

April 18, 2019

Mr. Chris Madden
1149 2nd Lakeview Cove
Hernando, MS 38632

Dear Mr. Madden:

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

Woodland Lake is presently functioning as a dynamic, balanced fishery. As such, our management recommendations center primarily on reducing the total number of adult predators (largemouth bass), introducing supplemental forage (crawfish) and improving the conditions for the production of forage through enhancing the pond's fertility level:

- Maintain the current fertilization regime.
- Initiate a supplemental feeding regime.
- Largemouth bass (12" and less) should be harvested, up to a total of ~2,360 pounds per year.
- Stock 1,000 pounds of crawfish in Spring 2019.
- Apply herbicide to control aquatic weeds in Spring 2019.
- Conduct an electrofishing balance assessment (Annual Evaluation) roughly one year from this date.

Mr. Madden, the lake has greatly improved over the past years. The bass population peak distribution is at 12 inches now, previously peaking at 9. These fish, however still short, are showing very healthy relative weights, validating our sample of the forage base. My best recommendation is to continue down the path you are on with encouraging the harvest of small bass. The shad and bluegill populations are looking very nice. Additional supplemental forage options would include crawfish. These could be stocked along the road access points where riprap would be conducive to crawfish habitat. We can control the pennywort with herbicide applications. This should be completed before the weed spreads. We are always available to discuss these recommendations or answer any other questions you might have.

Good fishing,

Luke Moran

Management Plan
For
Woodland Lake

April 8, 2019





Introduction

As an integral part of the ongoing management program for Woodland Lake, Southeastern Pond Management conducted a comprehensive evaluation of the 118 acre impoundment on April 8, 2019. A representative sample of the fish community was collected by electrofishing to accurately assess the present state of balance. In addition, a water chemistry test was conducted to determine total alkalinity. 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 in Woodland 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”+

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.

Previous evaluations of Woodland Lake have resulted in the thoughtful outline of management options in an effort to approach your stated management goals. Our latest findings, as well as management recommendations, result from our most recent visit and are contained within the following pages.



Electrofishing equipment was used to collect a fish sample from Woodland Lake, April 2019.



Lake Assessment

At the time of our visit, total water alkalinity in Woodland Lake was measured at **40** parts per million (ppm). This level of alkalinity is well above the minimum recommended threshold of 20 ppm, and represents conditions suitable for effective fertilization. Woodland Lake has been fertilized adequately in the recent past.

Bass harvest was reported as moderate. This level of harvest has proven adequate. Harvest, and its importance in structuring fish communities will be discussed in more detail in the Recommended Management Activities section of this report.

During the evaluation, we observed a light infestation of water pennywort growing along the margins. A description of this plant may be found in the Aquatic Weed Identification section of this report.

Woodland Lake appeared to have a light plankton bloom at the time of our visit. The area had recently received heavy rains, and the current weather included 100% cloud cover with intermittent showers through out the day. Due to the recent rains, the lake did have some slight turbidity in areas experiencing water inflow.



Woodland Lake, April 2019.



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 (W_r) is an index used to categorize the condition of fish within a given population. Calculated W_r values greater than 100 indicate

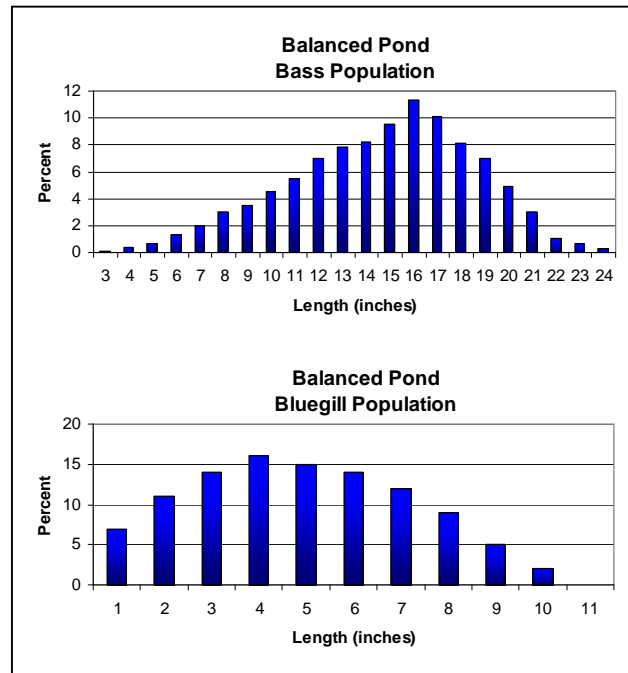


Figure 1. Length distribution of bass and bluegill in a typical balanced pond.

plump, robust fish. W_r values less than 100 suggest that individuals are in less than excellent condition, perhaps the result of some predator:prey imbalance. W_r 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 Woodland Lake was sampled with standard boat-mounted electrofishing equipment. The sample contained largemouth bass, Northern bluegill, threadfin shad, crappie, catfish, gizzard shad, warmouth, green sunfish and redear sunfish (shellcracker). Currently, largemouth bass, crappie, catfish, warmouth and green sunfish are functioning as the primary predators in Woodland Lake. The bluegill, shad and shellcracker are the prey.

Shad have become an important component of the forage base in Woodland Lake. We observed several different size groups of both gizzard shad, and threadfin shad, indicating a healthy population. Maintaining a healthy shad population will be important for Woodland Lake to continue producing quality and trophy size bass.

Largemouth bass ranging in size from 5 to 22 inches in total length were collected in moderate abundance. The length distribution of largemouth bass (Figure 2) reveals the presence of bass over a wide range of size classes. This represents significant improvement from the previous year, most likely the result of improved bass harvest.

The average relative weight of adult bass in our most recent sample additionally reflects notable improvement over 2017. This year’s average relative weight was 99, as compared to 2017, which was 90 (Figure 4). Some of this improvement can be attributed to the proximity of the evaluation to the spawning period, while females are carrying extra weight in eggs, but the improvements in the forage base in Woodland Lake do also justify the increase in the relative weights.

Largemouth bass 12 inches and smaller represent the primary targets for harvest over the coming months. We harvested 40 pounds of bass during the evaluation.

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. Of note, an abundance of intermediate (3-5”) bluegill and other forage was collected. Further, mature adult bluegill were relatively scarce in the sample.

Overall, we characterize the fish community in Woodland Lake as balanced. A more detailed explanation of balanced ponds in general, and Woodland Lake in particular is located in the Current State of Balance section of this report.

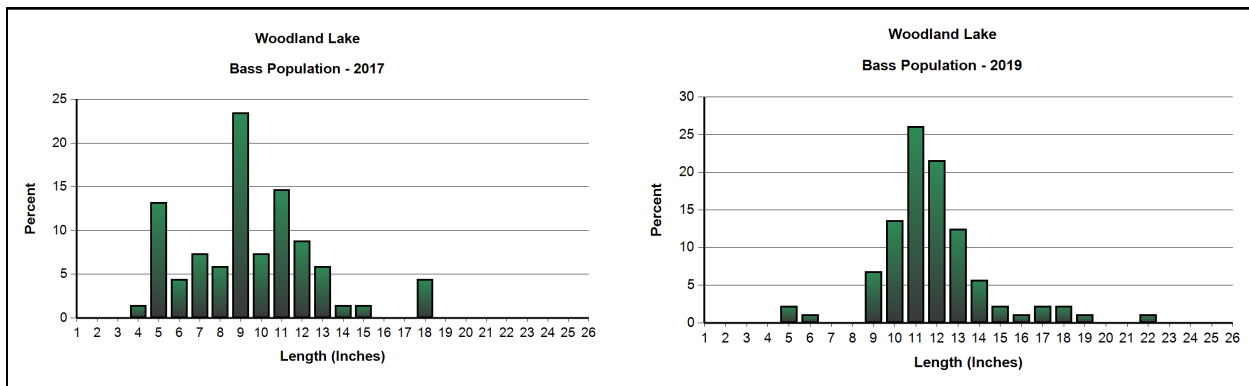


Figure 2. Comparison of the length distribution of bass collected in Woodland Lake in November 2017 and April 2019.

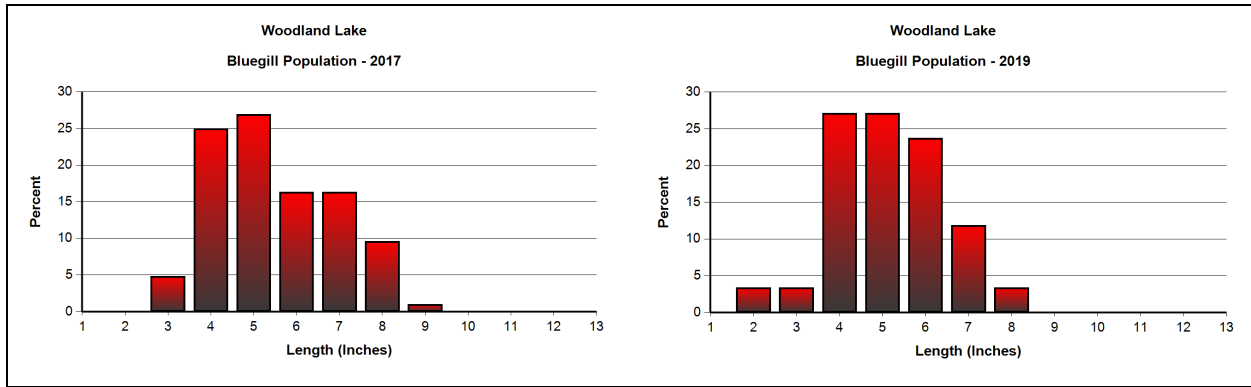


Figure 3. Comparison of the length distribution of bluegill collected from Woodland Lake in November 2017 and April 2019.

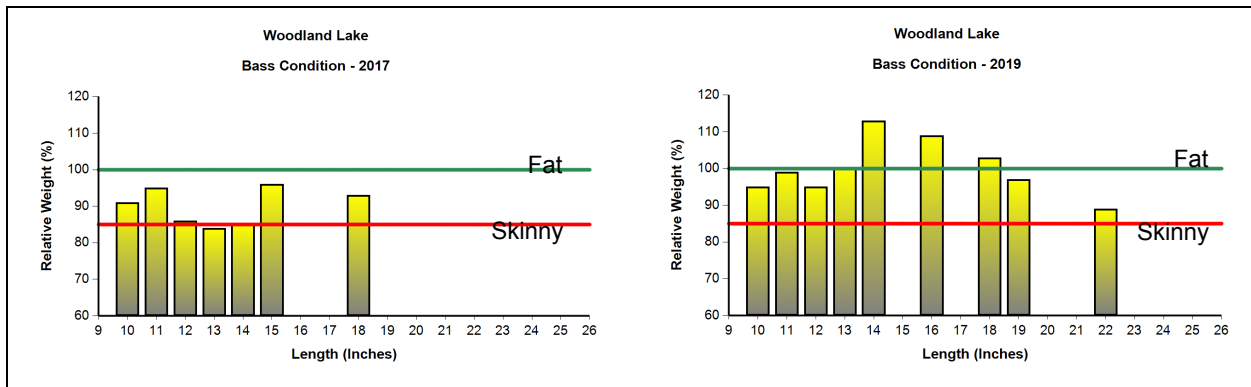


Figure 4. Relative weight distribution of adult largemouth bass collected from Woodland Lake in November 2017 and April 2019.



Balance

Most pond management activities are centered on creating or maintaining a balanced fish community. A balanced sport fish pond is preferred by most anglers because it provides quality bass and bluegill, both in terms of number and size. A balanced fish community is characterized by a wide size distribution of bass, bluegill and other forage species; adequate reproduction of all species is present.

As mentioned previously, our recent electrofishing sample from Woodland Lake contained a healthy distribution of bass across many different size groups. Additionally, the majority of the bass were in good condition with relative weights ranging from 86 to 112. Bass in the 14 to 18 inch length group were in excellent condition, indicating an abundant forage base for this length group of bass. However, bass in the 10 to 12 inch group were in slightly poorer condition, indicating the need for selective bass harvest and/or supplemental forage stocking to maintain a well balanced fishery.

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 high relative abundance of intermediate size prey is often an indication of a balanced pond.

When a state of balance exists, intermediate size prey are among the most abundant segment of the overall fish community. Under these conditions, bass typically grow quickly, and are capable of reaching their full growth potential.

During our electrofishing sample, we observed a healthy forage base, particularly the distribution of intermediate sized prey. In order to maintain the predatory:prey balance and the continued growth of bass in Woodland Lake, it will be necessary to ensure that conditions for the production of forage such as fertilization, supplemental feeding and selective bass harvest are sustained or even enhanced.

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, a bass-crowded condition is the likely result. This usually leads to a low quality bass fishery.

Strategies to improve the quality of the bass and bluegill fishing are discussed in the Recommended



A balanced pond supports an abundance of bass, bluegill and other forage species of all sizes.



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.

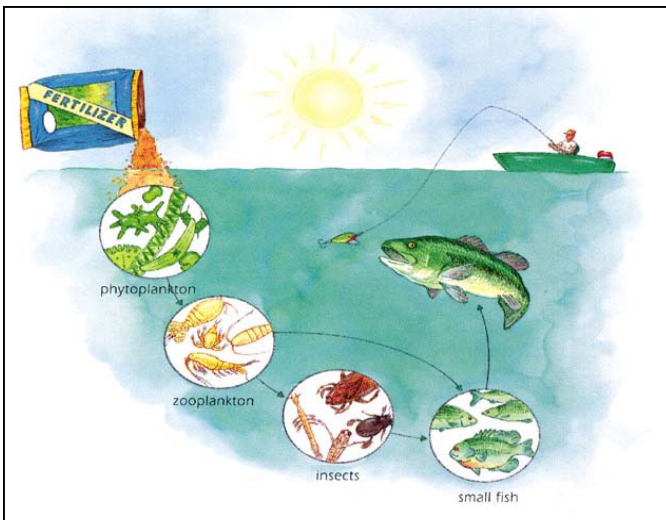


Fertilization

The concept of *carrying capacity* describes the total 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 is the most basic and important element necessary to create an environment conducive to the production and growth of sport fish. Fertilization takes place during the growing season, from March through October. We recommend SportMAX® Water Soluble Pond Fertilizer (10-52-4), applied at a rate of 4-8 pounds per surface acre per application. Fertilizer should be applied according to the Standard Pond Fertilization Schedule:



Food chain of a typical fertilized pond.



SportMAX® Water Soluble Pond Fertilizer can be poured directly into the prop wash of a small motor. 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.

We offer a convenient **Fertilization Service**, which completely removes the burden and nuisance of fertilizing your lake. Our trained technicians will visit your pond, at prescribed intervals, carefully measuring and recording water visibility and applying the proper dosage of fertilizer. Our visits are conveniently recorded on a small sign, situated on the pond bank. In addition, we regularly check and log total water alkalinity as well as keep an eye out for potentially problematic vegetation.

If you elect to fertilize on your own, **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-resistant 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.



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.

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.



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.

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.

There are also a variety of water colorants or dyes that can be added to ponds before weeds become established that limit sunlight penetration



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).

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.

Given the present state of vegetation in your pond, chemical control is recommended. This approach involves the use of aquatic-approved herbicides to reduce or eradicate aquatic weeds. We are commercially licensed to apply aquatic-approved herbicides. Our treatments are warranted to control existing weed growth. We cannot, however, warrant against re-growth; the integrated approach to controlling nuisance vegetation is your best insurance against weed problems in the future. The cost and timing of our recommended herbicide treatment are listed in the Recommended Management Activities section of this report.

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: 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.





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.

Heron 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

Woodland Lake is functioning as a balanced system that has a high level of fertility. Several management inputs are necessary to maintain a state of balance as well as increase the total density of sport fish. The management activities we are recommending for Woodland 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 **continue an intensive fertilization program** in Woodland Lake. **SportMax® Water Soluble Pond Fertilizer (10-52-4)** should be applied according to the *Standard Pond Fertilization Schedule*.

For Woodland Lake, **harvest bass 12 inches and smaller** at a rate of **20 pounds per acre per year** (2,360 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 Woodland Lake 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 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 Woodland Lake. Fish food should be applied from 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 Woodland Lake. Water pennywort has 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 Woodland Lake, 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 Woodland Lake.

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
2019

Current Status: Owner Responsibility

- Approved Declined Done

Date Approved: _____

Date Done: _____



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

*An additional mileage charge will be added.

MANAGEMENT ACTIVITY:
Harvest ~2,360 pounds of LMB (12" inches and less)

LEVEL 1

SPORTMAX

SPRING 2019

Current Status: Done

- Approved Declined Done

Date Approved: _____

Date Done: _____



COST: \$ 1.80/lb*

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

MANAGEMENT ACTIVITY:
Deliver 475 pounds of SportMAX Water Soluble Pond Fertilizer (10-52-4)

LEVEL 1

SUPPLEMENTAL FEEDING

ANNUALLY
2019

Current Status: Owner Responsibility

- Approved Declined Done

Date Approved: _____

Date Done: _____



COST: Cost of Food

MANAGEMENT ACTIVITY:
Begin a feeding program.
Feed at a rate of 5-10 pounds/day from each feeder

LEVEL 1

CRAWFISH

SPRING 2019

Current Status: Awaiting Owner Approval

- Approved Declined Done

Date Approved: _____

Date Done: _____



COST: \$ 3.25/lb*

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

MANAGEMENT ACTIVITY:
Stock 1,000 pounds of crawfish

LEVEL 3



HERBICIDE TREATMENT

SPRING 2019

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Herbicide treatment to control water pennywort

COST: \$ 750.00*

* This price includes the application. Chemical usage will be included on final charge. Complete control is warranted. An additional mileage charge will be added.

LEVEL 2

ANNUAL EVALUATION

SPRING 2020

Current Status: Awaiting Owner Approval

Approved Declined Done

Date Approved: _____

Date Done: _____



MANAGEMENT ACTIVITY:
Annual electrofishing evaluation

COST: \$ 850.00*

* 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

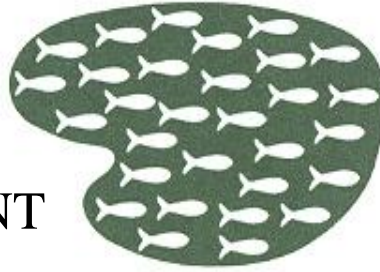
Tagged Fish Data

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

Other Records

Date	Comments

SOUTHEASTERN
POND
MANAGEMENT



“Managing Your Liquid Assets”

Southeastern Pond Management

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