to 3 inches) per acre
 - C. Bluegills must be supplemented with
 - (a) 500 threadfin shad per acre
 - or
 - (b) 500 golden shiners per acre Go to 11
- 10. High rainfall areas
 - A. Stock 30 adult bluegill sunfish (greater than 3 inches) per acre
 - or
 - B. Stock 500 bluegill sunfish fingerlings (1 to 3 inches) per acre
 - C. Bluegills may be supplemented with
 - (a) 500 threadfin shad per acre
 - or
 - (b) 500 golden shiners per acre Go to 11
- 11. Time of stocking for forage
 - A. Fingerling sunfish (1 to 3 inches), shad or shiners should be stocked in the fall prior to stocking bass
 - B. Advanced (greater than 3 inches) sunfish should be stocked at the same time as advanced (6 to 8 inches) bass. Advanced sunfish can be used with fingerling bass (1 to 3 inches) either in the fall or time of bass stocking Go to 13
- 12. Channel catfish desired
 - A. Fish to be unfed or occasionally fed
 - (a) Stock 100 channel catfish per acre and
 - (b) Stock 500 fathead minnows per acre Go to 13
 - B. Fish to be fed daily
 - (a) Stock up to 1000 channel catfish per acre Stop
- 13. Fertilized ponds
 - A. If an annual fertilization program is to be conducted, double all stocking rates Stop

PROPER HARVEST

Improper harvest of fish ruins future fishing in more Texas ponds than any other cause. Pondowners and other anglers frequently overharvest the bass population in the first season of fishing. This allows bluegill to overpopulate the pond. In other cases, bass harvesting is too low to impact the bass population leading to overpopulation of bass.

A pondowner can reduce the likelihood of bass overharvest by making his pond off limits to everyone. This practice is, however, not encouraged because underfishing can lead to about as many problems as overfishing. Although the pondowner controls access into his pond, he should not deny entrance to a responsible sportsman asking permission to fish.

The most sensible way to prevent bass overharvest is to establish 15-inch minimum length limits for a period of three years from stocking. If those who fish the pond abide by the restriction and release all bass less than 15 inches, the pond should begin producing good fish of all species. The bass that were originally stocked will have to support the majority of the harvest for three years, so they have to be used wisely.

After three years a decision must be made. The choice made will depend upon what kind of fishing is desired. Bass will have reproduced two or three times during this three-year period and young bass produced can come to exist in surplus numbers. If unharvested, poor growth rates occur due to excessive competition. The result will be a bass population comprised primarily of individuals less than 12 inches long. All these small bass will effectively control bluegill numbers and the pond will have plenty of 7-to 8-inch bluegill.

If the pondowner is interested in catching bass over 12 inches long, 8-to 12-inch bass must be controlled. About 25, 8-to 12-inch bass should be harvested per acre each year after the third year from stocking. The removal of these small bass reduces competition and allows some fish to attain lengths over 12 inches.

To keep bluegill in good condition, 12-to 15-inch bass should be released from the third year on. Releasing bass of this size will also insure that some bass over 15 inches will be caught.

If bass have not been harvested as described above, adjustment of the fish community may be required. It is likely that bass overharvest has occurred if primarily 3-to 5-inch bluegill and few or no bass are caught. This problem can be rectified by stocking 50, 8-to 12-inch bass per acre. Bass less than 15 inches long should be released until small bass become abundant. Then, bass less than 12 inches and over 15 inches long can be harvested.

If only small bass and few bluegill are caught, harvest of bass has not been adequate. In this case, 200, 3-to 5-inch bluegill should be stocked per acre. Approximately 25, 8-to 12-inch bass should be harvested per acre each year thereafter. Again, 12-to 15-inch bass should be released.

A decision is sometimes made to stock the pond with limited numbers of advanced bass and bluegill rather than fingerling fish. If this is the case, these few bass must be returned to the pond and carefully protected. One cannot afford to lose the original fish as they are present in very limited numbers.

CONCLUSION

Proper management of fish in a pond is more of an art than a science. As research seeks to answer the necessary questions and management evaluates the research findings, pond management will become more of a science. This publication is an attempt toward assembling research findings and management evaluations about Texas ponds.

The art of management will always be a necessity. If all the scientific facts needed for pond management were available in this publication, the successful pondowner would still need the ability to select the best combination of scientific facts to deal with unforeseen and foreseen problems. Experience, learning from mistakes and successes is the only way to develop the art of management.

This publication is not an end product. Almost immediately it will need revision. All of us--pondowners, fish farmers, researchers, biologists and managers--should set a goal of improving the information herein. Hopefully, in a few years, we will again work together to improve on this effort.

APPENDIX 1

U.S. Department of Agriculture 1/

Building A Pond. Farmers Bulletin No. 2256. Issued October 1973. 13 pp.

Dillon, Olan W., Jr., et al. Warm-Water Fishponds. Farmers Bulletin No. 2250. Reprinted April 1977. 44 pp.

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Forshage, Allen A., and Kenneth R. Moore. Fish Habitat Improvement in Reservoirs. PWD Booklet 3000-12. Printed May 1980.

Inman, C.R. Construction Hints and Preliminary Management Practices for New Ponds and Lakes. PWD Booklet 3000-7. Printed March 1980. 10 pp.

Menn, C.T. Rotenone: Its Use in Fisheries Management. PWD Brochure 3000-77. October 1979.

Smith, Dwane Q., and John M. Mitchell. The Ecology of Farm Pond Fertilization. PWD Brochure 3000-24. Printed June 1978.

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Klussmann, Wallace G., et al. Common Aquatic Plants in Texas, Identification and Control. Coded B-1018. 15 pp.

Klussmann, Wallace. Texas Agricultural Progress. "What Makes Fish Bite?" Vol. 12, No. 1, pages 7-8. TAP 420. Winter 1966.

Lock, Joe and Wallace Klussmann. Improve Your Farm Fish Pond. 18 pp.

Steinbach, Don W. "Stocking Fish". Memorandum to all County Extension Agents, Agriculture. Dated February 26, 1979. 2 pp.

Steinbach, Don W., and Joe T. Lock. Catfish in Farm Ponds for Food and Recreation. Manuscript of MP-1142. Reprint. 14 pp.

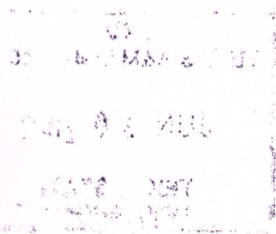
1/ For sale: Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402

2/ Available from: Texas Parks and Wildlife Department, 4200 Smith School Rd.
Austin, Texas 78744

3/ Available from: Texas Agricultural Extension Service, The Texas A&M
University System, College Station, Texas 77843

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