July 27, 2022

Mrs. Kristy Young
Swan Lake Estates HOA
P.O. Box 3748
Gulfport, MS 39505

Dear Mrs. Young:

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

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

- Largemouth bass (12" and less) should be harvested, up to a total of ~510 pounds per year.
- Harvest bluegill at 10 per angler per day.
- Stock 2 loads of threadfin shad Immediately.
- Begin a supplemental feeding program in Summer 2022.
- Stock 204 diploid grass carp in Fall 2022.
- Stock 8,500 intermediate coppernose bluegill in Fall 2022.
- Begin a fertilization program in Spring 2023.
- Conduct an electrofishing balance assessment (Annual Evaluation) roughly one year from this date.

With regards to the fish population, this is a classic bass crowded fishery. Reducing the numbers of small bass through angling and improving the forage base through the stocking of threadfin shad and coppernose bluegill are fundamental to improving the balance of the fishery. The stocked forage will do best when a proper fertilizing and feeding program are implemented.

The submersed aquatic vegetation (Chara) is best controlled through the stocking of grass carp. Although grass carp have been stocked in the recent past, obtaining enough numbers of grass carp is important to our success. If the Chara becomes more robust, the stocking of grass carp is recommended. The emergent vegetation of white water lily, water shield, and water pennywort is best treated with an herbicide. The label name of the herbicide is Habitat or Arsenal. They are both the same active ingredient. Once applied according to label direction, it will take 25-30 days to kill the plant. Because it is a contact herbicide, it may take several applications to contact all of the plant material. While applying the herbicide, it is necessary to not wash the herbicide from the plant during application. Additionally, the last herbicide application should occur no later than the end of October.

The cause of the vegetation is in part due to the shallow nature of the lake. The sedimentation that has occurred over the years has shallowed man sections of the lake. I encourage you to limit sediment load into the lake the best you can The installation of sediment booms near the main points of water introduction can help slow the sediment introduction. The floating booms have "nets" that hang in the water that catch and slow the sediment. It will be necessary on occasion to remove the sediment via excavation in the areas that the booms are placed.

It will be difficult to remove sediment from the lake. Dredging is very expensive and it is not likely that we will be able to find a company willing to work on a small scale lake. Most dredging companies are on the coast and work on large, navigable areas of the river or bays. Our best option to improving the depth will be through excavation areas with a long reach track hoe. It will be necessary to find access points for the equipment and areas to stage dirt for it to dry prior to be trucked away. This process is also very expensive. We do not provide dirt work services.

I do not encourage drawing the water level down. Given the bass crowded balance of the fishery, low water level will simply make the imbalance worse. Additionally, the low water level is unlikely to help curb the aquatic vegetation. The idea is that you expose the vegetation to cold winter weather and prevent growth the following year. Given the shallow nature of the lake and the relatively mild winter weather, your success will be limited. Additionally, trying to obtain greater water depth through raising the water level is not possible without excavating the margin of the lake prior to raising the water. Without obtaining an appropriate slope to the margin of the lake, we will simply be flooding more shallow water.

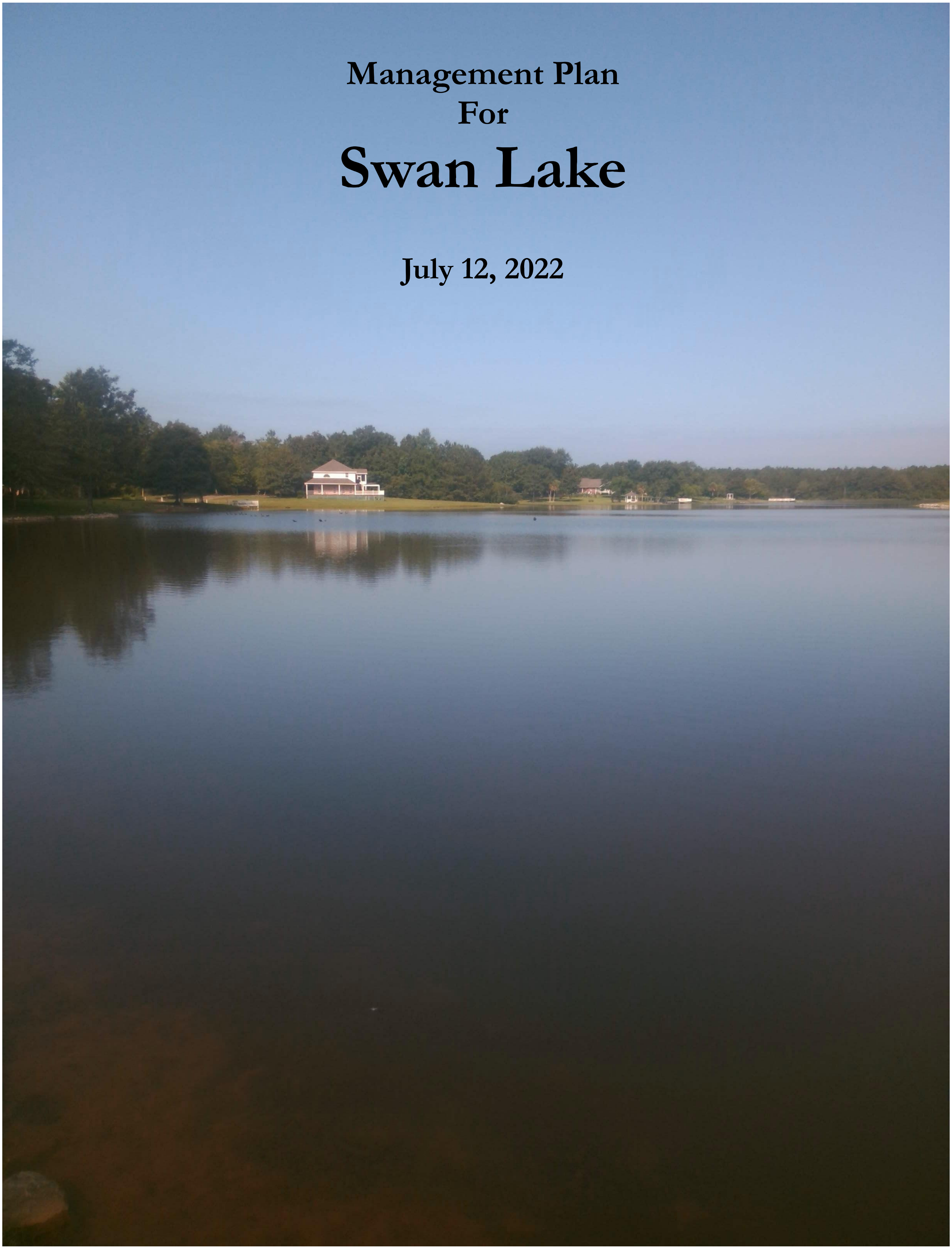
Mrs. Young, we are always available to discuss these recommendations or answer any other questions you might have.

Good fishing,

Scott Kirk
Fisheries Biologist, MS
601-594-9424

Management Plan
For
Swan Lake

July 12, 2022



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 Swan Lake on July 12, 2022, in order to conduct a comprehensive evaluation of the 17 acre Swan Lake. 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, plus consultation with Kristy Young, provide the basis for this management plan.

The goal of this management plan is to create and maintain a balanced fish community in Swan Lake. 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 Swan Lake, July 2022.

Lake Assessment

Swan Lake is a 17-acre watershed impoundment located in Harrison County, Mississippi. The lake was originally impounded in 1997. An emergency spillway is present. In addition, we noted a moderate 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. Swan Lake 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 **20** parts per million (ppm). This level of alkalinity is near the minimum recommended threshold of **20** ppm, and represents conditions suitable for effective fertilization. Swan Lake has not been adequately fertilized in the recent past.

Swan Lake appeared to have a light plankton bloom at the time of our visit, the result of inadequate fertilization.

Swan Lake contains areas along the margins and in the upper end that are less than 3 feet deep and highly susceptible to aquatic weed growth. During the evaluation, we observed a light to moderate infestation of Chara, a light infestation of water lily and a very light infestation of watershield and water pennywort growing along the margins. Descriptions of these plants may be found in the Aquatic Weed Identification section of this report.

Swan Lake was originally stocked with largemouth bass and bluegill in 1998. Fish harvest has been limited in the recent past. Harvest, and its importance in structuring fish communities will be discussed later in this report.

Swan Lake, July 2022.

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 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.

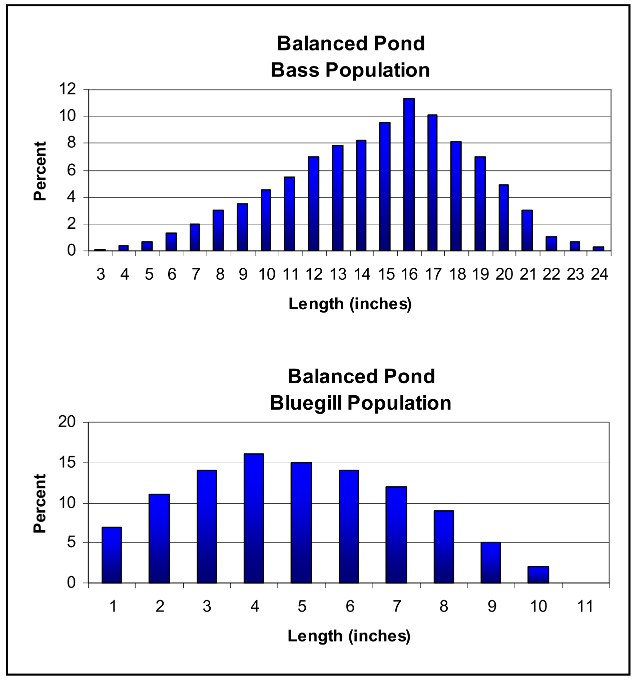


Figure 1. Length distribution of bass and bluegill in a typical balanced pond.

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

Fishery Assessment

The fishery in Swan Lake was sampled with standard boat-mounted electrofishing equipment. The sample contained largemouth bass, northern bluegill, and crappie. Currently, largemouth bass and crappie are functioning as the primary predators in Swan Lake. The bluegill are the prey.

Largemouth bass ranging in size from 2 to 18 inches in total length were collected in moderate abundance (Figure 2). The bass population was dominated by bass 11 to 14 inches in length. However, there are larger bass present as well as reproduction. Largemouth bass 12 inches and smaller represent the primary targets for harvest over the coming months. We harvested 8 pounds of bass during the evaluation.

Bluegill were collected ranging in size from 2 to 8 inches in total length. Figure 3 depicts the length distribution of the bluegill population. Of note, relatively few intermediate (3-5”) bluegill were collected. Further, mature adult bluegill were modest in the sample. These items collectively require management attention.

The average relative weight of adult bass collected from Swan Lake was 82 (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.

Crappie were present in low numbers and were 4 to 9 inches in length.

Overall, we characterize the fish community in Swan Lake as bass-crowded. A more detailed explanation of bass-crowded ponds in general, and Swan Lake 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.

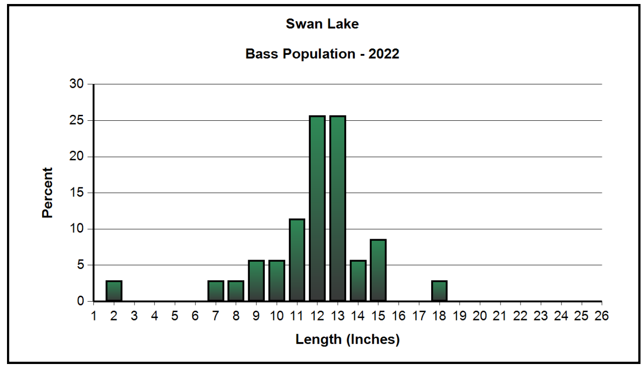


Figure 2. Length distribution of bass collected from Swan Lake in July 2022.

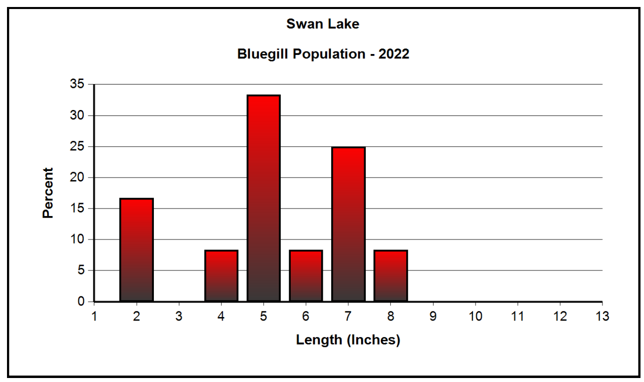


Figure 3. Length distribution of bluegill collected from Swan Lake in July 2022.

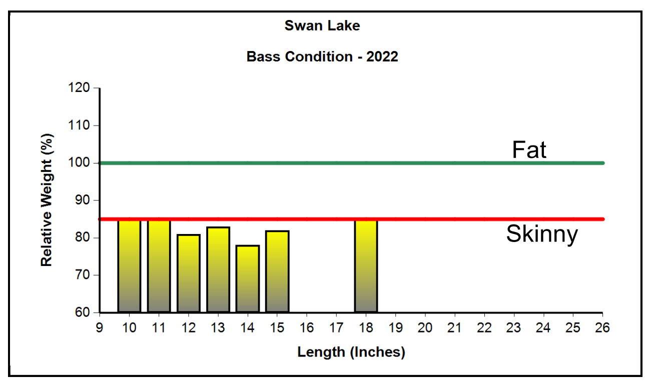


Figure 4. Relative weights (W_r) of adult largemouth bass collected from Swan Lake in July 2022.

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 Swan Lake included relatively low numbers of intermediate size bluegill, particularly in the 3 to 4 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 Swan Lake.

Typical bass from a bass-crowded pond.

In a typical fertilized sport fish pond, bass harvest is required in order to prevent 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 were observed in relatively low numbers in Swan Lake. There is not an immediate concern that these species will significantly impact the management program. Nevertheless, the potential impact of competing predator species, including crappie, 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 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.

Crappie

Channel Catfish

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

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

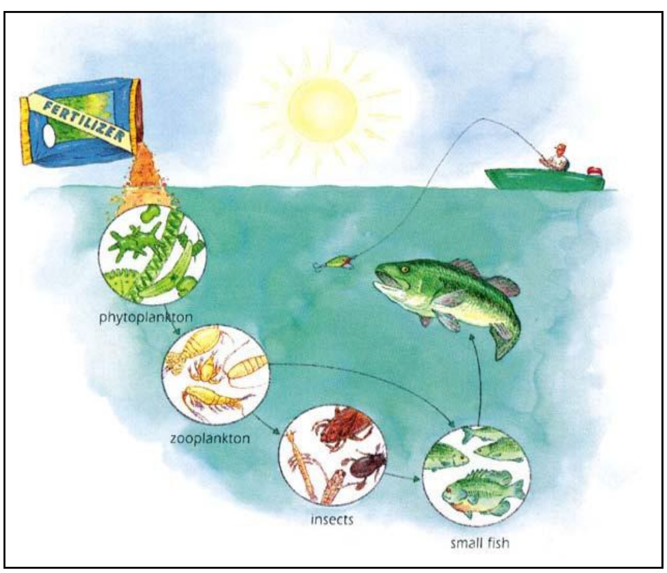
Fertilization

The concept of *carrying capacity* describes the total biomass (i.e., weight) of fish a pond is capable of producing. A given body of water, subject to varying levels of fertility, has a finite limit, or carrying capacity, in terms of the overall biomass which it can support. Lake fertility limits the number as well as the average and maximum size of fish present.

The limiting nutrient in most freshwater systems, as it relates to plankton production and a generally high level of fertility, is phosphorous. Phosphorous must be added on a regular basis during the growing season in order to stimulate significant plankton growth. Plankton, both plant and animal, are the base of the food chain in ponds. Infertile ponds, those with low alkalinity and relatively little nutrient input, are characterized by low levels of plankton production. In effect, this limits the amount of food available to the small insects and insect larvae which are the next link in the food chain. The *ripple effect* of low fertility is observed far up the food chain, all the way to the primary predators, largemouth bass. In order to create and maintain a high level of plankton production, thus providing conditions most favorable for fish production, fertilizing on a regular basis is required.

Fertilization takes place during the growing season, from March through October. Fertilization is the most basic and important element necessary to create an environment conducive to the production and growth of sport fish.

Fertilizer should be applied according to the Standard Pond Fertilization Schedule:



Food chain of a typical fertilized pond.

SportMAX® Water Soluble Fertilizer takes all the fuss and mess out of properly fertilizing your pond. A well fertilized pond should have 18 to 24 inches of visibility.

Standard Pond Fertilization Schedule

- Beginning in early March, make three applications at two week intervals.
- Make the next three applications at three week intervals.
- Thereafter, apply once per month or whenever visibility exceeds 18-24 inches.
- Cease fertilization by the end of October.

Simply put, the most efficient and effective pond fertilizer on the market today is SportMAX® Water Soluble Pond Fertilizer (10-52-4). Since you have elected to handle the fertilization of your own lake, **we can supply you with a season's worth of material, prior to the scheduled start of the season.** SportMAX® comes conveniently packaged in heavy duty, water-resistent plastic bags; ideally, it may be stored in a barn or equipment shed sufficient to keep the direct elements away.

SportMAX® is easy to use; proper application involves simply pouring the material directly from the bag into the open water — no mixing… no mess!

Recommended application rates for SportMAX® range from 4 to 8 pounds per acre. Particularly in the early season, the higher rate is often necessary to stimulate a plankton bloom. Generally by the middle part of the season, the lower rate is adequate.

The cost of a season's worth of SportMAX® Water Soluble Pond Fertilizer, including delivery to your lake, is listed in the Recommended Management Activities section of this report.

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. 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 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

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

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

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.

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.

Supplemental Forage Stocking

In sport fish lakes where only pure northern strain bluegill are present, we recommend stocking **intermediate coppernose bluegill** in an attempt to create a genetically diverse and ultimately more aggressive bluegill population. The northern bluegill (*Lepomis macrochirus macrochirus*), sometimes referred to as a common bluegill, is native to the rivers and reservoirs throughout most of the U.S. This subspecies has been stocked in sport fish ponds as the primary prey for bass for many years. However, a common variety stocked in ponds today is the coppernose bluegill (*Lepomis macrochirus purpurescens*). Analogous to the Florida largemouth bass, this subspecies of bluegill is native to much of Florida and parts of southern Georgia. The adult male coppernose bluegill may be easily identified by the distinct copper band across the top of its head. Vertical bars across the side of the body, in both sexes, are often present.

The habitat and biology of the coppernose bluegill is similar to the northern bluegill. Whereas, northern bluegill tend to be less responsive to pellet feeding, coppernose aggressively consume pellet feed when offered. When placed on a supplemental feeding program, coppernose bluegill often grow larger and faster than northern bluegill in small impoundments. Due to their aggressive nature, anglers report higher catch rates in ponds where coppernose are present.

Coppernose bluegill will help “train” northern bluegill to consume pellet feed..

Coppernose bluegill will interbreed freely with the northern bluegill in your lake, resulting in enhanced genetic diversity. In addition, coppernose bluegill will help “train” your northern bluegill to consume pellet feed. Stocking rates vary, depending on lake size and status of the current bluegill population.

Northern bluegill (left) and coppernose bluegill (right).

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 Sweeney and Texas Hunter automated game and fish feeders. Simply put, these feeders are the finest of their kind. Sweeney directional feeders are offered in two sizes (AF1100 - 75 pound capacity and AF1300 - 225 pound capacity) and three colors (galvanized, hunter green and camo). Texas Hunter directional feeders are also offered in two sizes (DF125 - 75 pound capacity and DF425 - 225 pound capacity) and they are only available in green. They are powered by rechargeable 12-volt batteries and most models come equipped with a solar charger. Sweeney and Texas Hunter directional feeders may be conveniently mounted on the bank or 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 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.

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

Herbicide application is typically the quickest form of weed control.

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.

Color photos, including distinguishing characteristics and growth habits of the aquatic vegetation in your pond, are listed in the following Aquatic Weed Identification section.

Common Name: Chara

Scientific Name: *Chara* sp.

Distinguishing Characteristics:
Branchlets whorled around stem. Strong "musty" or "garlic-type" odor.

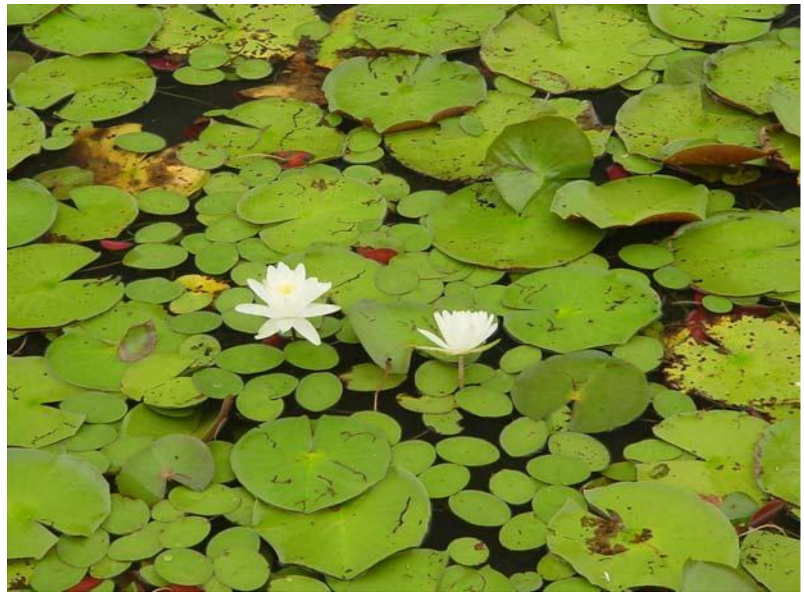
Growth Habit:
Submersed. Forms dense underwater mats.

Management Program Impact:
Severe.

Common Name: Fragrant Water Lily

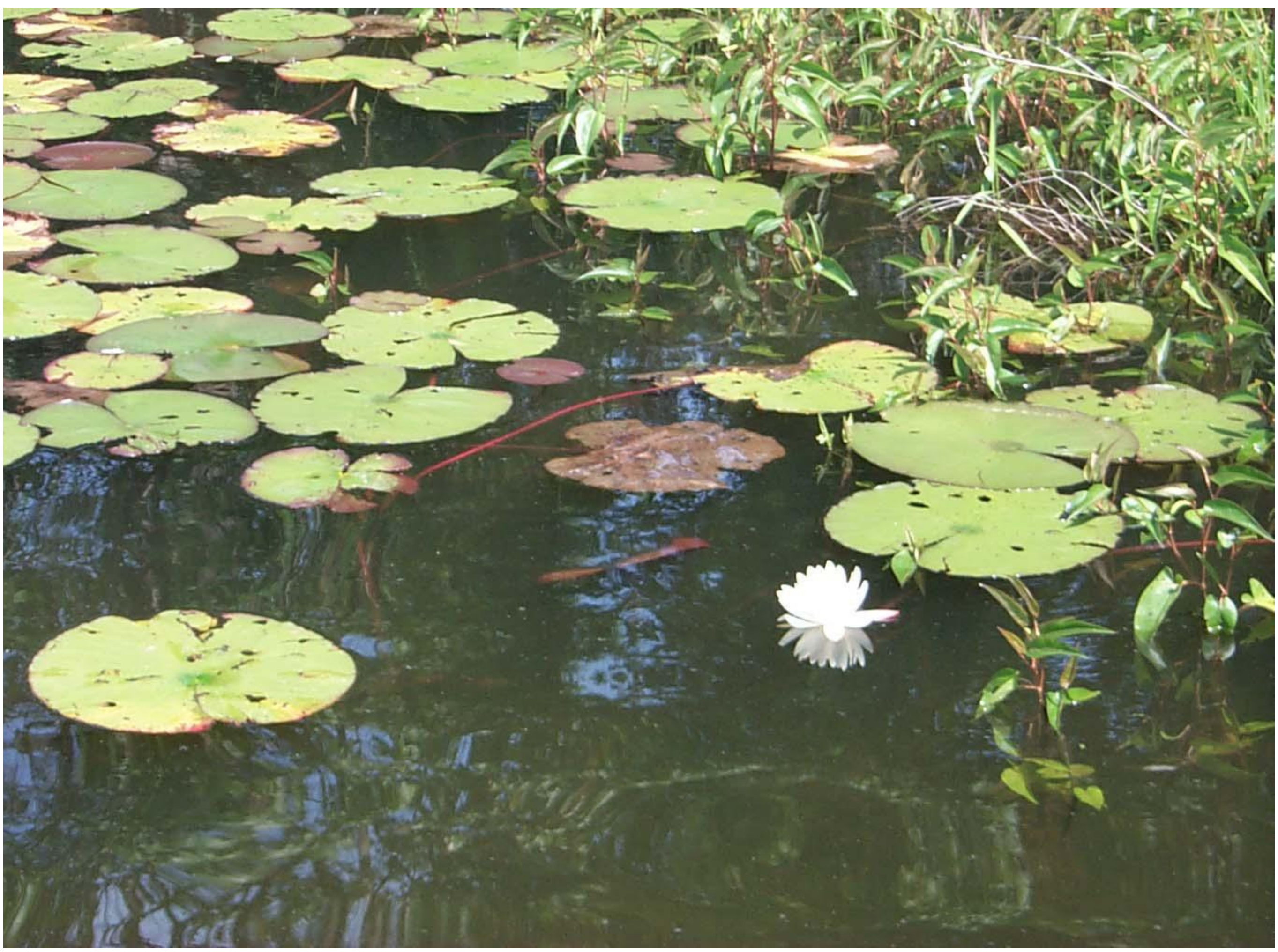
Scientific Name: *Nymphaea odorata*

Distinguishing Characteristics:
Lily pad medium to large, almost perfectly round, with single notch to center. Usually smaller lily pads of various sizes mixed in. Lily pad usually floats and edges may curl up. Underside of lily pad deep brownish-purple. Flowers showy, fragrant blooms that appear as large snowballs from a distance. Colors vary.



Growth Habit:
Floating-Leaved.

Management Program Impact:
Moderate.



Common Name: Water Pennywort

Scientific Name: *Hydrocotyle* sp.

Distinguishing Characteristics:
Small plant with single, terminal leaf shaped like a half-dollar. Rounded, blunt teeth along leaf margin. Leaf shiny and leathery. Stem attaches to bottom center of leaf.

Growth Habit:
Emersed. Two growth forms:
- Short plant (less than 1 foot) grows in moist soil or shallow water.
- Tangled mass of fine stems with floating leaves. Sometimes forms dense mats.

Management Program Impact:
Moderate.

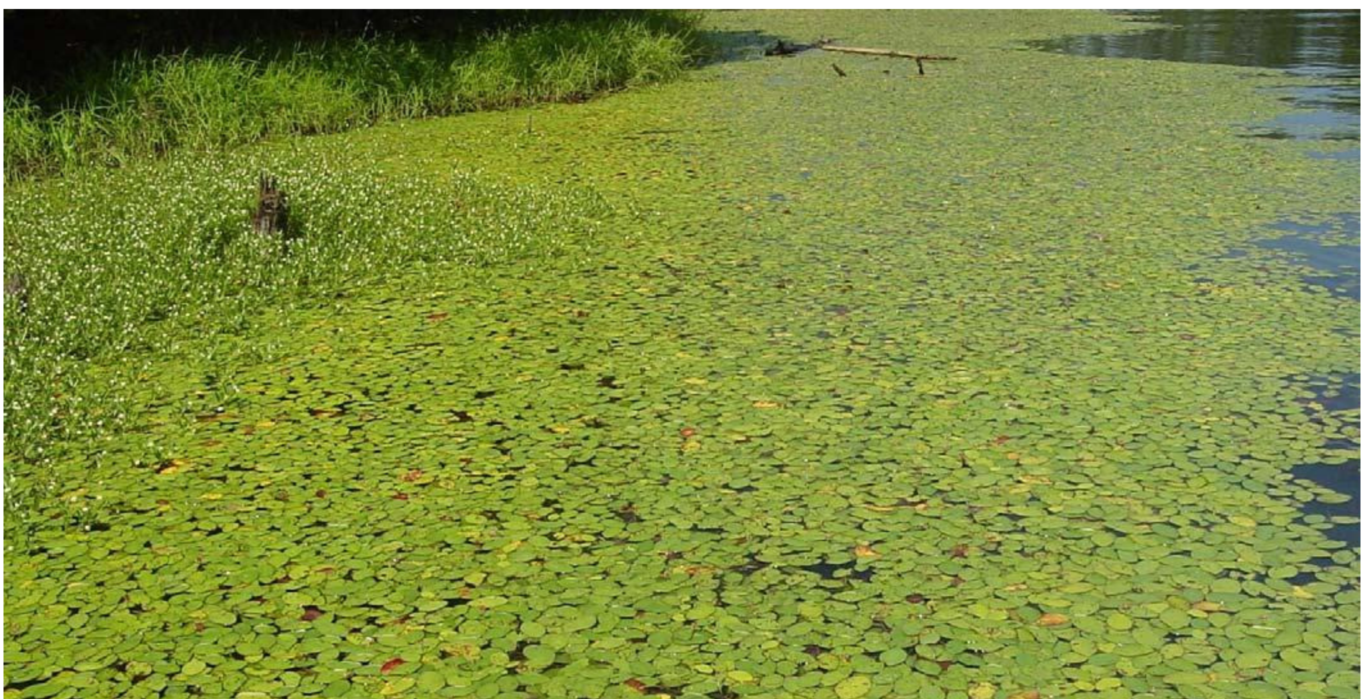
Common Name: Watershield

Scientific Name: *Brasenia schreberi*

Distinguishing Characteristics:
Lily pad 1 to 4 inches across and shaped like a football. No dissection. Underside of lily pad deep purple with gelatinous covering. When present, flowers reddish-purple and emerge from surface on short, red stalks.

Growth Habit:
Floating-Leaved. Regularly grows in water up to 6 feet.

Management Program Impact:
Moderate to severe.



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, tress 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 of 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).

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

Swan Lake 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 Swan Lake will center on reducing the total number of adult predators, introducing supplemental forage, and enhancing the conditions for the production of forage.

To maintain a high density of sport fish as well as help control aquatic vegetation, we recommend **initiating an intensive fertilization program** in Swan Lake. **SportMax® Water Soluble Pond Fertilizer** (10-52-4) should be applied according to the *Standard Pond Fertilization Schedule.*

For Swan Lake, **harvest bass 12 inches and smaller** at a rate of **30 pounds per acre per year (510 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 Swan Lake to a "consumptive" level, meaning ONLY bluegill 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 and coppernose bluegill should be stocked in order to enhance the growth and condition of the largemouth bass.

We recommend **initiating an intensive supplemental feeding program** in Swan Lake. Fish food should be applied from 3 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 Swan Lake. Chara, water lily, water pennywort and watershield 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 Swan Lake, if they should become a problem in the future, is by herbicide application and stocking grass carp.

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
2022

Current Status: Owner Responsibility

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

COST:
Hook and line: N/A
Electrofishing: $450.00/hour.*

*An additional mileage charge will be added.

MANAGEMENT ACTIVITY:
Harvest ~510 pounds of LMB (12” inches and less)

LEVEL 1

BLUEGILL HARVEST

ANNUALLY
2022

Current Status: Owner Responsibility

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

COST: N/A

MANAGEMENT ACTIVITY:
Harvest bluegill at 10 per angler per day

LEVEL 1

THREADFIN SHAD

IMMEDIATELY
2022

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

COST: $ 2,100.00/load*

* This price does not include delivery.

MANAGEMENT ACTIVITY:
Stock 2 loads (~20,000) adult threadfin shad

LEVEL 1

SUPPLEMENTAL FEEDING

SUMMER 2022

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

COST: $ 1,175.00 each*

* This price includes a Texas Hunter LM-175 directional fish feeder, solar charger, rechargeable battery, assembly, and installation. An additional delivery charge will be added.

MANAGEMENT ACTIVITY:
Install 3 Texas Hunter LM-175 directional fish feeders
Feed at a rate of 5-10 pounds/day from each feeder

LEVEL 1

GRASS CARP

FALL 2022

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

MANAGEMENT ACTIVITY:
Stock 204 adult diploid grass carp

COST: $ 9.00/each*

* This price does not include delivery.

LEVEL 1

INTERMEDIATE BLUEGILL

FALL 2022

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

MANAGEMENT ACTIVITY:
Stock 8,500 intermediate coppernose bluegill

COST: $ 0.65/each*

* This price does not include delivery

LEVEL 1

SPORTMAX

SPRING 2023

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

MANAGEMENT ACTIVITY:
Deliver 1,000 pounds of SportMAX Water Soluble Pond Fertilizer (10-52-4)

COST: $ 2.25/lb*

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

LEVEL 1

ANNUAL EVALUATION

SUMMER 2023

Current Status: Awaiting Owner Approval

☐ Approved ☐ Declined ☐ Done

Date Approved: __________

Date Done: __________

MANAGEMENT ACTIVITY:
Annual electrofishing evaluation

COST: $ 1,100.00*

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

LEVEL 1

Bass Harvest Records

Date	Number Harvested	Total Pounds Harvested	Comments

Bass Harvest Records

Date	Number Harvested	Total Pounds Harvested	Comments

Tagged Fish Data

Date	Tag Number	Length (in.)	Weight (lbs.)	Comments

Fertilizer Application Records

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

Other Records

Date	Comments

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