

November 9, 2021

Snow Lake Shores Corporation
Mr. Gerry Printz
Box 38
Ashland, MS 38603

Dear Mr. Printz:

Enclosed, please find your copy of the Management Plan we recently completed for Snow Lake Shores.

Snow Lake Shores is presently functioning as a dynamic, predator-crowded fishery. As such, our management recommendations center primarily on reducing the total number of adult predators (largemouth bass), introducing supplemental forage (coppernose bluegill, threadfin shad and crawfish) and improving the conditions for the production of forage through supplemental feeding:

- Largemouth bass (13" and less) should be harvested, up to a total of ~2,680 pounds per year.
- Begin a supplemental feeding program in Fall 2021.
- Stock 40,000 intermediate coppernose bluegill in Fall 2021.
- Stock 4 loads of threadfin shad in Spring 2022.
- Stock 3,350 black crappie in Spring 2022.
- Stock 1,000 pounds of crawfish in Spring 2022.
- Conduct an electrofishing balance assessment (Annual Evaluation) roughly one year from this date.

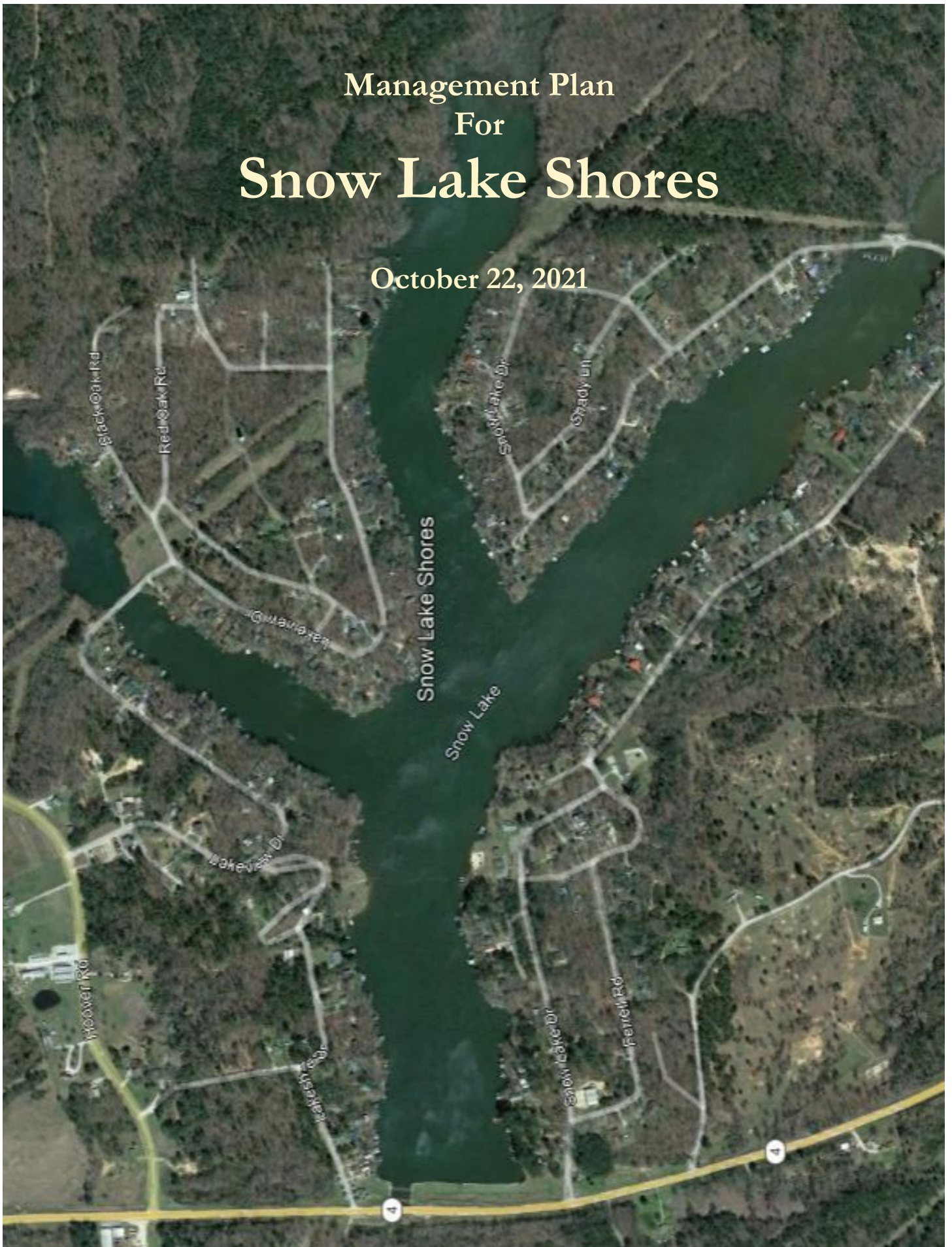
Mr. Printz, thank you again for having us out to look at the fish population in Snow Lake. There are a variety of species present in this lake, some of which have little impact on management, and others which can definitely play a part in the long term management of the fishery. The 'trash fish' we collected—redhorse and gar, do contribute to the fish population. Gar being predatory and feeding on shad, while redhorse compete with more common forage species for invertebrates. The main issues facing the fish population and contributing to the angling shortfalls are the lack of forage for an abundant bass population. Reducing the numbers of small bass in the population in conjunction with increasing the forage, will improve the bass population, as well as the crappie population. Due to the small numbers of crappie observed, adding more may not be a bad idea. Predators have become a major concern for pond owners and fisheries managers. Otters in particular have become widespread over the past 20 years and can cause significant damage to fisheries. They tend to target bass between 14-20 inches, and when present in large numbers can destroy a fishery quickly. Trapping is the best way to control otters when they are present. If you all have any questions, we are always available to discuss these recommendations or answer any other questions you might have.

Good fishing,

Luke Moran
731-499-4436

Management Plan For Snow Lake Shores

October 22, 2021





Introduction

Management of bass-bluegill sportfish ponds in the Southeast is based on the ideas of H.S. Swingle, founder of the Fisheries Management program at Auburn University. Southeastern Pond Management combines Dr. Swingle's management principles with the latest and most innovative management techniques to provide quality pond care. Successful pond management is based on assessing and manipulating pond fertility, aquatic weeds, and fish populations. Control of these three factors allows fish ponds to provide the maximum benefit to the pond owner. It is important to note that "benefit" is defined by the owner and can take the form of trophy bass, trophy bluegill, or a well-balanced fish community. Fortunately, modern pond management is flexible enough to fine-tune a pond to precisely fit the goals of the owner.

Southeastern Pond Management visited Snow Lake Shores on October 22, 2021, in order to conduct a comprehensive evaluation of the 134 acre Snow Lake Shores. A representative sample of the fish community was collected by electrofishing to accurately assess the present state of balance between the predator and prey species. In addition, the physical and chemical properties of the water were inspected to assess water quality. The degree of aquatic weed infestation was also recorded. Results of these assessments provide the basis for this management plan.

The goal of this management plan is to create and maintain a balanced fish community focusing on largemouth bass and crappie in Snow Lake Shores. The following evaluation report and management plan details and explains our recommendations with the following goals in mind:

- ◆ Create conditions favorable for the consistent production of "quality size" and "trophy size" largemouth bass (Table 1).
- ◆ Create conditions favorable for the consistent production of "quality size" bluegill (Table 1).
- ◆ Generally maintain a high level of water quality as well as an aesthetically pleasing environment for aquatic recreation.

Table 1.

	LMB	Bluegill
"Quality Size"	16-20"	7-10"
"Trophy Size"	20"+	10"+

This report is designed with the above interests in mind. Normally, we feel most comfortable with the recommendations listed at the end of this report. However, we encourage you to pursue whatever goals you may choose. In addition, although parts of this report may seem quite technical, we include this information only to clearly illustrate the present fish community structure. As biologists, we depend on the electrofishing survey to show us where management input is necessary.

It is important to note that quality fishing will not be accomplished "overnight". As you read through this plan, bear in mind that the specific activities we have recommended are not one-time inputs, but rather a collection of ongoing management activities that will establish and maintain long-term quality fishing. Proper pond management, like the management of any natural resource, is an ongoing process. Each management input is recommended individually; however, it should be noted that the *management program* suffers if all activities are not implemented. Feel free to contact us and further discuss management ideas you may have.



Electrofishing equipment was used to collect a fish sample from Snow Lake Shores, October 2021.



Pond Assessment

Snow Lake Shores is a 135-acre watershed impoundment located in Benton County, Mississippi. It is unknown when the pond was originally impounded. An emergency spillway is present. In addition, we noted a limited amount of cover for bass and bluegill in the form of brush piles and fallen trees.

The surrounding topography is characterized by rolling hills of mostly pine and some hardwood tree growth. Snow Lake Shores is located in a region of the state where soils are often relatively infertile, and highly acidic (low pH). Ponds constructed on such soils usually require the application of agricultural lime to ensure a successful fertilization program. At the time of our visit, total water alkalinity was measured at **12** parts per million (ppm). This level of alkalinity is well below the minimum recommended threshold of **20** ppm, and represents conditions unsuitable for effective fertilization. Snow Lake Shores has not been adequately fertilized in the recent past.

Snow Lake also has a significant amount of

flow through, which would impact the longevity of a lime application and the effectiveness of fertilizer applications.

Snow Lake Shores appeared to have a only light plankton bloom at the time of our visit, the result of watershed nutrients flowing into the lake..

Snow Lake Shores contains many acres in the upper end and through a larger than normal percentage of the lake that are 3 feet deep or less and highly susceptible to aquatic weed growth. During the evaluation, we did not observe any problematic aquatic vegetation. Aquatic weeds and problems associated with them will be discussed in the Aquatic Weed Control section.

Snow Lake Shores was recently stocked with threadfin shad in 2021 by Southeastern Pond Management. Fish harvest has been limited in the recent past. Harvest, and its importance in structuring fish communities will be discussed later in this report.



Snow Lake Shores, October 2021.



Fish Community Balance

Ponds and the animals they support are governed by a predator-prey relationship. The interactions of predator and prey are characterized by a concept we refer to as *balance*. By definition, suitable balance in a fish community is characterized by a healthy distribution of both predator and prey over a wide range of age and size classes. In order to assess the relative balance of a fish community, the species functioning as predators and the species functioning as prey must be defined. **Predators** are species which rely on other fish as their primary food source. **Prey** species rely on sources other than fish for their food source.

Classic balance in small impoundments is defined by several parameters, not the least of which involves a suitable ratio (by weight) of predator to prey. Further, the key to maintaining balance in a sport fish pond is a healthy size distribution of both predator and prey. If one size-class becomes overly abundant or lacking, a condition of imbalance results. By analyzing an electrofishing sample it is possible to determine the state of balance within a given fish community.

In fisheries science, the *condition* of individual fish is used as another indicator of the overall balance of the entire fish community. Relative weight (Wr) is an index used to categorize the condition of fish within a given population. Calculated Wr values greater than 100 indicate

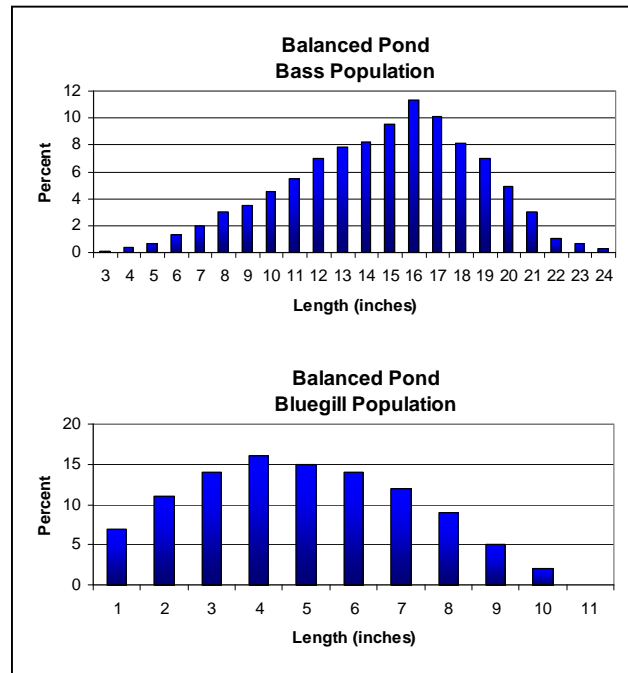


Figure 1. Length distribution of bass and bluegill in a typical balanced pond.

plump, robust fish. Wr values less than 100 suggest that individuals are in less than excellent condition, perhaps the result of some predator:prey imbalance. Wr values less than 85 would indicate malnourished fish; a sign of intense competition for forage.

Figure 1 depicts balanced populations of predator and prey in a typical sport fish pond. Note that all sizes are well represented; no noticeable gaps are present.



Predator and prey fish are measured and weighed to analyze the overall balance of the fish community.



Fishery Assessment

The fishery in Snow Lake Shores was sampled with standard boat-mounted electrofishing equipment. The sample contained largemouth bass, bluegill, threadfin shad, crappie, catfish, gizzard and threadfin shad, longear sunfish and redear sunfish (shellcracker). Currently, largemouth bass, crappie and catfish are functioning as the primary predators in Snow Lake Shores. The bluegill, shad, sunfish and shellcracker are the prey.

Threadfin and gizzard shad are an important component of the forage base in Snow Lake Shores. Shad make up a major portion of the diet of bass and crappie. Threadfin shad are especially beneficial due to their relatively small size. Nearly all predators can feed on threadfin shad making them an ideal forage fish.

Largemouth bass ranging in size from 2 to 22 inches in total length were collected in moderate abundance (Figure 2). The bass population was dominated by individuals 11 to 13 inches. Largemouth bass 13 inches and smaller represent the primary targets for harvest over the coming months. We harvested about 15 pounds of bass during the evaluation.

Crappie were collected ranging 9 to 13 inches. Over all these fish appeared to be thin and unhealthy. A more robust forage base, and overall fertility of the water would help the crappie increase in health.

Bluegill and shellcracker were collected ranging in size from 2 to 8 inches in total length. Figure 3 depicts the length distribution of the bluegill population. While the length distribution is not all that bad, besides the definite drop in 4 inch fish, the actual distribution of fish around the lake was not very good. The majority of bluegill in the sample were collected in a select few locations.

Furthermore, the majority of what we were thinking were bluegill during the collection, were in fact long ear sunfish. These items collectively require management attention.

The average relative weight of adult bass collected from Snow Lake Shores was 81 (Figure 4). In other words, most of the adult bass were in relatively poor condition. The bass population is dominated by skinny, slow growing individuals.

Overall, we characterize the fish community in Snow Lake Shores as bass-crowded. A more

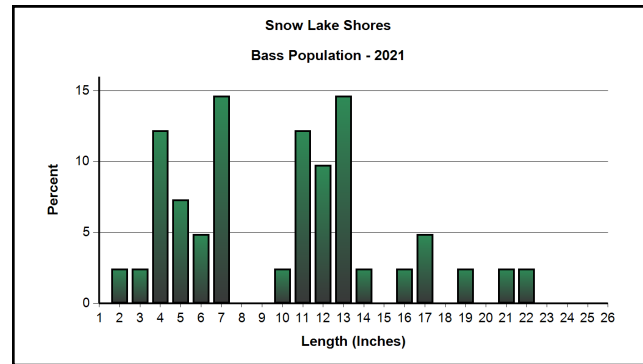


Figure 2. Length distribution of bass collected from Snow Lake Shores in October 2021.

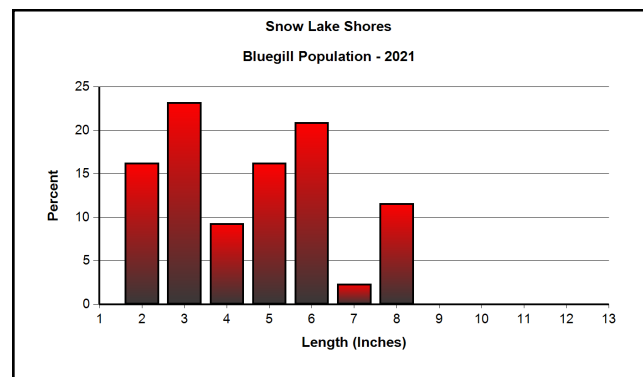


Figure 3. Length distribution of bluegill collected from Snow Lake Shores in October 2021.

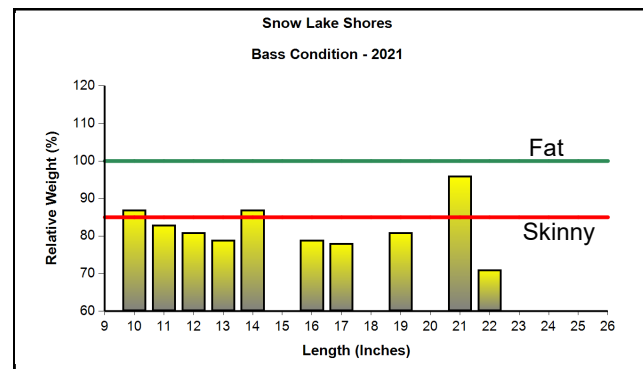


Figure 4. Relative weights (W_r) of adult largemouth bass collected from Snow Lake Shores in October 2021.

detailed explanation of bass-crowded ponds in general, and Snow Lake Shores in particular is located in the Current State of Balance section of this report.

Management inputs aimed at shifting the fishery toward balance are listed in the Recommended Management Activities section of this report.



Bass-Crowded

Bass-crowded is an imbalanced condition that is relatively common in private ponds and is characterized by large numbers of small, skinny bass, and relatively few but unusually large adult bluegill. In this situation, bass growth is stunted due primarily to a lack of adequate nutrition. The largemouth bass is such an efficient predator that, if not controlled through responsible harvest, it will severely reduce its own food supply. Under these conditions, bass will perform poorly and will never reach their full growth potential.

The presence of intermediate size (3-5") prey is critically important in sport fish ponds. These individuals are the size preferred by the more abundant, younger bass in a typical population. A low relative abundance of intermediate size prey is often an indication of a bass-crowded pond. Under these conditions, bass typically become stunted between 8 and 14 inches. Bass in this size range require an ample supply of 3-5" prey in order to grow past the stunted size and become "quality" and "trophy" adults. When a condition of balance exists, intermediate size prey are among the most abundant segment of the overall fish community. As mentioned previously, our recent electrofishing sample from Snow Lake Shores included relatively low numbers of intermediate size bluegill, particularly in the 4 to 5 inch size range.

Under-harvest of bass is most often the cause of the bass-crowded condition. In bass-crowded populations, despite their overabundance and relatively poor condition, the adult bass spawn each year. Due to the presence of an actively reproducing prey population, these juvenile bass are able to grow quite well in their first year. In order to maintain this rate of growth past 8-10 inches however, they require a slightly larger prey item. In bass-crowded ponds, the availability of slightly larger (3-5") prey is limited. As a result, the growth rates of the bass decline dramatically and they begin to demonstrate characteristics of stunting. Recent bass harvest was reported as "limited" in Snow Lake Shores.

In a typical fertilized sport fish pond, bass harvest is required in order to prevent



Typical bass from a bass-crowded pond.

overcrowding. The old idea of "throw him back and catch him when he gets bigger" is not a sound approach in small impoundments. If sufficient harvest does not occur, the crowded condition perpetuates itself. This results in a less than quality bass fishery.

Finally, competing predator species in the form of crappie, catfish, and gar were observed in relatively low numbers in Snow Lake Shores. The potential impact of competing predator species, including crappie and catfish, are discussed in the following pages.

Strategies specifically geared toward improving the bass-crowded condition are discussed in the Recommended Management Activities section of this report.



Competing Predator Species

The presence of predator fish species other than largemouth bass may have an impact on the balance of the fish community. The severity of the impact depends largely on the species present and its density relative to the entire fish community. Some predator species may prove to be beneficial to certain management goals at moderate densities; however, most species negatively affect management goals to some degree. Generally, the more fish species present in a pond, the more complicated and less predictable pond management practices become. Once established, it is often difficult to completely remove an undesirable predator from a pond; however, harvesting every individual caught will increase the availability of prey for largemouth bass. In order to maintain a balanced pond with competing species, the bass must become a larger component of the predator community. An additional forage species, such as threadfin shad, typically reduces the negative effects of additional predators.

Competing predator species can be introduced in a number of ways. A pond can be contaminated with different fish species by a feeder stream, especially if the pond basin is not poisoned before stocking. Occasionally, adjacent waters flood and connect a pond introducing different species. For example, oxbow lakes are often flooded on a regular basis by an adjacent stream or river. This greatly reduces the effectiveness of many management practices. Many times, competing predator fish are brought in from other waters by fishermen themselves. Several competing predator fish found in small impoundments are listed below:

Black and/or white crappie are commonly introduced by fishermen in ponds, however they are not a desired predator species in small impoundments less than 50 acres. Not only do crappie compete with adult bass for food, but also with juveniles because they typically spawn before bass. Furthermore, their reproduction is often highly erratic. Maintaining balance with an abundant crappie population can be difficult in small impoundments.

Catfish are often stocked with bass and bluegill to add angling opportunity. Unfortunately, catfish are also direct competitors of largemouth bass and



Crappie



Channel Catfish

can have an impact on the forage community if they are allowed to reach large sizes. Catfish recruitment is usually low in ponds with an established bass population. Therefore, a small population of catfish can be sustained in small impoundments if an abundant forage base is maintained.

Spotted bass caught from public waters are often mistaken for largemouth bass and introduced in sport fish ponds. Spotted bass compete fiercely with largemouth bass in small impoundments. Not only do the adults compete for food, but spotted bass typically spawn earlier, thus giving the fry a survival advantage. Often this early advantage allows spotted bass to dominate the bass population in smaller systems. Once spotted bass become established, targeting spotted bass when harvesting becomes an ongoing management practice.



Spotted Bass



Gar



Bowfin



Green Sunfish

Other predator species, such as **gar**, **pickerel**, **bowfin**, etc., are often considered “rough” or “trash” fish. The presence of these fish in a pond usually indicates flooding of an adjacent river or major tributary. They are often difficult to remove with angling. They do not seem to become as abundant as crappie or spotted bass in a bass/bluegill pond, but have a negative impact nonetheless.

Other species such as **green sunfish** and **warmouth** commonly inhabit sport fish ponds. These species typically are introduced by small feeder creeks. Green sunfish, in particular, have the ability to enter ponds without a feeder stream, possibly by way of aquatic birds. Each of these fish can function as predators by eating small bluegill

and other forage in ponds. They can also compete with bluegill for food and spawning sites. Fortunately, their impact is usually minimal as they rarely exceed 6 or 7 inches and typically do not become abundant in a pond with an established bass population. However, these species can become problematic if allowed to multiply before a healthy bass population is present.



Fish Harvest

One of the keys to a balanced fish community, as well as the growth of trophy largemouth bass in your pond, is the selective removal of largemouth bass. Largemouth bass, when present with bluegill as their primary source of forage, produce an annual surplus which must be harvested in order to maintain balance. We generally recommend harvesting the smaller, more abundant size range of bass at a rate of **25 to 35 pounds per acre per year**. Bass harvest rates are designed to reduce the level of predation on the bluegill population as well as increase the growth rate and condition of the remaining bass. Recommended harvest quotas often change in response to population changes and should be re-evaluated annually. Harvesting largemouth bass can be accomplished by the following methods:

(1) **Hook and Line Harvest:** Largemouth bass of the appropriate size should be removed whenever they are caught up to the harvest goals. A record should be kept of the total number and weight of bass removed during each fishing trip. Larger bass, those presently exceeding the size limit, may be "protected" since these represent the potential trophy bass in the pond.

(2) **Electrofishing Harvest:** Selective bass harvest through electrofishing is a particularly effective management tool. This method of harvest may be quite productive if hook-and-line efforts are not



A measuring device should be kept handy to determine the correct size bass to harvest.

adequate. The cost for this service is based on time spent (hourly). We will keep close records of the total number and weight of individuals removed.

One important point is that bluegill and shellcracker harvest is strictly optional in balanced ponds. It is not necessary to harvest a certain weight of bluegill per acre to maintain the predator/prey balance or to prevent bluegill overpopulation. The bass will more than adequately control bluegill numbers. Typically, a generous amount of adult bluegill can be harvested in a well-fertilized, balanced lake. However, over-harvest of bluegill may be a concern, depending on the number of anglers and fishing pressure. We often recommend limiting bluegill harvest to **10 per person per day** in bass-crowded ponds to prevent over-harvest. In severely bass-crowded ponds, we recommend **suspending bluegill harvest** until the population increases through management efforts.



Bass must be harvested at the proper rate each year in order to maintain a balanced fish community in small impoundments.



Supplemental Forage Stocking

The harvest of largemouth bass at the proper size and rate can be quite challenging in sport fish lakes, especially if they are not fished extensively. When the annual largemouth bass harvest falls short of the recommended quota, stocking supplemental forage becomes extremely important in efforts to maintain an adequate forage base. An abundance of forage must be available at all times in order to maximize the growth of top-end predators such as largemouth bass. The feeding behavior and movement patterns of adult predators change frequently. Therefore, the presence of a variety of forage types, occupying different habitats within the pond, tends to maximize predator:prey encounters and improves overall foraging efficiency.

In your lake, the introduction of **threadfin shad** (*Dorosoma petenense*) will be highly constructive. The benefits to stocking threadfin shad are numerous. The combination of a relatively small adult size, coupled with their ability to reproduce in large numbers, make threadfin shad a near perfect food for the most abundant size group of largemouth bass. Most often, results of successfully establishing threadfin shad into a lake will be

observed in improved growth rates for all size groups of bass. In addition, by partially shifting bass predation from bluegill to shad, more bluegill will reach the important *intermediate* size range. Finally, through subtle interactions lower in the food chain, threadfin shad effectively reduce bass *recruitment*. In other words, fewer bass fingerlings survive to adulthood, thereby reducing the annual bass surplus. The bass that are *recruited* into the adult population will enjoy an increased abundance of prey, which leads to enhanced growth rates and a larger maximum size.

Threadfin shad frequently exhibit a distinctive schooling behavior, most often in open-water areas. In fact, the shad's primary defense against predators is its ability to seek out open water, away from where predators are more likely to be waiting to ambush prey. Once the bass figure out this behavior, the jig is up. Ponds with abundant shad populations frequently enjoy excellent top-water fishing action, oftentimes in or around schools of shad in open water.

Threadfin shad typically have two distinct heavy spawning periods: in the Spring and again in early Fall. Stocking is most often recommended immediately prior to or during a heavy spawning



Threadfin shad are ideal forage for increasing the growth and condition of largemouth bass. Adults range from 3 to 7 inches.



period. Stocking rates are designed to establish a sustainable population of threadfin shad and vary depending on the size of the lake and its state of balance.

We also recommend stocking **intermediate coppernose bluegill**. The term, *intermediate*, refers to their size: roughly 3 to 5 inches. Stocking intermediate bluegill will accomplish three important things: first, 3 to 5 inches represents an ideal forage size for the abundant stunted bass in your lake. The introduction of intermediate bluegill will directly increase the growth of these bass, by putting a suitable-size prey item in their mouths. Secondly, and most importantly, is the resulting increase in the amount of bluegill reproduction in your pond. Intermediate bluegill are sexually mature; they will spawn initially at the first spawning period subsequent to their introduction. Naturally, as they are multiple-spawners, these newly introduced bluegill will additionally spawn roughly once per month throughout the entire spawning season (May - October). The dramatic increase in the amount of bluegill reproduction will ultimately lead to a “flood” of bluegill in the intermediate size range. A final benefit, coppernose bluegill are highly aggressive surface feeders and will readily consume pellet feed. In fact, intermediate coppernose bluegill are often stocked to stimulate northern bluegill to consume pellet feed more aggressively. Stocking rates vary depending on the lake size and status of the current bluegill population.

Finally, to directly increase the growth and condition of bass even further, we recommend stocking **crawfish**. We often observe a tremendous increase in the condition of largemouth bass as early as two weeks after crawfish are introduced. Bass in lakes that are periodically stocked with crawfish are

reportedly easier to catch, especially with crawfish-type lures. Crawfish occur naturally in almost every aquatic system in the southeast and are readily consumed by largemouth bass when they cross paths. The ease of capture and extremely high protein content make crawfish a very efficient prey item for bass.

Native crawfish populations rarely become abundant enough to account for a large portion of bass diets in small impoundments. Supplemental stocking of adult crawfish will provide an immediate supply of forage to quickly increase bass growth rates and overall condition. Stocking crawfish can also reduce the predation pressure on the bluegill population and increase recruitment of juvenile bluegill into the intermediate size range.

Crawfish primarily feed on aquatic vegetation and detritus. In late spring and early summer, females dig burrows (“chimneys”) on the pond bank to lay eggs where 500 to 700 young will hatch and return to the pond. Although there is no practical approach to measuring their contribution to the forage base in subsequent seasons, we are confident in their ability to increase the growth and condition of bass each year they are stocked. Crawfish are usually available in April and May. Stocking rates are based on the size of the pond and the pond owners’ desired results.

Stocking each of these forage types within the same year will produce the quickest and greatest results. The basic principles of pond management - the enhancement of water quality and fertility as well as the control of surplus predator production - are crucial to maintaining a well-balanced and abundant fish community. The introduction of supplemental forage can rapidly increase the growth of largemouth bass.



An abundant supply of intermediate size bluegill is a requirement for a balanced pond.



Crawfish are easy prey that can quickly increase the growth rates of largemouth bass.



Supplemental Feeding

Feeding bluegill pellet food is a proven management practice used to increase the number of “quality” and “trophy” size bluegill in ponds. Feeding produces unusually large and healthy bluegill and increases their reproductive potential. In addition, feeding concentrates fish for improved catch rates and provides entertainment from watching the fish eat. Given these benefits we recommend initiating an intensive feeding program in your pond.

In an effort to benefit the entire bluegill population, fish food should be applied from at least 1 feeding station for every 5 acres of water. Each feeding station should dispense feed at a rate of 5-10 lbs/day during the growing season (March - October). The daily ration should be divided into 3 short feeding periods, such as: early morning, late morning, and late afternoon. Several short periods are necessary to reduce feed waste because bluegill have small stomachs and will not consume much at once. Most commercial floating catfish fingerling pellets are suitable for feeding bluegill. These types of feeds are readily available on the market; Purina® makes an excellent pellet, under the name, “Game Fish Chow”. Game Fish Chow is made up of several different pellet sizes that can be consumed by a wide size range of bluegill.



Optimally, choose a floating ration with multiple pellet sizes.

For an additional boost to the bluegill population, feeding in the winter is an option. Winter feeding keeps the bluegill plump and healthy during a period when natural food is not readily available. To improve consumption in the cold months, a sinking feed may be used. Sinking feed can be purchased during the winter at most dealers that normally stock fish food. Several feeding periods should be maintained for the winter also. However, the timer on the feeder should be changed in late October to adjust for the shorter day length.



Supplemental feeding attracts bluegill to certain areas so they are easier to catch.



We market Texas Hunter automated fish feeders. Simply put, these feeders are the finest of their kind. Texas Hunter directional feeders are offered in three sizes (LM135 - 70 pound capacity , LM175 - 100 pound capacity, and LM435 - 250 pound capacity) and they are only available in green. They are powered by rechargeable 12-volt batteries and come equipped with a solar charger. Texas Hunter directional feeders may be conveniently mounted with adjustable legs on the bank, or on with fixed dock legs on piers.



Aquatic Weed Control

Aquatic weed growth can be a serious problem in recreational ponds. Weeds use up important nutrients in fertilizers that are intended for fish production, as well as interfere with normal activities such as fishing and swimming. In addition, excessive weed growth detracts from the aesthetic value of a pond, particularly if it is the focal point of a recreational area.

There are three approaches we use to prevent or reduce unwanted aquatic weeds. They can be placed in 3 different categories: chemical control, biological control, and sunlight-limiting control. Often, an integrated approach involving a combination of these tools offers the most effective solution.

Chemical control involves the use of aquatically approved herbicides to reduce or eradicate aquatic weeds. Although chemical control can be costly on large areas, it is usually the best method for a quick response.

The most common form of biological control is stocking grass carp. Grass carp are often introduced into ponds at low stocking densities as a preventive measure before weeds become established. However, once weeds have become established, a higher density of grass carp is needed to control them. Grass carp readily eat a variety of common weeds, do not reproduce, and are fairly inexpensive. Typically, grass carp become less effective when they reach 6 to 7 years old and must



Herbicide application is typically the quickest form of weed control.



Grass carp are often introduced for long-term control (top). Pond dyes temporarily limit sunlight to retard aquatic weed growth (bottom).

be restocked. One drawback to grass carp is their propensity to train on pellet food intended for bluegill; thereby reducing the effectiveness of a supplemental feeding program.

There are also a variety of water colorants or dyes that can be added to ponds before weeds become established that limit sunlight penetration and “shade out” certain types of weeds. A regimented fertilization program is often the most effective form of sunlight-limiting control. Typically, phytoplankton blooms stimulated early in the spring through fertilization can shade out potential weed growth before it becomes a problem.



Fish Attractors

Cover, whether natural or artificial, is attractive to fish for many reasons. Cover attracts many aquatic invertebrates that are consumed by fish, protects fish from other predators, provides ambush locations for predator fish, and provides fish with shade from the sun. For these reasons, fish attractors play an important role in the management of small impoundments. By concentrating high numbers of bass, fish attractors help anglers meet recommended annual bass harvest goals. To maintain a balance between the predator and prey species within a pond, adequate predator harvest is necessary. Not only do fish attractors enhance the fishing experience by making the fish easier to locate, but the added strategy of locating each attractor creates a whole new dimension to pond fishing.

Any object placed under water has the potential to attract fish. Certain types of cover will attract

more fish than others. Generally, objects with a high surface area (i.e., brush piles) will attract more fish than objects with a low surface area (i.e., large rocks). However, cover with a high surface area tends to decompose or deteriorate quicker. A variety of different cover types, whether grouped together or mixed, will attract the most fish in ponds.

When choosing natural cover to be added to ponds, keep in mind that hardwoods such as oaks and hickories last longer than softwoods. Cedar trees are also an excellent choice because their branches are finely divided and they maintain their structure for 3 to 5 years. Osage-orange (Mock-orange or “horse apple”) trees, located in black belt soils, provide exceptionally long-lasting cover. Trees can be weighted using concrete blocks and wire. However, another popular method of sinking trees or limbs is by placing them in a bucket and filling with concrete. These “pickle barrels” offer excellent vertical structure. Small beds of pea gravel



Structure piles attract fish to certain areas so they are easy to locate, thereby making it easier to achieve annual harvest goals.



can be placed in 2 to 3 feet of water to attract bluegill for spawning.

Many different types of artificial material can provide good, long-lasting cover for fish. Wooden pallets will attract all sizes of fish when tied together in a triangular formation and weighted. Used tires should be tied together in rows and the rows can then be tied together. If tires are used, be sure to drill a large hole at the upper most point on each tire to allow air to escape. Large construction materials such as concrete culverts can be stacked on top of one another. Materials such as car bodies or other motorized appliances should have all potential pollutants removed before sinking. Plastic Honey Hole trees and shrubs are excellent artificial fish attractors. These structures are made of plastic and will last nearly forever. They also have a large surface area providing plenty of cover for baitfish and attracting predators.

The location and size of fish attractors is more important than the type of material used. Most small impoundments develop a thermocline during the warmer months below which oxygen is too low to support fish. To ensure the attractors are where the fish can use them year-round, a high percentage should be placed in water less than 10 feet deep. Fish will utilize cover in deeper water during the colder months. Typically, any sharp change in bottom contour is attractive to fish. Often, bottom structure such as humps, points, ridges, ditches, etc., are formed when building ponds. Cover placed in these areas is usually very productive. However, areas with a relatively flat bottom can be greatly enhanced as well with fish attractors. Placing fish attractors within casting distance of piers is also popular.

Keep in mind, it is possible to have too much cover spread out in the bottom of a pond. If too many fish attractors are put in a lake, catch rates can decline because the fish are spread out instead of concentrated. Extreme amounts of cover can decrease bass foraging ability and growth rates. Generally, fish attractors should be at least a full “cast” away from each other.

Obviously, fish attractors are not useful to anglers unless they can be found. Some attractors may be visible while others may be strategically placed in areas that are hard to find. One popular



Honey Hole trees are a popular artificial cover that provide ample surface area and will last a long time.



Too much cover placed in the bottom of ponds may spread the fish out where they are difficult to locate.

method of marking off-shore fish attractors is with a physical marker like a floating duck decoy or a metal stake. Physical markers will facilitate the addition of new cover when the attractors deteriorate over time. Triangulating between 2 or 3 spots on the bank is a more inconspicuous method of marking these spots. On larger lakes, a GPS unit can be used to store fish attractor locations. Most hand-held GPS units will allow you to navigate within several feet of a location. These locations along with their coordinates can then be plotted on a map using mapping software.



Dam and Shoreline Maintenance

Dam and shoreline maintenance should be addressed periodically to ensure the integrity of the dam and overall recreational value of the pond. The dam should be kept free of trees; roots may eventually tunnel into the dam, creating weak spots. If mature trees are already present, they should not be cut down, as dead and decaying roots are potentially more harmful. Generally, trees less than 4 inches in diameter at breast height do not have roots penetrating the core of the dam and should be removed before they become a threat to the structure of the dam.

In an effort to prevent erosion the entire dam should be covered with a manageable grass. Large rock is recommended at the waterline along the dam face if there is the potential for erosion from wave action. The spillway should also have some type of erosion prevention. The amount and frequency of water flow should determine the type. The bottom and sides of the spillway should be lined with large rock or concrete if water flows across it often. For

spillways that are used less frequently, well maintained grass provides sufficient erosion protection. Spillways should be checked periodically and any debris should be cleared.

Additionally, the shoreline and surrounding watershed should be vegetated to prevent erosion and muddy water. If necessary, livestock should be provided limited access to the pond. Heavier vegetation should be trimmed or treated with herbicide.

Beavers and muskrats can cause aesthetic and structural damage to sport fish lakes. Large rock placed along the waterline of the dam will usually prevent beavers and muskrats from boring in. Trees can be protected by wrapping steel mesh around the base of the tree to a height of about 4 feet. Otters often visit ponds from nearby creeks and can have a significant impact on the fish population. Droppings with scales and fish bones are evidence of otter visits. These nuisance animals should be removed as soon as detected. Techniques include body-gripping traps, snares, foothold traps, and shooting. Permits and licenses may be required.



Beavers and muskrats can bore in to the side of the dam and weaken its structure. Emergency spillways should be lined with concrete if they receive heavy flow (inset).



Nuisance Animal Control

Several different aquatic animals can affect the management of small impoundments. Some critters bore holes and make dens in the dams of ponds. This can reduce the integrity of the dam as well as ruin the aesthetic value of the pond. Other animals can impact the fish community. However, there are many aquatic animals that have little negative impact on ponds or the fish community and coexist quite well. Determining if an animal has a negative effect on a sport fish pond, and then creating a method of control is an important component of a comprehensive management program.

Beavers and muskrats are common residents of sport fish ponds across the Southeast. Although they seem to have little affect on the fish community, they are both capable of significant aesthetic and structural damage. They often bore in to the shoreline of ponds to create dens. Dens built along the dam can eventually weaken the structure of the dam. Beavers are especially capable of severe timber destruction around the shoreline.

Attempts to remove beavers and muskrats should begin as soon as detected. Techniques include body-gripping traps, snares, foothold traps, and shooting. Complete removal of beavers and muskrats can be quite difficult in small impoundments, thus protecting the dam and shoreline trees may be necessary. Large rock placed along the waterline of the dam will usually prevent beavers and muskrats from boring in. Trees can be protected by wrapping steel mesh around the base of the tree to a height of about 4 feet.



Shoreline beaver damage.

Otters can be frequent visitors of sport fish ponds, especially if they are built on or near a large creek. Otters consume large amounts of fish each day and can have a significant impact on a sport fish



Puncture wounds left by otters on largemouth bass and gizzard shad (inset).



community. Their impact varies with the number of individuals present, frequency of visits, and size of the pond. Otters are secretive and often go unseen; however, droppings with scales and fish bones are evidence of their presence. Techniques for removal include body-gripping traps, snares, foothold traps, and shooting.

Many fish-eating birds visit sport fish ponds seasonally or even daily. Cormorants are probably capable of the most destruction to fish communities as they often congregate in large numbers to over winter in the southeast. Lakes located near large river systems and/or near large catfish operations are the most susceptible to cormorant problems. Also, ponds with an abundance of standing timber seem to be particularly attractive. Depending on the food availability, cormorants may remain on a pond for months, potentially making a large impact on the fish community. The best approach to controlling cormorant predation on small impoundments is to



Cormorant

use harassment techniques. These techniques often involve shooting guns, noise makers, cannons, etc. However, this technique requires a dedicated effort and often must be repeated several times a day for several weeks. Lethal control of cormorants requires a depredation permit issued by the U.S. Fish and Wildlife Service.

Hérons and kingfishers usually have a solitary lifestyle and will not congregate in large groups. Although, their impact may be more noticeable in small ponds less than 1 or 2 acres, their control is hardly worth the effort. Mergansers also visit southeastern ponds during the winter; however, their impact appears minimal.

A long-time misconception is that turtles can become too abundant and can affect the balance of a fish community. Turtles typically forage on aquatic invertebrates, plant material, and dead organic matter. Although they may stumble upon an occasional nest of fish eggs, turtles have no noticeable effect on the ability for sport fish to reproduce sufficiently.

If an aquatic animal is thought to be negatively impacting the recreational value of a sport fish pond, it is recommended that you consult one of our fisheries biologists before control measures are taken. Remember to follow the state game laws and acquire permits and licenses if required.



Great Blue Heron



Annual Evaluation

In addition to ongoing management, your pond should be checked on a regular basis. Our annual maintenance plan includes an aquatic weed assessment, a water test to determine lime requirement, and an electrofishing balance check to assess the fish community.

Regular electrofishing evaluations are necessary to assess the effectiveness of a management program. Electrofishing allows us to stay on top of the pond's condition in order to make necessary changes in management recommendations.



Annual electrofishing evaluations determine the effectiveness of management practices.



Summary of Management Recommendations

Snow Lake Shores is functioning as a bass-crowded system that has a low level of fertility. Several management inputs are necessary to restore a state of balance as well as increase the total density of sport fish. The management activities we are recommending for Snow Lake Shores will center on reducing the total number of adult predators, introducing supplemental forage, and enhancing the conditions for the production of forage.

For Snow Lake Shores, **harvest bass 13 inches and smaller** at a rate of **50 pounds per acre per year (2,680 lbs./yr.)**. The recommended bass harvest rate and size will likely change over the next few years as the fish community responds to management inputs.

We recommend **limiting bluegill harvest** in Snow Lake Shores to a “consumptive” level, meaning **ONLY** bluegill and shellcracker which are intended for table fare should be removed; the over-harvest of adult bluegill, particularly during the spawning season, may lead to a decrease in the total number of mature, adult bluegill and a corresponding decline in angling catch per unit of effort. **Annual electrofishing evaluations** will help determine if fish harvest recommendations should be adjusted.

Supplemental forage in the form of threadfin shad, coppernose bluegill and crawfish should be stocked in order to enhance the growth and condition of the largemouth bass.

We recommend **initiating an intensive supplemental feeding program** in Snow Lake Shores. Fish food should be applied from 30 feeding stations at a rate of at least 5 lbs/feeder/day from March through October.

Aquatic weed control will also be an integral part of the management program for Snow Lake Shores. We did not observe any problematic aquatic vegetation during the evaluation. However, many aquatic plants have the potential to multiply quickly and should be monitored closely, particularly during the

growing season. We feel that the quickest and most efficient way to control aquatic weeds in Snow Lake Shores, if they should become a problem in the future, is by herbicide application.

Finally, **additional cover in the form of brush or rock piles** would increase the catch rates of sport fish in Snow Lake Shores.

The management activities we recommend over the course of the next twelve months are listed in the following pages. In an effort to assist in the prioritization of these management inputs, we have developed a simple color-coding system. You will note this system in the bottom right-hand corner of the respective Management Recommendations to follow:

LEVEL 1

Highest priority. Generally, require immediate attention.

LEVEL 2

Secondary in importance to Level 1. Directed toward achieving your stated management objectives.

LEVEL 3

Increase enjoyment and/or functionality of your pond but have less impact on the overall management program.



ANNUAL HARVEST

ANNUALLY
2021-22

Current Status: Owner Responsibility

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Harvest ~2,680 pounds of LMB (13" inches and less)

COST:
Hook and line: N/A
Electrofishing: \$350.00/hour.*

*An additional mileage charge will be added.

LEVEL 1

SUPPLEMENTAL FEEDING

FALL 2021

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Install 30 Texas Hunter LM-175 directional fish feeders
Feed at a rate of 5-10 pounds/day from each feeder

COST: \$ 1,070.00 each*

* This price includes a Texas Hunter LM-175 directional fish feeder, solar charger, rechargeable battery. Assembly and installation will incur additional charges, as will delivery.

LEVEL 1

INTERMEDIATE BLUEGILL

FALL 2021

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Stock 40,000 intermediate copperside bluegill

COST: \$ 0.50/each*

* This price does not include delivery

LEVEL 1

THREADFIN SHAD

SPRING 2022

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Stock 4 loads (~40,000) adult threadfin shad

COST: \$ 2,000.00/load*

* This price does not include delivery.

LEVEL 2



BLACK CRAPPIE

SPRING 2022



COST: \$ 3.50/each*

* This price does not include delivery.

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____

MANAGEMENT ACTIVITY:

Stock 3,350 black crappie

LEVEL 2

CRAWFISH

SPRING 2022



COST: \$ 3.50/lb*

* Pricing subject to market variability. Final pricing to be confirmed prior to stocking. This price does not include delivery.

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____

MANAGEMENT ACTIVITY:

Stock 1,000 pounds of crawfish

LEVEL 3

ANNUAL EVALUATION

FALL 2022



COST: \$ 1,050.00*

* This price includes comprehensive written Management Report. An additional mileage charge will be added.

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____

MANAGEMENT ACTIVITY:

Annual electrofishing evaluation

LEVEL 1

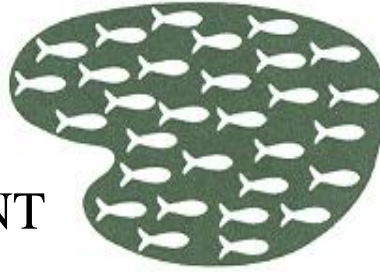
Fertilizer Application Records

Date	Water Color	Water Visibility (in.)	Fertilizer Applied (lbs.)	Comments

Other Records

Date	Comments

SOUTHEASTERN
POND
MANAGEMENT



“Managing Your Liquid Assets”

Southeastern Pond Management

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