UNIVERSITY OF MISSOURI
Extension

NATURAL RESOURCES

Managing ponds and lakes for aquaculture and fisheries in Missouri

Pond Management Calendar

Managing a pond or lake for sport fishing takes time, resources and a year-round commitment. Timing is crucial to many pond and lake management practices. The pond management calendar in Table 1 can help you plan management activities. It is not a comprehensive list, but rather an overview of the most important activities. Some might not be necessary each year, and some might not be appropriate for your pond.

Apply lime if necessary

Ponds in areas with acidic soils (pH lower than 7) might benefit from an application of agricultural limestone, or calcium carbonate, to balance the pH. Fall and winter are the ideal times to apply lime. Liming reduces the acidity of the soils on the pond bottom and increases the availability of nutrients that foster growth of phytoplankton and other aquatic plants crucial to a healthy pond. Phytoplankton forms the basis of the pond food chain; they provide food for zooplankton, which in turn serve as a food source for small fish, such as bluegill. If soils on land adjacent to a pond require lime, then the pond would often also benefit from liming.

Contact your local University of Missouri Extension center to have the alkalinity of your pond water tested. If alkalinity levels are below 20 mg/L, liming is recommended. Submit a sample of your pond soil to the MU Soil and Plant Diagnostic Lab to determine how much lime should be applied (See the *Additional information* section to learn more about the Plant Diagnostic Lab).

As a general rule, ponds that need lime require at least one ton per acre. An application of agricultural lime typically lasts three to four years, depending on the volume of water flowing through the pond. Only use agricultural limestone in ponds with fish populations. Other forms, such as hydrated or quick lime, should only be used to lime the soil of a drained pond before fish are stocked. These forms of lime cause the pH to increase dramatically, which can result in a fish kill.

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Many ponds in Missouri should not be fertilized

A large percentage of ponds in Missouri are located in watersheds with soils that provide nutrients and have a pH suitable for supporting a phytoplankton bloom. If your pond is in an area with acidic soil or has inadequate soil fertility, as determined by the soil test, then a lime application and fertilizer program that stimulates phytoplankton growth would be beneficial. However, a fertilizer program would be detrimental if your pond is described by any of the following conditions:

- The pond receives an abundance of nutrients from the surrounding watershed.
- The pond is not heavily fished.
- The pond is muddy.
- The pond is infested with undesirable fish.
- The pond is infested with filamentous algae and other troublesome aquatic plants.
- The pond has out-of-balance fish populations.
- The pond has fish being fed a commercial feed.
- The pond has a large volume of water flow in which added nutrients are discharged before having the desired effect.

Fertilize if necessary

The decision to fertilize a pond should be carefully considered. Phytoplankton is an important part of the food chain in a pond. Fertilizer applications stimulate the growth of phytoplankton, which turn the water a greenish color. This is referred to as a phytoplankton bloom. The phytoplankton bloom also shades the pond bottom and discourages growth of troublesome aquatic weeds.

If you decide to implement a fertilizer program, begin applications in spring as water warms to 65 degrees Fahrenheit to promote phytoplankton growth before rooted aquatic plants become established. Once you begin a fertilizer program, maintain it throughout the growing season and discontinue it when water temperatures fall below 60 degrees.

Pond fertilizers are available in liquid, granular and powdered forms, all of which can be effective if the pond soil pH and water chemistry parameters are in the correct ranges. The pond soil's pH should be between 6.5 and 7.5. A fertilizer ratio with an N-P-K of 13-37-0 — or 13 percent nitrogen, 37 percent phosphorus and 0 percent

Table 1. Use this calendar to help plan pond management activities during the year.

Management activity	January	February	March	April	May	June	July	August	September	October	November	December
Apply lime according to soil test	■										■	■
Fertilize if necessary				■	■	■	■	■				
Check density of phytoplankton bloom				■	■	■	■	■	■	■		
Draw down pond for renovation	■									■	■	■
Refill pond		■	■	■								
Control nuisance aquatic plants with chemicals			■	■	■	■						
Biological control of aquatic plants	■	■	■	■	■	■	■	■	■	■	■	■
Stock catfish if necessary			■	■					■	■		
Stock bluegill fingerlings[1]				■					■	■		
Stock largemouth bass fingerlings[1]				■	■							
Check pond fish species balance					■	■	■					
Feed fish if necessary				■	■	■	■	■	■	■		
Fish and harvest pond	■	■	■	■	■	■	■	■	■	■	■	■

Shaded areas indicate when a management activity should be conducted.

[1] Stocking bluegill fingerlings and largemouth bass fingerlings is necessary only in new or renovated ponds. Before conducting additional pond stocking, consult a fisheries biologist for recommendations.

potassium — is a common formulation that can be applied to ponds in need of fertilization. Phosphorus is the most important nutrient for ponds, so select a fertilizer with high phosphorus content.

Check algae bloom density

You should periodically check on the phytoplankton bloom during the growing season, particularly after an initial application of fertilizer, to observe how a pond responds to added nutrients. Pond water should develop a greenish or green-brown color in seven to 10 days. Allow at least two weeks between fertilizer applications to monitor the results of each additional application.

There are several methods for checking the density of a bloom, such as a commercial Secchi disk or simply lowering a white object into the water. One simple method that can be used to measure bloom density is to nail a pie tin to the bottom of a yardstick. Lower the tin into the water until it disappears from view and pull it back up until it is visible. Then measure the depth at which the tin becomes visible. In most ponds, a bloom depth of 18 to 24 inches is ideal. If the bloom is thicker than this (a depth reading of fewer than 18 inches), do not apply fertilizer. If the depth is greater than 24 inches, apply fertilizer.

Winter drawdown

If a pond was constructed with a water control structure, drawing down the water in the pond during the winter months (November through February or March) can be an effective management practice. Reducing the pond area can help prevent an overabundance of small bluegill from developing by forcing them to move out from protection into open areas where they are more vulnerable to predators such as bass.

Winter drawdowns also provide an opportunity to deepen pond edges to the recommended minimum depth of three feet and place fish attractors, such as brush tops, in strategic locations to improve fish habitat. Drawdowns can also help control certain aquatic weeds at the pond edge by exposing them to freezing weather. Depending on your pond's topography, shape, design and amount of shallow water, lowering the water level by two to four feet is usually sufficient to expose enough of the pond bottom to conduct management activities. This management practice poses no threat to existing fish populations and costs nothing if the pond is properly designed and equipped with a water-control structure. Allow the pond to refill before spring.

Aquatic plant control measures

Chemical control

Aquatic plants form the basis of the pond food chain and provide many benefits for fish populations, but an overabundance of some plants, such as filamentous algae, can cause problems. Certain prevention and control measures can be conducted year-round. If you're considering applying an aquatic herbicide to control nuisance plants, which should generally be done only as a last resort, do so in spring before problem plants get out of hand.

You can generally conduct spot treatments using recommended aquatic herbicides without problems. If a whole pond treatment is necessary though, it is extremely

important to accurately measure the area of the pond to calculate the correct dosage of herbicide.

Aquatic plants decompose after herbicide application. The process of decomposition removes oxygen from the water, which can result in a fish kill, especially in hot summer months. Controlling weeds is crucial in spring months when water temperatures are cooler and a loss of dissolved oxygen due to hot weather and decomposing vegetation is less likely to occur. Treating only a small area of a pond at a time also decreases the chances of an oxygen deficiency by allowing affected weeds to decompose before treating the next area. Refer to MU Extension publication G9478, *Managing Ponds and Lakes for Aquaculture and Fisheries in Missouri: Controlling Nuisance Aquatic Vegetation*, for detailed information on how to handle aquatic plant problems in ponds and lakes in Missouri.

Biological control

Biological control measures, such as stocking ponds with grass carp, can be effective at reining in an overabundance of nuisance aquatic plants. Stocking rates for grass carp depend on the severity of the aquatic plant problem, but five to 10 fish per surface acre is generally sufficient to keep problem plants under control. More severe plant problems might call for higher stocking rates.

Fish stocking

Bluegill and largemouth bass fingerlings

Bluegill and largemouth bass provide the basis for a sustainable fishery in Missouri ponds. Stocking rates depend on the productivity of the pond, but stock at a ratio of 500 bluegill to 100 largemouth bass per acre as a general rule. Although bluegill can be stocked in ponds during spring or fall months, it is often preferable to stock smaller fingerlings in fall so they have a chance to grow before you stock largemouth bass the following spring.

Channel catfish

Catfish are not necessary to balance bass and bluegill populations in your pond, but they provide additional fishing opportunities. Although catfish can spawn in most ponds, 8- to 10-inch fingerlings need to be restocked from year to year in ponds with balanced populations of bass and bluegill, as bass quickly consume smaller fingerlings. Keep records of how many catfish are harvested, and restock as needed. You can stock 100 catfish fingerlings per acre each year, assuming a bass and bluegill fishery. In new ponds, you can stock 4- to 6-inch catfish fingerlings in fall or spring.

Refer to MU Extension publication G9475, *Managing Ponds and Lakes for Aquaculture in Missouri: Fish Selection and Stocking for Sport Fishing*, for recommendations on stocking fish in Missouri ponds and lakes.

Check fish balance in the pond

Fish populations should be balanced in your pond to ensure optimal fishing opportunities. Using a seine, or net, in spring to capture fish and monitor spawning activity can help determine the condition of your pond from year to year. This can be done in May, June and July, which is when bass and bluegill will have reproduced.

You can also determine the balance of largemouth bass and bluegill by examining your catch from fishing, which can provide ongoing information about the general status of the fish population. Your catch over the year should consist of a variety of sizes of both bass and bluegill, and perhaps a few channel catfish if they are stocked. For example, if more than half of the bluegills were 6 inches or larger and a majority of the bass caught were 12 to 16 inches long, the population is probably in balance. An unbalanced population might result from catching many small or stunted bluegill and relatively few large bass; this condition is generally caused by overcrowding bluegill in the pond, possibly as a result of overharvesting bass.

There are many other scenarios that can result in a fish population that is out of balance and reduces the quality of fishing. The Missouri Pond Management Handbook, published by the Missouri Department of Conservation, includes examples of these scenarios and offers recommendations for re-establishing balanced bass and bluegill fish populations.

Feed fish if desired

Several species of fish, including catfish and bluegill, will eat commercially prepared feeds. A feeding program can increase fish production within a pond. Feeding can allow for higher stocking densities and offers a chance for fish to grow faster if natural food production is limited by low nutrients or there are water quality problems. As a general rule, use a floating feed and only use as much feed as fish consume in about 10 minutes.

The choice of a fish feed is important. For example, feeds for catfish contain at least 28 percent protein in the ration. Other feed formulations might have a greater percentage of protein, but they are more expensive and are unlikely to produce larger catfish in ponds also stocked with bass and bluegill.

Fish and harvest the pond

Harvesting is an important management activity that is necessary to maintain a balanced fish population. The amount harvested in a given year depends on your overall management objectives, but there are a few guidelines you should consider.

Do not harvest bass in new ponds until three years after they have been stocked. At three years, many of the bass should have grown to 12 to 14 inches. Overharvesting bass before the three-year mark can shift bass and bluegill populations out of balance.

Three years after stocking bass, harvest approximately 10 to 15 pounds of bass per acre in infertile ponds, 20 to 25 pounds of bass in naturally fertile ponds and more if the pond is fertilized or you have initiated a feeding program. As a general rule, remove bass that are 13 inches or smaller and release fish that are 13 to 16 inches long,

as they are aggressive feeders that help maintain a stable bluegill population. You can spread a bass harvest over the year, but keep accurate records of your harvest to guide future management efforts.

Bluegill can be harvested much sooner than bass. Harvest bluegill at about four to five times the rate you harvest bass, or four to five pounds of bluegill for every pound of bass. It is difficult to overharvest bluegill in most ponds, but not harvesting enough can lead to problems with an overabundance of stunted bluegill in the pond. Refer to the Missouri Pond Management Handbook or consult a fisheries biologist for harvest recommendations that might be applicable to your pond.

Additional information

The MU Soil and Plant Diagnostic Lab offers testing and analysis services for soil samples, as well as soil fertility recommendations. Learn more about their services and how to submit a sample at ***http://soilplantlab.missouri.edu***.

Refer to MU Extension publication G9474, *Managing Ponds and Lakes for Aquaculture and Fisheries in Missouri: Pond Construction and Management Considerations*, for information on pond construction, water control structures and pond management techniques that can be used during the year to enhance water quality and improve the pond for fishing.

Refer to MU Extension publication G9476, *Managing Ponds and Lakes for Aquaculture and Fisheries in Missouri: Pond Dynamics and Water Quality Considerations*, for information on pond water dynamics, fertility, water quality considerations and management techniques that can be implemented to increase the productivity of your pond for fishing.

These publications from the Missouri Department of Conservation provide detailed information about pond management activities that can be implemented to achieve your objectives.

- Missouri Pond Handbook: ***http://mdc.mo.gov/sites/default/files/resources/2010/05/mopondhb2015.pdf***
- Guides on pond improvements, construction and maintenance: ***http://mdc.mo.gov/your-property/improve-your-property/pond-improvements***

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