Pond Design & Management

Pickaway Soil & Water Conservation District

Publication by:

Pickaway Soil & Water Conservation District
www.pickawayswcd.org
110 Island Road Suite D
Circleville, Ohio 43113
740-477-1693

Information & Resources Provided By:

Fairfield Soil and Water Conservation District

Natural Resource Conservation Service

Ohio Department of Natural Resources
Division of Wildlife

Ohio State University Extension

Ohio State University Extension's Farm Office

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Table of Contents

Lakes and Pond Checklist

The following is a checklist that is provided by the Pickaway Soil & Water Conservation District, that must be completed before pursuing installation of the pond.

Please check if you have completed the following objectives:

_____ Contacted township trustee, ask about permit requirements & pond regulations.
_____ Meet with a district technician staff member at 110 Island Road, Suite D, Circleville, OH 43113.
_____ Provide district with a sketch plan or engineering plan showing location of proposed site of pond/lake, crossroads for reference, distance from property line and other zoning requirements.
_____ Request the district to provide soil map and data on the soil capabilities of proposed construction site.
_____ Request that the district determine size of pond - minimum ratio for a healthy pond is 6 acres of watershed to 1 acre pond.
_____ Obtain the technical standard for embankment/excavated pond construction and other appropriate publications.
_____ Liability and safety issues
_____ Fire protection options
_____ Proper disposal of excess soil
_____ Erosion control issues
_____ Pond maintenance
_____ Ohio drainage laws: http://bit.ly/2uNC6gF

If area is considered feasible for pond installation:

_____ OUPS contact number, must be called at least 48 hours before any excavation 1-800-362-2764.
_____ OGPUPS contact number, must be called at least 48 hours before any excavation. Dial 811
_____ Contact contractor for quotes: http://bit.ly/2uUItyW
_____ Request soil scientist for site inspections http://bit.ly/2uEUicV

Please Note:

The Pickaway SWCD will not provide an engineering plan design for an urban pond. The District shall provide assistance in the evaluation of soils and drainage in the proposed construction area. It is highly recommended that ponds be designed by a registered professional engineer according to the approved specifications and standards.

INTRODUCTION

The Pickaway Soil and Water Conservation District (SWCD) has assembled this warm-water pond brochure to assist interested landowners in becoming aware of the elements involved in the design of a pond. Whether it is for recreational use, livestock watering, or fire protection, good judgment and common sense are essential in applying the design criteria that makes a successful pond in Pickaway County.

We will touch on areas of concern and briefly define some of the terms used in pond construction. Our purpose is to provide landowners with some background to begin the process. It is important when considering building a successful pond that you take the necessary steps to protect the health and property of the people of Ohio. Ohio is a strict liability state in regards to dams, meaning even if a loss is due to a natural disaster, the owner would still be liable for damages. If you are not well versed in the design of a pond, you should contact a qualified private engineer, consultant, or contractor knowledgeable in this field.

A glossary of terms used is located in the back of this guide for your convenience.

WARM-WATER VS. COOL-WATER PONDS

Warm-water ponds provide many hours of good fishing and pleasant recreation on farm or suburban property. Warm-water ponds can also provide related recreation benefits such as boating, swimming, picnicking, and water for wildlife. Largemouth bass, bluegill, redear sunfish, channel catfish, and bait fish are best suited to these ponds.

Managing a pond for fishing requires more than building, stocking, and fishing the pond. Fish production is influenced greatly by such natural water qualities as temperature, oxygen, acidity or alkalinity (pH of 6.5 to 9.0 is satisfactory for reproduction and growth), and water clarity. The amount of water that flows through the pond is also important.

Most warm-water ponds reach summer temperatures of 75 to 82 degrees Fahrenheit. Bass, bluegill, channel catfish and sunfish are warm-water fish and grow well in these temperatures.

A cool-water pond is one in which summer temperatures rise to 70 degrees but seldom above 80 degrees. Although spring-fed ponds often may have lower water temperatures, without aeration they may lack adequate oxygen levels near the bottom to support trout, yellow perch, or walleye. These fish species seldom survive in Ohio ponds.

TYPES OF PONDS

There are generally two types of ponds: excavated and embankment. Excavated ponds are built by digging a hole in the ground to impound water. Embankment ponds require the construction of a dam to impound the water.

Excavated ponds are typically built in flatter areas where the water table is within a few feet of the surface of the ground. Excavated ponds are usually limited in size and capacity by the construction techniques and equipment used to build them. There is typically excess soil material (spoil) that must be used or disposed of off-site.

Embankment ponds are built where the ground is more sloping and water concentrates in a watercourse, draw, or stream. A dam across the watercourse is needed to hold the water. Provisions must be made during the planning and construction phase to allow excess water to safely pass the dam during periods of heavy rainfall. This typically involves putting a pipe through the dam (principal spillway) to pass the usual amounts of rainfall and water run-off. To protect against storms, an emergency spillway should be built on one end of the dam to safely take the excess water past the dam without eroding the dam.

Ponds in Ohio should have a minimum depth of water. It is generally recommended to have a minimum depth of 8 feet over about 1/3 of the pond area. It may be necessary to have a deeper pond if the primary purpose is for irrigation or fish management. Many uses such as fire protection require that there may be a certain minimum volume of water in the pond.

SITE SELECTION

Initially, you need to evaluate the location by looking at the size of the watershed, the quality of water that can be expected, the area needed for construction, and the downstream effects.

A watershed ranging from 10 to 30 acres is typically necessary to keep a one-acre pond full. Damming a stream can be difficult to manage. It is costly and can result in excess sediment with larger watersheds entering the pond. Undesirable fish species may enter ponds constructed on a flowing stream and federal and state permits are required to dam a stream.

With increased urban development, water quality in the watershed of the pond must be considered. Good vegetated land with properly working septic systems is acceptable. The area needed for the construction of a pond must include not only the pool area, but the area needed for borrow material and the area needed for the dam. The total area must be included in the overall plan for your property along with the location for your septic system, underground utilities, house site, and other recreational areas.

Riparian rights should also be considered before damming perennial streams. There are state laws governing the construction of certain sized ponds. Each individual should be aware of these laws. Information on this can be obtained from the Ohio Department of Natural Resources—Division of Water Resources (ODNR-DOWR) *http://water.ohiodnr.gov/safety/dam-safety*

Remember Ohio Drainage Laws. Water can not back up across the property line onto neighboring properties and pond overflow must be returned to its natural watercourse before it leaves the property. Any property easements, deed restrictions and zoning regulations should also be investigated prior to building a pond.

The diversity of terrain and soil types found in Pickaway County make site selection a critical element in the process of building a pond. The majority of Pickaway County is covered by glacial till, which is comprised mainly of clay with varying amounts of sand, silt and gravel. This stresses the important of gathering soil information before you proceed with installing a pond on your property.

SOIL EVALUATION

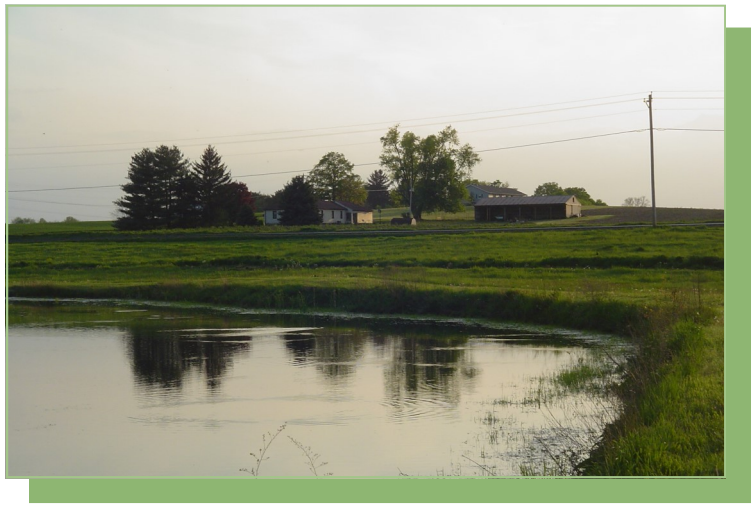
Surface soil appearances are not representative of the conditions necessary to impound water. The Pickaway County soil survey can be used in the preliminary investigation of the site. However, each site needs to be evaluated to a depth greater than that provided by the survey.

It is essential to do a soil evaluation before investing money in building a pond. Knowing what soils are on-site and their limitations will allow you to determine expected costs and possible methods to overcome any obstacles posed by poor soils. Contact the Pickaway SWCD for assistance with soil information.

Soils in the watershed have a major influence on the amount of water that reaches the pond. Soils have different characteristics that affect the infiltration of water and the growth of plants.

Soil type also affects the feasibility and cost of building a pond. Soils that are too rocky, sandy, or silty are not favorable for pond construction. Typically the costs of building a pond increase as the soils become less favorable. Clay soils are generally needed for embankment ponds.

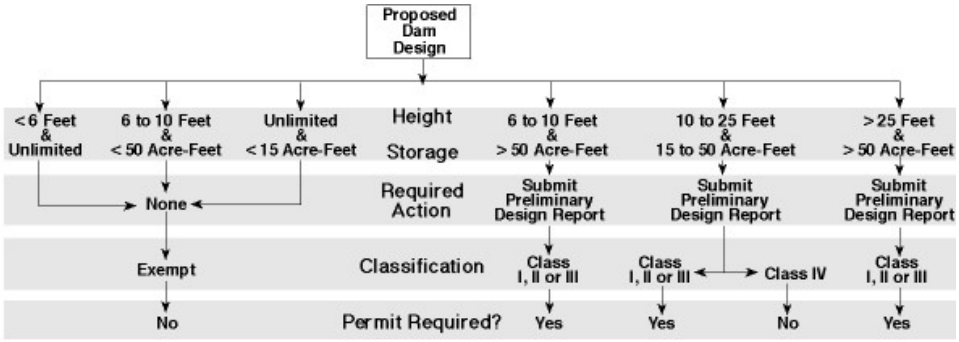
A backhoe is typically used to dig test holes. This provides the subsurface information needed to determine such things as pond and core trench depth. A soil specialist will recognize soil layers that would allow the pond water level to fluctuate. An engineer can determine the suitability and quantity of material available for construction.



DESIGN AND PERMITS

Section 1521.06 of the Ohio Revised Code requires that individuals or government agencies wishing to build a dam first obtain a construction permit from ODNR-DOWR. This law protects life, health, and property from damages due to improper design or construction. However, there are dams exempt from the permit process. There are required Emergency Action Plans for permitted ponds. Another concern with ponds is dam/water ownership. It is not recommended to share ownership of a pond with a neighbor without clear legal agreements.

Diagram of Construction Permit Determination



"**Height**" means the vertical dimension of a dam as measured from the natural stream bed or watercourse at the downstream or outside toe of a dam to the top of the dam.

"**Storage**" means the total volume impounded when the pool level is at the top of the dam immediately before it is overtopped.

"Classification"

Class I - If the danger of probable loss of human life or serious damage to homes, high-value industrial or commercial properties, or major public utilities exists, the dam shall be placed in Class I. Dams having a storage volume greater than 5000 acre-feet or a height greater than 60 feet shall be placed in Class I.

Class II - If a possible health hazard or probable loss of high value property or damage to major highways, railroads, or other public utilities exists, but loss of human life is not anticipated, the dam shall be placed in Class II. Dams having a storage volume greater than 500 acre-feet or a height greater than 40 feet shall be placed in Class II.

Class III - If property losses are restricted mainly to rural lands and buildings and local roads, and no loss of human life or hazard to human health is anticipated, the dam shall be placed in Class III. Dams having a height greater than 25 feet or a storage volume of greater than 50 acre-feet shall be placed in Class III.

Class IV - If property losses are restricted mainly to the dam and rural lands, and no loss of human life or hazard to health is anticipated, dams which are 25 feet or less in height and have a total storage volume less than 50 acre-feet shall be placed in Class IV.

Please be advised that the disturbance of continuous flow, intermittent flow, and ephemeral stream channels and wetlands in Pickaway County need the approval of multiple agencies. If your proposed pond or lake includes the construction of dikes and dams, culvert placement, the movement of the stream channel or fill and dredge operations of a "stream" as mentioned above, you must obtain all necessary permits.

Ohio EPA permits may be required. If the primary purpose of the pond is irrigation, an NPDES permit is not needed. However, if the pond is at an animal feeding operation or is primarily for pollution control, then you must obtain one. Permits are needed for aquaculture ponds. For recreational ponds, if the construction area disturbs an acre or more, you must obtain a permit. The construction area includes spoil piles and roads/traffic areas.

These permits can be lengthy and expensive and require the approval and review of other agencies for threatened or endangered species. You are often required to provide professional engineering calculations or professional analysis of streams and wetlands. Pickaway SWCD is not the permitting authority for these permits. To receive further information, please contact the following:

Ohio EPA Central District Office
Division of Surface Water, Suite 700, Columbus, OH 43215
Phone: (614) 728-3844 Fax: (614) 728-3898

The United States Army Corps of Engineers
502 8th Street, Huntington, WV 25701
Phone: (304) 399-5210 Fax: (304) 399-5085

The Ohio Department of Natural Resources, Dam Safety
Division of Water—Dam Safety Program
2045 Morse Road, Bldg. B-2, Columbus, OH 43229-6693
Phone: (614) 265-6731
http://water.ohiodnr.gov/safety/dam-safety

Pond Liability

General rule for premises liability:

Landowners can be liable for injuries to certain visitors on the premises who are harmed by a "dangerous condition" on the property if the landowner failed to warn the visitors or take steps to eliminate the danger. A dangerous condition is one that creates an unreasonable and unnecessary risk of harm that is not readily apparent to the visitor. Certain situations, although dangerous, are not considered dangerous conditions because they are ordinarily encountered or are "open and obvious" to a visitor. A landowner would not have a duty to protect a property visitor from those types of dangerous situations.

Exceptions to the general rule:

1. *Perilous conditions in and around the pond:* If a landowner actively or negligently creates a perilous condition in or around the pond, such as a defective diving board, a leaky rowboat, or a hidden electrical transformer. In such a situation, the landowner might be liable if the landowner should have foreseen that a visitor to the property could come into contact with the condition and the landowner failed to warn the visitor or eliminate the danger.

2. Trespassing children: The "attractive nuisance doctrine," adopted by the Supreme Court of Ohio and later enacted into law by the Ohio Legislature, places a duty upon landowners to protect a foreseeable child trespasser from "dangerous artificial conditions" on the property that attract the child, but for which the danger is unknown to the child. A landowner can be liable for the child's harm if the landowner failed to take steps to protect the child from the danger, even if the child was trespassing. The landowner has a duty to protect the child from artificial perilous conditions such as a deep hole in a seemingly shallow pond, a diving board or a very steep bank that causes slipping or prevents a child from climbing out.

Limiting legal liability risk for a pond:

1. Locate and construct the pond with visitors in mind
2. Routinely inspect the pond for dangerous conditions
3. Restrict access to the pond
4. Post signs
5. Install rescue devices
6. Educate neighbors and employees
7. Utilize the Recreational User's Statute
8. Review insurance policies
9. Maintain detailed records

**information provided by OSU Extension's Farm Office*

POND COMPONENTS

If you are considering building a pond or having someone build a pond for you, it is important to be aware of the necessary components of a good pond design. The information provided here is simplified to help you understand the features of a pond. The principal spillway for small ponds is usually a pipe made of steel, concrete, or plastic. Its purpose is to control the water level of the pond. It is designed to handle the volume of run-off from low intensity rainfalls. Examples are shown below and on the following page.

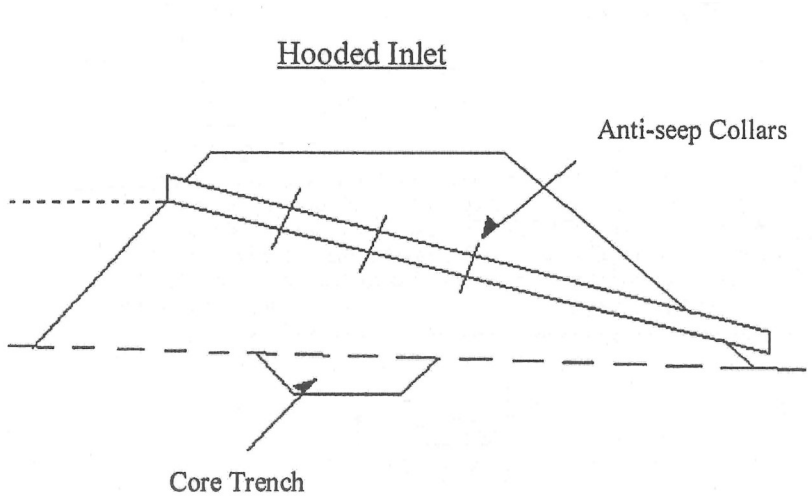
The emergency spillway is a vegetated earthen pathway usually around the side of the dam. It allows for large volumes of storm run-off to pass safely. It is an important feature and should be constructed along with the principal spillway.

The dam must be constructed of compacted soil preferably with a sheepsfoot roller with adequate clay content. A thick, dense stand of grass is important to stabilize the dam and prevent erosion.

A beach area is an important safety feature. It provides an area of shallow water that will allow someone to get out of the water safely.

Typical Principal Spillway Pipe Designs

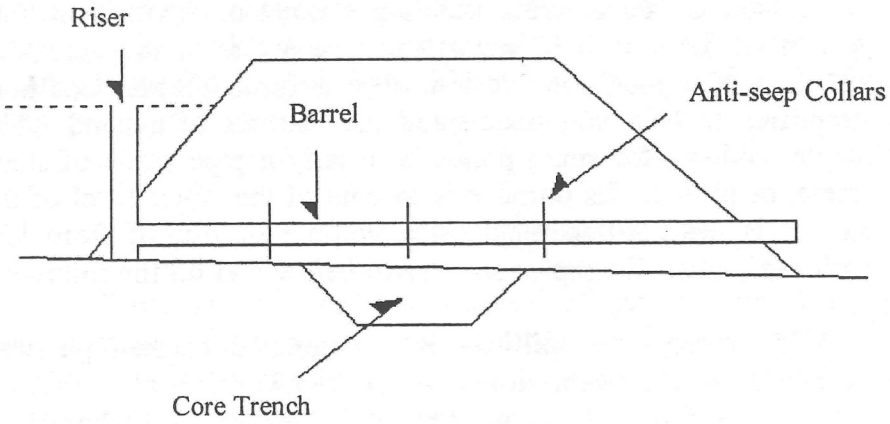
(small and medium watershed ponds, ponds with a lot of storage between pipe and emergency)



**information provided by Fairfield SWCD*

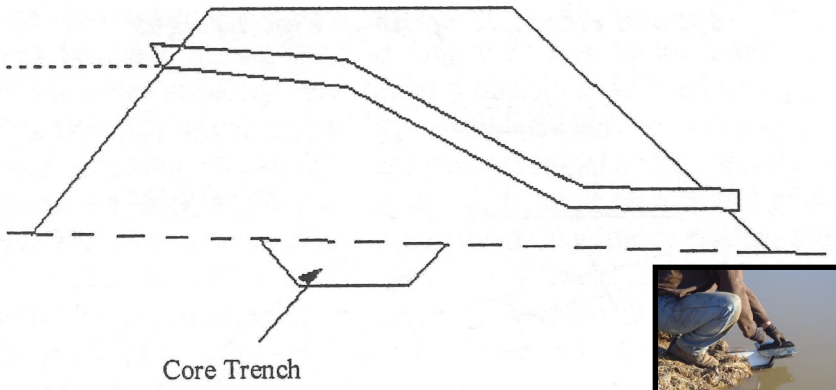
Barrel and Riser

(medium and larger watershed ponds, excavated ponds)

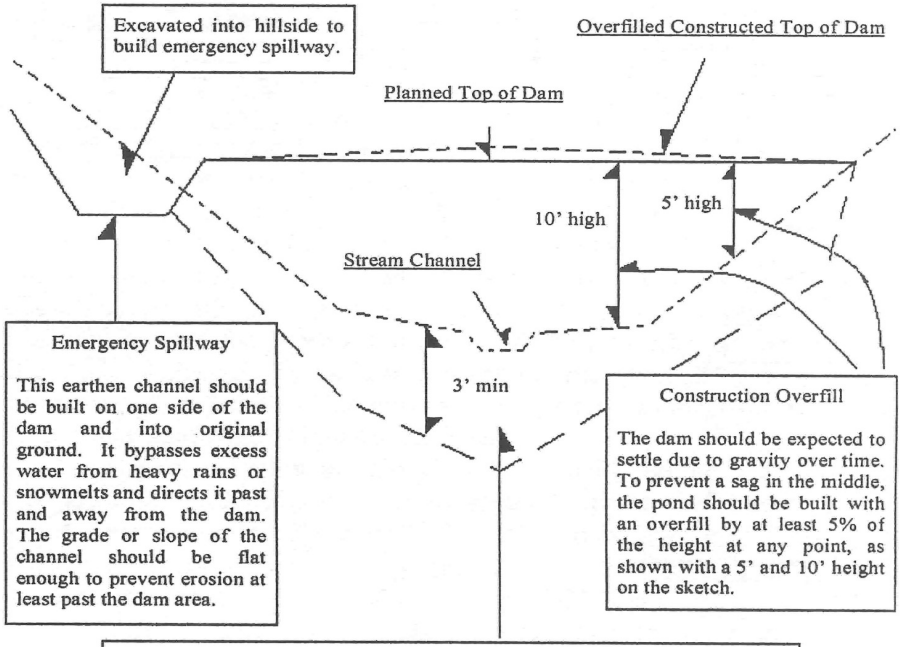


Trickle Tube

(Less than 10-acre watershed)



*An anti-vortex plate (not shown on drawings above and previous page) is recommended on top of the pipe on the upstream side of the dam to prevent swirling and allow for more effective water intake.



Emergency Spillway

This earthen channel should be built on one side of the dam and into original ground. It bypasses excess water from heavy rains or snowmelts and directs it past and away from the dam. The grade or slope of the channel should be flat enough to prevent erosion at least past the dam area.

Construction Overfill

The dam should be expected to settle due to gravity over time. To prevent a sag in the middle, the pond should be built with an overfill by at least 5% of the height at any point, as shown with a 5' and 10' height on the sketch.

Cutoff Trench

The cutoff trench is also referred to as the keyway or core trench. It is needed to assure that natural seepage layers or zones under the dam are 'cutoff' or intercepted. By compacting clay into this trench, seepage under and around the dam is reduced. The trench should be at least three feet deep, but is often deeper, especially in valleys/draws where layered deposits in soils are common. The trench should extend under the whole length of the dam and up both sides above the water line.

Dam Profile

Not to Scale

The height difference between the emergency & top of dam should be approximately 1 1/2 to 2 feet.

The height difference between the principal spillway pipe inlet and the emergency spillway should be approx. 1.5 times the diameter of the pipe.

The top width of the dam should be a minimum of 8 feet.

The inlet of the principal spillway pipe controls the water level in the pond. The inlet should have a baffle to prevent the water from swirling as it enters the pipe.

During construction, the dam should be built at least 5% higher than planned to allow the soil to settle.

Anti-seep collars (large plates of steel or neoprene) should be sealed around the principal spillway pipe to prevent leaking around the pipe. They are normally spaced about 5'-10' apart.

Waterline

2 min
1

3 min
1

The slopes of the sides of the dam should be steeper on the inside and flat enough on the outside to be easily mowed.

A principal spillway pipe is needed to carry normal water flow safely beyond the dam.

The existing sod and topsoil must be removed underneath the entire dam area to prevent a seepage layer.

Core Trench

A water level control box (pictured below) may be installed to be able to lower the water level for maintenance or habitat purposes.

A cut off or core trench should be deep enough to cutoff any possible seepage either through gravel layers or rock and extend from one side of the dam to the other. It should be wide enough for typical equipment to build easily.

9" - 18" rocks placed at the outlet of the principal spillway pipe helps prevent erosion below the dam.

Dam Cross Section
Not to Scale

POND AREA IN ACRES

WIDTH \ LENGTH - FEET	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	950	1000
100	0.230	0.344	0.459	0.574	0.689	0.803	0.918	1.03	1.15	1.26	1.38	1.49	1.61	1.72	1.84	1.95	2.07	2.18	2.30
150	0.344	0.517	0.689	0.861	1.03	1.21	1.38	1.43	1.72	1.89	2.07	2.24	2.41	2.58	2.75	2.93	3.10	3.27	3.44
200	0.459	0.689	0.918	1.15	1.38	1.61	1.84	2.07	2.30	2.53	2.75	2.98	3.21	3.44	3.67	3.90	4.13	4.36	4.59
250	0.574	0.861	1.15	1.43	1.72	2.01	2.30	2.58	2.87	3.16	3.44	3.73	4.02	4.30	4.59	4.88	5.17	5.45	5.74
300	0.689	1.03	1.38	1.72	2.07	2.41	2.75	3.10	3.44	3.79	4.13	4.48	4.82	5.17	5.51	5.85	6.20	6.54	6.89
350	0.803	1.21	1.61	2.01	2.41	2.81	3.21	3.62	4.02	4.49	4.82	5.22	5.62	6.03	6.43	6.83	7.23	7.63	8.03
400	0.918	1.38	1.84	2.30	2.75	3.21	3.67	4.13	4.59	5.05	5.51	5.97	6.43	6.89	7.35	7.81	8.26	8.72	9.18
450	1.03	1.43	2.07	2.58	3.10	3.62	4.13	4.65	5.17	5.68	6.20	6.71	7.12	7.75	8.26	8.78	9.30	9.81	10.3
500	1.15	1.72	2.30	2.87	3.44	4.02	4.59	5.17	5.74	6.31	6.89	7.46	8.03	8.61	9.18	9.76	10.3	10.9	11.5
550	1.26	1.89	2.53	3.16	3.79	4.42	5.05	5.68	6.31	6.94	7.58	8.21	8.84	9.47	10.1	10.7	11.4	12.0	12.6
600	1.38	2.07	2.75	3.44	4.13	4.82	5.51	6.20	6.89	7.58	8.26	8.95	9.64	10.3	11.0	11.7	12.4	13.1	13.8
650	1.49	2.24	2.98	3.73	4.48	5.22	5.97	6.71	7.46	8.21	8.95	9.70	10.4	11.2	11.9	12.7	13.4	14.2	14.9
700	1.61	2.41	3.21	4.02	4.82	5.62	6.43	7.12	8.03	8.84	9.64	10.4	11.2	12.0	12.9	13.7	14.5	15.3	16.1
750	1.72	2.58	3.44	4.30	5.17	6.03	6.89	7.75	8.61	9.5	10.3	11.2	12.0	12.9	13.8	14.6	15.5	16.4	17.2
800	1.84	2.75	3.67	4.59	5.51	6.43	7.35	8.26	9.18	10.1	11.0	11.9	12.9	13.8	14.7	15.6	16.5	17.4	18.4
850	1.95	2.93	3.90	4.88	5.85	6.83	7.81	8.78	9.76	10.7	11.7	12.7	13.7	14.6	15.6	16.5	17.6	18.5	19.5
900	2.07	3.10	4.13	5.17	6.20	7.23	8.26	9.30	10.3	11.4	12.4	13.4	14.5	15.5	16.5	17.6	18.6	19.6	20.7
950	2.18	3.27	4.36	5.45	6.54	7.63	8.72	9.81	10.9	12.0	13.1	14.2	15.3	16.4	17.4	18.5	19.6	20.7	21.8
1000	2.30	3.44	4.59	5.74	6.89	8.03	9.18	10.3	11.5	12.6	13.8	14.9	16.1	17.2	18.4	19.5	20.7	21.8	23.06

CONSTRUCTION NOTES

Clearing

The first step in the construction of a pond is clearing the area of brush, roots, vegetation and other unsuitable materials. Care must be taken to assure that all tree roots are removed under the dam. Topsoil is stockpiled for later use on the front of the dam to encourage vegetative growth. Clearing should also include the area that will be under water.

Dam Layout

Once the site is cleared, the centerline of the dam is laid out. The core trench will be constructed along this centerline by removing at least 3' depth of material the width of the excavation equipment used. If questionable soils are noted, excavate below that material and re-compact with suitable clay. Otherwise see compaction for replacement of the removed material. This will ensure that water will not leak under the dam. Also measure your 3:1 or flatter back slope to ensure the toe is far enough from any property line to meet your local zoning. Contact your local township zoning officer for any zoning ordinances relevant to pond construction. Also check your deed for drainage or flood easements or other restrictions.

Subsurface Investigation

Ponds are often constructed in drainage patterns that contain subsurface drainage. Any tile found during excavation should be routed around the pond and outlet below the toe of the dam. Ignoring these tile could lead to backing up water in the tile or draining of your pond.

Compaction

Proper compaction is important to block seepage and prevent dam failure. Earth fill material should have an appropriate clay and moisture content.

The moisture content of the fill prior to compaction must be suitable to form a handheld ball that does not break apart. Compacted earth fill required to build the dam and core trench should be placed in uniform layers with a maximum pre-compacted thickness of 6". Each layer of fill should be uniformly tracked by a minimum of 4 passes with a sheepsfoot roller having a minimum compaction of 200 psi. The "feet" of the roller should have contact with the previously compacted layer. The dam should be built to the full design height with compacted layers. Once built, place 6"-12" of topsoil over the dam and disturbed areas to be seeded to establish good grass cover. Pictured is a true sheepsfoot roller.

Spillways

The pond must allow water to bypass safely. A typical pond has two structures called a principal spillway and emergency spillway; however, they can be combined in some cases. The principal spillway is the main structure usually in the form of a pipe. The pipe size is determined by the amount of runoff, drainage area, pipe material, pipe slope through the dam and how much storage area can be backed up behind the dam. The principal spillway should pass the 2-year or routed 2-year storm event quantity. Anti-seep collars should be placed on the pipe to prevent leaking. Around the pipe should be hand compacted until mechanical means can assure uniform compaction.

The secondary structure is the emergency spillway. It directs excess flow to a safe outlet during large rains. The emergency is typically notched out near the edge of the dam and never on filled material. This will be a wide flat area at least 1 to 2 feet lower than the top of dam. The emergency spillway should be designed to handle either the 10-year or 25-year storm quantity (depending on size of pond) minus the quantity of water the principal spillway is accepting. It should be planted with high velocity and water tolerant grass such as turf type or tall fescue to form a dense sod.

Use and Maintenance

All ponds require maintenance for proper operation. The landowner should check the inlet of the principal spillway pipe regularly and remove the debris that collects around the pipe. The outlet of the pipe should be checked for erosion. The dam should be checked regularly for signs of seepage, especially along the edges, bottom or toe of the dam, and along the

principal spillway pipe. The owner should inspect the dam for any signs of excess settlement, including slips on the inside or outside face of the dam. Remove any woody vegetation over the principal spillways and control invasive plant growth. Maintain the shape and height of the dam. Problems to look for in the emergency spillway include sparse vegetation, small rills or gullies, and debris buildup. If any of these problems are found they should be corrected as soon as possible.

The landowner should ensure that all safety equipment and signs are in working order and properly maintained. Any docks, rafts, or boats should be inspected regularly for safety. If a safety or privacy fence was built, it should be properly maintained to keep its original function. Pond dams and spillways should be protected from trampling by livestock with adequate fencing.

Beavers, muskrats, and other wildlife are attracted to ponds. If not properly controlled, beavers and muskrats can threaten the structural integrity of the dam by burrowing or plugging up the principal spillway pipe. Crayfish holes can potentially cause leakage. Wildlife should not be allowed to impair the proper functioning of a pond and related structures.

One of the most common maintenance problems is unwanted vegetation both in and around the pond. For weed control in the pond, contact the PSWCD. The first step in control of nuisance vegetation around the pond begins with proper construction. The pond's bottom should slope a minimum of 3 to 1 from the pond edge to minimize the area of shallow water. Many older ponds have trees growing on the backside of the dam. Their roots act like small pipes through the dam and allow water to slowly leak past the dam. Annual mowing of the dam and spillway keeps unwanted woody vegetation out of these areas. The pond should be built with slopes that allow access for mowing. Typically, the steepest slope that is safe to mow is 3 to 1.

Pond Liners

There are two alternatives for holding water on a site where the soil is too permeable to hold water naturally. The first option is to import clay from another site and incorporate it into the pond bottom before the pond fills with water. Bentonite clay that is available in 40 pound bags is another option. Clay products are cheaper and easier to install than textile liners. Both excavated clay and bentonite should be mixed with existing soil and compacted with heavy equipment, such as a sheepsfoot roller.

If clay is not available or practical to use, textile liners are another option for sealing ponds. These liners may be made of polyethylene, PVC or rubber. When using these products make sure that the thickness (mils) of the material is suitable for pond use. A minimum number of mils would likely exceed 5. These liners can be custom ordered but are not generally an option for larger ponds because of the cost of the materials.

Normally the liner is covered with 12 inches of soil to anchor the material and to guard it from ultraviolet light and any herbicides or other chemicals used in the pond at a later date. This soil cover can be troublesome on side slopes due to sloughing. Vandalism can be an issue as well. If the liner is punctured, the seal is broken and the pond water level will begin to fluctuate. Biodegradation of organic matter in the subsurface layer of soil or a rising water table can cause upward movement of gases which can expel the air from soil voids. If either of these problems are likely to occur based on your site conditions, the installation of a geotextile material sufficient to handle the estimated flows would be required to release the gases.

Alternative Water Sources for Rural Areas

Clean water can be taken for granted. Homeowners not served by public water systems generally turn to drilled wells as a potential source of household water. However, there are areas where well water production can be too low for domestic use.

Ponds that collect surface water can provide a good alternative and provide a source of clean, safe, and inexpensive water for livestock watering, lawns and gardens, swimming pools, or any other home or farm use. Optimum water quality is found at a depth of 12" to 36" regardless of total pond depth.

Managing the pond for weeds and algae, maintaining vegetation in the drainage area, and restricting the use of chemicals and pesticides within the watershed can protect the quality of the pond water. It is also important to consult state and local health departments to get the current regulations when planning a pond water system.

Pond Safety

Ponds can be enjoyed by everyone. Unfortunately, ponds are often the sites of accidents and drowning. Liability may increase for non-posted, non-fenced ponds. Making your pond as safe as possible should be a priority for every pond owner.

- Restrict entry to your pond to keep out uninvited guests.
- Keep rescue devices near your pond and readily accessible.
- Remove submerged safety hazards.
- Mark safe swimming areas with floats.
- Have your pond tested for any suspected contamination.
- Assure that guests and family members know how to swim.
- NEVER SWIM ALONE!

**information provided by Fairfield SWCD*

Dam Safety: Classification of Structures

Classification of dams is defined in the Ohio Administrative Code, Section 1501:21-13- 01. Dams which are exempt from the Ohio Department of Natural Resources, Division of Soil and Water Resources jurisdiction are defined in Ohio Revised Code, Section 1521.06. The chief of the Division determines the class of a dam during the preliminary design review for a new structure and/or during the periodic inspection of existing structures. Classification of dams is necessary to provide proper design criteria and to ensure adequate safety factors for dams according to the potential for downstream damage should the dam fail. Please note that the classification is not an indication of the condition of a dam.

Height of Dam

Class I — greater than 60 feet
Class II — greater than 40 feet
Class III — greater than 25 feet
Class IV — less than or equal to 25 feet

Storage Volume

Class I — greater than 5000 acre-feet
Class II — greater than 500 acre-feet
Class III — greater than 50 acre-feet
Class IV — less than or equal to 50 acre-feet

Potential Downstream Hazard

Class I — probable loss of life
Class II — health hazard, flood water damage to homes, businesses, industrial structures (no loss of life envisioned), damage to state and interstate highways, railroads, downstream dams, only access to residential areas
Class III — damage to low value non-residential structures, local roads, agricultural crops and livestock
Class IV — losses restricted mainly to the dam

Each dam would be evaluated on the preceding criteria and placed in the highest class that any one of these criteria might meet. The Division has the right to reclassify any dam as a result of a change in circumstances not in existence at the time of the initial classification. A dam is exempt from the state's authority if it is 6 feet or less in height regardless of total storage, less than 10 feet in height with not more than 50 acre-feet of storage, or not more than 15 acre-feet of total storage regardless of height.

**information provided by ODNR*

Dam Safety: Rodent Control

Rodents like the groundhog (woodchuck), muskrat, and beaver are attracted to dams and reservoirs, and can be dangerous to the structural integrity and proper performance of the embankment and spillway. Groundhog and muskrat burrows weaken the embankment and can serve as pathways for seepage. Beavers may plug the spillway and raise the pool level. Rodent control is essential in preserving a well-maintained dam.

Groundhog Control

Occupied groundhog burrows are easily recognized in the spring due to the groundhog's habit of keeping them "cleaned out." Fresh dirt is generally found at the mouth of active burrows. Half-round mounds, paths leading from the den to nearby fields, and clawed or girdled trees and shrubs also help identify inhabited burrows and dens.

Control methods should be implemented during early spring when active burrows are easy to find, young groundhogs have not scattered, and there is less likelihood of damage to other wildlife. Groundhogs can be controlled by trapping or shooting. Groundhogs will be discouraged from inhabiting the embankment if the vegetal cover is kept mowed.

Muskrat Control

Muskrats make their homes by burrowing into the banks of lakes and streams or by building "houses" from bushes and other plants. Barriers to prevent burrowing offer the most practical protection to earthen structures. A properly constructed riprap and filter layer will discourage burrowing. The filter and riprap should extend at least 3 feet below the water line. As the muskrat attempts to construct a burrow, the sand and gravel of the filter layer caves in and thus discourages den building. Heavy wire fencing laid flat against the slope and extending above and below the water line can also be effective. Eliminating or reducing aquatic vegetation along the shoreline will discourage muskrat habitation. Where muskrats have inhabited the area, trapping is usually the most practical method of removing them from a pond.

The recommended method of backfilling a burrow in an embankment is mud-packing. This simple, inexpensive method can be accomplished by placing one or two lengths of metal stove or vent pipe in a vertical position over the entrance of the den. Making sure that the pipe connection to the den does not leak, the mud-pack mixture (90 percent earth and 10 percent cement) is poured into the pipe until the burrow and pipe are filled with the earth-water mixture. The pipe is removed and dry earth is tamped into the entrance. All entrances should be plugged with well -compacted earth and vegetation re-established. Dens should be eliminated quickly as damage from just one hole can lead to failure of a dam or levee.

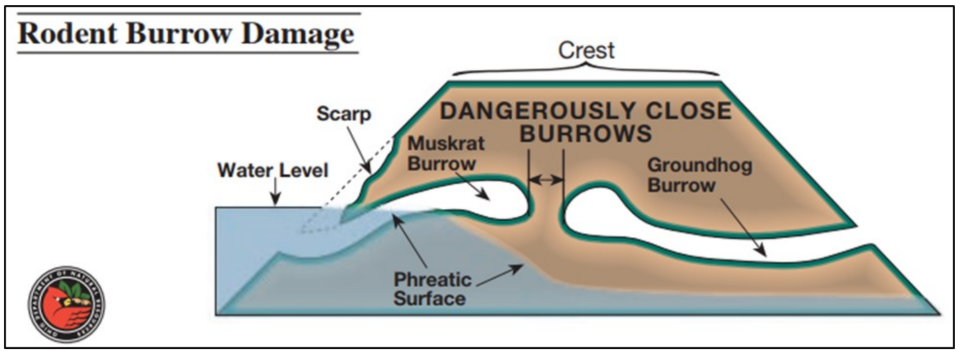
Beaver

Beaver will try to plug spillways with their cuttings. Routinely removing the cuttings is one way to alleviate the problem. Trapping beaver may be done by the owner during the appropriate season, however, the nearest ODNR, Division of Wildlife, District Office or state wildlife officer should be contacted first.

Hunting and Trapping Regulations

Because hunting and trapping rules change from year to year, ODNR, Division of Wildlife authorities at one of the following offices should be consulted before taking any action.

Additional questions or concerns should be directed to:
Ohio Department of Natural Resources, Division of Soil and Water Resources, Dam Safety Program
2045 Morse Road, Columbus, Ohio 43229-6693
Voice: (614) 265-6731
E-mail: dswc@dnr.state.oh.us
Website: http://soilandwater.ohiodnr.gov/
Emergency 24hr hotline: 614-799-9538

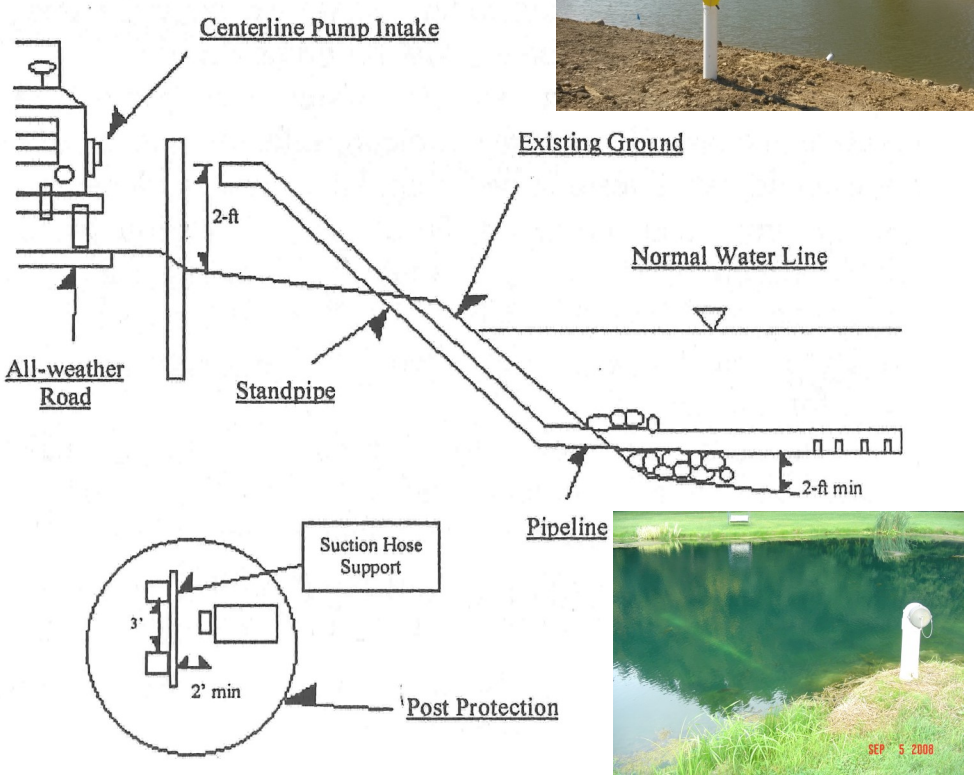


FIRE PROTECTION

A dry fire hydrant is a pipe system in a lake or pond that gives rural fire departments quick access to water year-round. Installation of a dry hydrant is partnership between a local fire department and the pond owner. In many areas of the state, fire insurance rates have been reduced by having a network of these structures in the rural community.

Dry hydrants do not impact the fish or wildlife population in the pond, nor will pond owners see much difference in the water level. Recommended water depth is 8' minimum. A minimum of 30,000 gallons (1.1 acre-inches) of pumpable impoundment water or a minimum pump flow rate of 250 gpm without interruption for 2 hours is considered a dependable water supply. The site must also be easily accessible for fire equipment.

Contact your local fire department to determine if installing a dry hydrant is an option.



**information provided by Fairfield SWCD*

AERATION

Dissolved oxygen is the single most important water quality parameter in lakes and ponds. All fish and most other aquatic organisms depend on dissolved oxygen for life. The minimum amount of dissolved oxygen required for fish to survive is 5 parts per million (ppm). Nearly all Ohio ponds under normal circumstances have oxygen levels that exceed this amount. Under natural conditions, plant life and surface diffusion from the air produce oxygen. This is distributed in the water by wind currents and by diffusion. These processes are adequate to satisfy the oxygen demands of the fish and other organisms under normal conditions. The exception might be an extremely hot, still summer day or prolonged ice and snow cover on top of a pond during the winter. Older ponds (over 30 years old) are much more susceptible to summer and winter oxygen problems because of the amount of accumulated organic matter on the bottom that uses up oxygen as it decays. This situation can lead to oxygen reductions in deeper water and fish kills can occur.

Aeration equipment can be purchased from fish and pond equipment suppliers to help overcome oxygen problems, especially in older ponds. Having a bottom-diffuser type aeration unit will keep the pond from stratifying during the warmer months. This allows the fish to have adequate oxygen levels from the top of the pond to the bottom. In general, the older a pond is, the more it will benefit from supplemental aeration. The most efficient systems use a bottom diffuser in one or two locations powered by an air compressor on shore. Compressors and diffusers are sized according to how large and deep the pond is. Most compressors are between 1/3 and 1 horsepower (hp). Power requirements for a 1 hp pump would increase electric costs for the pond owner by approximately $72 per month, assuming 10 cents per kilowatt hour, 1/2 hp would be $36 per month and 1/3 hp would be $24 per month. Approximate costs for an aeration system vary between $800 and $1,500 for a typical system.

**information provided by Fairfield SWCD*

STOCKING THE POND

Large mouth bass

Redear sunfish

Channel catfish

Bluegill

Bass, bluegill, and channel catfish are the most desirable species for warm-water ponds in this area.

Fish for stocking are usually purchased from commercial producers. The kinds and numbers of fish stocked in your pond will affect its success. Most ponds are stocked with a combination of a predator species and a forage species.

Largemouth bass are the recommended predator species for stocking in Ohio ponds. Stock bass at the rate of 100 per surface acre. Because bass feed almost exclusively on other fish, a forage species should be stocked as a food source. **Bluegill** and **redear sunfish** are the most commonly stocked forage species. Stock bluegill or redear sunfish at the rate of 150-200 per surface acre.

The least expensive size of fish for stocking is **fingerlings**. When using fingerlings, stock 100 largemouth bass and 500 bluegills and/or redear sunfish per surface acre of water. Ponds less than one-half surface acre may be stocked at this rate or with 200 **channel catfish fingerlings** per acre only. Channel catfish fingerlings may be stocked with bass and a forage species in ponds one-half acre or larger. Stock at the rate of 100 per surface acre.

These stocking rates for bluegills and redear sunfish are designed to supply the food needed by the bass and provide enough survival of the forage species to ensure spawning for a sustained food source. The rates for both predator and forage species should also produce enough adult fish to provide good recreational fishing.

Some pond owners want to fish for only largemouth bass and do not want bluegill or redear sunfish in their pond. For such a pond, golden shiners, bluntnose minnows, or fathead minnows may be stocked to provide food for the bass. These minnows should be stocked at the rate of 500 to 1,000 per surface acre.

Optional Stocking Sequence

- First year – minnows and bass
- Second year – bluegill, redear sunfish, and catfish
- Third year – channel catfish, grass carp, etc.

Water Temperatures

A common feature in building a pond is to create an environment for fish that will sustain them through the winter. This can be done by making at least 25 percent of the area of the pond eight feet deep or more.

Care should be taken when moving fish from one water source to another. If the water temperature difference is greater than 5 degrees F, slowly add pond water to the fish container so the temperature change is not greater than 2 degrees F per hour. If the fish are supplied to you in a plastic bag, float the bag in the pond for 30-45 minutes, then open and release.

Fish Spawning

Bass, bluegills, redear sunfish, and minnows will find suitable places to spawn in ponds without the addition of any special spawning structures. Catfish, however, require spawning structures that normally do not exist in a pond. If they do not reproduce, channel catfish must be restocked periodically to replace those harvested. In larger ponds, channel catfish may spawn if you provide eight inch or larger concrete tiles or rubber tires placed in areas where the water is two to five feet deep.

Exotic Species

The Ohio Revised Code states that it is illegal to introduce exotic (not native) species of fish into public or private waters of the state, but with a few exceptions. Triploid (not capable of reproducing) white amur (or grass carp) may be stocked in Ohio lakes and ponds for the control of aquatic vegetation.

Stocking Additional Species

Trout, crappie, perch, and walleye are not suitable for most ponds. Years of experience by hundreds of Ohio pond owners suggest that a pond stocked with bass, bluegill and/or redear sunfish, and channel catfish provides the best fishing and the fewest problems.

VEGETATION CONTROL

Vegetation that grows under, on, or out of the water in a pond may interfere with fish production and harvest, fishing, swimming, boating, and other recreational uses of the pond.

Vegetation that grows in a pond may be divided into four general groups. The first includes the microscopic plants that, along with microscopic animals, are called plankton. The microscopic plants in the water provide necessary oxygen and fish food, while large plants are not needed for fish life.

The other three groups (floating weeds, submerged weeds, and emergent weeds) are all undesirable from a management standpoint. Undesirable vegetation in a pond can be controlled mechanically, biologically, or chemically. Factors to consider include extent of control desired, feasibility, long- or short-term effectiveness, and cost.

Mechanical Weed Control - Vegetation around the pond edge can be controlled by hand pulling, cutting, or mowing. A longer-lasting, though more expensive, solution is to eliminate the shallow areas that are conducive to weed growth.

Biological Weed Control - This involves disrupting plant growth by modifying the aquatic environment through natural manipulation, or it can mean the introduction of a living organism capable of controlling the weeds. This can be done by maintaining a high level of plankton, by using inert dyes, or by adding triploid white amur to the pond. Triploid white amur are available from dealers with permits from the Ohio Department of Natural Resources, Division of Wildlife. County wildlife officers can provide a list of these dealers.

Chemical Weed Control - Three considerations are a must before starting a chemical weed control program: uses of the pond and the pond water, the time of year when the chemical is to be applied, and the kind of weeds to be controlled. Always read the entire label on any herbicide before applying. Note: The use of herbicides for the control of aquatic weeds usually requires annual applications. Applications made early in the growing season will usually give better results and will reduce the hazard of oxygen depletion later.

Types of Weeds and Treatments

Floating Weed Control

The most common type of floating weed in Ohio ponds is filamentous algae (moss or pond scum). This weed, which looks like a dense mat of hair like fibers, starts to grow on the pond bottom and on submerged objects in late February. It floats to the surface, often covering large areas of the pond.

Most species of this plant group can be controlled with very low concentrations of copper sulfate. It is best if treated in late March or early April. Determine the size of the area to be treated and then calculate the amount of chemical needed. The application method will determine what grade of copper sulfate to purchase. For best results, dissolve copper sulfate in water and spray it on the surface of the algal mat or on the water surface over the algae. Whether using liquid or granular copper sulfate products, apply early on a sunny day. Treat only half of the pond at a time to help prevent any oxygen problems.

Watermeal and duckweed are common weeds that grow in older ponds. Sonar or Avast are the best treatment options. The best sequence is applying half of a full treatment dose with a non-ionic surfactant to attach the chemical to the tiny plants on the pond surface. Wait a week and apply the other half of the treatment without a surfactant. This will ensure both the plants on the surface and the ones on the bottom are treated.

Emergent Weed Control

This group of weeds includes those growing along the margin of the pond as well as in other shallow waters. Their stems and leaves protrude above the water surface, like cattails, water lilies, bulrushes, arrowhead, and spatterdock. Their peak growing time is in July and the best time to treat them is after the first week of July.

Constructing the pond properly to maintain as little shallow water as possible is the best control for these weeds. Diquat dibromide (Reward) and glyphosate (Rodeo) are approved for emergent weed control. Diquat dibromide and glyphosate are applied as sprays and will give better results when applied with a wetting or sticking agent. You can add two tablespoons of liquid detergent to each gallon of spray mixture and spray on the exposed surfaces of

Water lilies can be invasive. Beware when planting.

the emergent weeds so a thin film covers the leaves. To reduce the amount of herbicide falling on the water surface when spraying emergent weeds, apply from a boat, directing spraying toward the shore. When applying herbicides along shorelines or spot-treating weed beds, it is best if applications are started along the shoreline or in the shallowest area and applied out to the deeper, water. This will enable fish to move into deeper water to escape the chemical.

Submerged Weed Control

Many water weeds grow below the surface of the water. They can be loosely or firmly rooted, suspended fragments, or clusters. They thrive in clear, calm, shallow waters. The common kinds of species found in Ohio ponds include the large family of pondweeds, coontail, water milfoil, water weeds, and naiads.

Once the plant has been identified, there are three herbicides that are most effective. For most pondweeds, Aquathol-K in liquid or granular form is very effective. This product is used in a tank or 1-3-gallon hand sprayer without any surfactant. It is a contact herbicide, so the chemical touching the actively growing plant will kill the leaves but not the root system. Aquathol-K is effective for nearly all submerged plants except coontail and watermilfoil. For these plant species, Reward is a better option. A third herbicide, Sonar or Avast, is also effective. The active ingredient is fluridone and it is the only aquatic herbicide on the market that has a timed-release. It can also control weed growth for more than one season. Treat early before submerged aquatic plants become too dense. Apply herbicide to only half the pond, then wait 7-10 days to apply the other half to prevent oxygen problems. Grass carp stocked at a rate of 4-6 fish per surface acre of water is also an effective way of controlling these aquatic plants.

Water Milfoil photo courtesy of Save Black Lake

Common Pond Weeds and Algae

Watermeal is a very tiny (less than 1 millimeter) light green free-floating, rootless plant. In fact, watermeals are the smallest seed-bearing plants in the world. Watermeal tend to grow in dense colonies in quiet water, undisturbed by wave action. Often watermeal will be associated with colonies of duckweeds. Watermeal can be an aggressive invader of ponds and are often found mixed in with duckweeds or mosquito fern. If colonies cover the surface of the water, then oxygen depletions and fish kills can occur. These plants should be controlled before they cover the entire surface of the pond.

Dense colonies of watermeal often can completely cover the surface of a pond and will cause dissolved oxygen depletions and fish kills. These colonies will also eliminate submerged plants by blocking sunlight penetration. Watermeal is not known as an important food but many ducks may consume it and often transport it to other bodies of water.

Common duckweed is a very small light green free-floating, seed bearing plant. Duckweed has 1 to 3 leaves, or fronds, of 1/16 to 1/8 inch in length. A single root (or root-hair) protrudes from each frond. Duckweeds tend to grow in dense colonies in quiet water, undisturbed by wave action. Often more than one species of duckweed will be associated together in these colonies. Duckweeds can be aggressive invaders of ponds and are often found mixed in with mosquito fern or watermeal. If colonies cover the surface of the water, then oxygen depletions and fish kills can occur. These plants should be controlled before they cover the entire surface of the pond.

Duckweed colonies provide habitat for micro invertebrates, but if duckweed completely covers the surface of a pond for an extended period it will cause oxygen depletions. These colonies will also eliminate submerged plants by blocking sunlight penetration. Many kinds of ducks consume duckweed and often transport it to other bodies of water.

Elodea is a rooted multi-branched perennial plant but can survive and grow as floating fragments. The dark green blade-like leaves (3/5 inch long and 1/5 inch wide) are in whorls of three with finely toothed margins. The flowers of Elodea have three white petals with a waxy coating that makes them float.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food (called "detritus") for many aquatic invertebrates. Elodea has no known direct food value to wildlife but is used extensively by insects and invertebrates.

Filamentous algae are single algae cells that form long visible chains, threads, or filaments. These filaments intertwine forming a mat that resembles wet wool. Filamentous algae starts growing along the bottom in shallow water or attaches to structures in the water (like rocks or other aquatic plants). Often filamentous algae floats to the surface forming large mats, which are commonly referred to as "pond scums". There are many species of filamentous algae and often more than one species will be present at the same time in the pond.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates (i.e. bugs, worms, etc.). These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food (called "detritus") for many aquatic invertebrates. Filamentous algae has no known direct food value to wildlife.

Planktonic algae are floating microscopic plants that are normal and essential inhabitants of sunlit surface waters. There are literally millions of floating planktonic algae, and they color pond water shades of green, blue-green, brown or variations in between. Planktonic algae that color the water is often called a "bloom" or "algae bloom". Many species of algae are involved in algae blooms and these species change over time based on temperature, light, nutrients, and other factors.

Planktonic algae blooms are considered desirable as the beginning of the pond food chain. In fact, fertilization programs are often used to promote algae blooms and thereby support a larger fish population. Planktonic algae is desirable for shading the pond bottom (in areas over 2 feet deep). This shading suppresses the establishment of rooted aquatic plants. However, too much planktonic algae can cause oxygen depletions and fish kills.

Chara is often called muskgrass or skunkweed because of its foul, musty almost garlic-like odor. Chara is a gray-green branched multicellular algae that is often confused with submerged flowering plants. However, Chara has no flower, will not extend above the water surface, and often has a "grainy" or "crunchy" texture. Chara has cylindrical, whorled branches with 6 to 16 branchlets around each node.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food. Chara is consumed by many species of ducks.

Sago pondweed is a perennial plant that arises from thickly matted rhizomes and has no floating leaves. The stems are thin, long and highly branching with leaves very thin and filament-like, about 1/16 of an inch wide and 2 to over 12 inches long tapering to a point. The leaves grow in thick layers and originate from a sheath. The fruit is nut-like 1/8 to 1/4 inches long and 1/10 to 1/8 inches wide.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food (called "detritus") for many aquatic invertebrates. Sago pondweed is an excellent food for waterfowl which eat both the fruits and the tubers.

Curly-leafed pondweed is a perennial plant that is native to Europe and gets it name from the rippled or wavy nature of its submerged leaves. The leaves are alternate, oblong 3/4 to 4 inches long and 1/4 to 1/2 inch wide. Mature leaves are toothed with a distinct midrib with paired parallel lateral veins, nearly translucent. Stems are flattened and branching. Fruits are seldom found, they reproduce from small "burr-like" vegetative structures that form at the base of some leaves. Curly-leafed pondweed can be an aggressive invader that can cover large portions of ponds.

Submerged portions of all aquatic plants provide habitats for many micro and macro invertebrates. These invertebrates in turn are used as food by fish and other wildlife species (e.g. amphibians, reptiles, ducks, etc.). After aquatic plants die, their decomposition by bacteria and fungi provides food (called "detritus") for many aquatic invertebrates. Since fruits are not usually present on curly-leafed pondweed, it has little food value to wildlife. It is a non-native plant and should not be spread.

*Common pond weeds and algae pictures and information are used from the Texas Cooperative Extension

This booklet is to assist prospective pond owners. The intent here is to provide you with the information to understand the proper procedures to acquiring and maintaining a pond. It is a general guide which should lead you to more specific information or where to get it. It is your responsibility to confirm current guidelines as this booklet was published and current as of the date it was revised.

MOST FREQUENTLY ASKED QUESTIONS

Q. What does the average pond cost?
A. Each site must be evaluated on its own. A qualified contractor or consultant can provide an accurate cost estimate. Multiple bids are recommended. A contractor's list is available at *www.pickawayswcd.org*

Q. Does the government stock private ponds?
A. No. Several private fish hatcheries can be found in Ohio. Fish are also available for purchase at the Pickaway SWCD fish sale each spring. For a list of fish offerings, contact the office at 740-477-1693

Q. I've had a fish kill. Can anyone tell what caused it?
A. There are many reasons why there can be a sudden fish kill. Disease, parasites, chemicals, and extreme weather changes can result in fish kills. The first three listed may require laboratory analysis. The weather can also play a part. As the water temperature increases in the spring, the water on top becomes warmer than the water at the bottom. Cold water is heavier, thus a sudden and hard, cold rain can cause the water on top to become colder than the water on the bottom. This will cause the water in the pond to flip over, taking the oxygen laden water to the bottom. This water will become clouded when it is stirred up in this manner. Since the fish stay in the upper reaches, they become starved for oxygen. Usually it will kill the larger fish first. A build up of snow on a frozen pond surface should partially be safely removed to allow sunlight in.

Q. How do I control the weeds and algae in my pond?
A. Many weed and algae problems can be eliminated with proper construction practices. Water less than four feet deep tends to encourage weed growth. Reducing the amount of shallow water in the pond will reduce the amount of weed and algae control needed. Spring fed ponds may require additional maintenance because the water is very clear allowing more sunlight to penetrate, which promotes weed growth. Chemicals control most weed problems. Information on these products and their proper use can be obtained from local chemical dealers. Proper ID is the key to controlling nuisance vegetation. Don't guess what the problem vegetation is. ALWAYS READ AND FOLLOW LABEL DIRECTIONS.

Another method for controlling pond weeds is the use of the triploid white amur. This grass eating carp cannot reproduce and will consume leafy and floating pond weeds and algae. They can grow up to five feet in length and can weigh up to 50 pounds. For more information, contact the Ohio Department of Natural Resources—Division of Wildlife.

Q. Do I need a permit to build a pond?
A. Sec. 1521.06 of the Ohio Revised Code governs construction permits for dams, dikes and levees. To obtain information on these laws, you should contact the Ohio Department of Natural Resources—Division of Water Resources. EPA permits may also be required, especially if over an acre is disturbed.

Q. Should I plant or maintain trees around my pond?
A. Any shrubbery or trees should be kept back from the water line and should never be planted on the dam itself. Falling leaves add excessive nutrients to the pond and can lower oxygen levels as they decompose. Trees are also a favorite place for animals to burrow near. Decayed roots leave potential channels for water to travel through the dam.

GLOSSARY OF TERMS

Borrow: Soil excavated from the surrounding area to build the dam.

Core trench: Excavated trench into original ground along the center line of the dam to a depth necessary to cutoff previous layers which could cause the water to travel under the dam.

Riparian rights: Rights a person has in the use of water when owning land adjacent to a stream or river.

Test holes: Pits usually dug with a backhoe to evaluate the soil to determine its capacity to hold water and determine levels of previous layers.

Triploid: Having an extra chromosome, which inhibits reproduction.

Watershed: This is the area that will drain toward the pond when it rains.

pH: A measure of the acidity or alkalinity of a solution. 7 = neutral solution, < 7 is acidic, and > 7 is alkaline.

Perennial: Lasting or active through the year.

Moraine: Debris, as boulders or stones, deposited by a glacier.

Outwash: Material carried from a glacier by meltwater and laid down in stratified deposits.

Acre-feet: The volume of water that will cover an area of 1 acre to a depth of 1 foot.

Sheepsfoot roller: A large roller drum with protruding "feet" or knobs, typically pulled behind a tractor.

PICKAWAY COUNTY ZONING INSPECTORS

Circleville Township	Dale Hoover	740-207-5932
Darby Township	Robert Hanrahan	740-869-7677
Deercreek Township	Steve Hammond	740-207-3230
Harrison Township	Doug Czakco	740-954-0270
Jackson Township	Dan Green	740-477-2744
Madison Township	Ben Bitler	614-774-1998
Monroe Township	John Secrest	740-869-3868
Muhlenberg Township	Kevin Steward	740-477-8600
Perry Township	Ron Spangler	740-495-5747
Pickaway Township	Alan Gabriel	740-474-5094
Saltcreek Township		No Zoning
Scioto Township	Jim McCoskey	614-214-1384
Walnut Township	Dale Hoover	740-207-5932
Washington Township	Kevin Driesbach	740-207-1318
Wayne Township	Mark Flynn	740-477-1304
City of Circleville		740-477-8224
Commercial Point		614-877-9248
New Holland		740-495-5097
Tarlton		No Zoning

information provided by Pickaway Co.

LINKS

Other pond information can be found at the following links:

Pickaway Soil and Water Conservation District
www.pickawayswcd.org
Be sure to look for:
- Fish species selection for stocking
- Controlling filamentous algae
- Ohio Drainage Laws
- Soil consultant list - https://bit.ly/2uKzkcL

Natural Resources Conservation Service Pond Standard
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1255042.pdf

Natural Resource Conservation Service Ponds-Planning, Design, Construction
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_030362.pdf

Ohio Fish Propagators
http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/fishing/pub196.pdf

Ohio Pond Management Handbook
http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/fish%20management/Pub432.pdf

Ohio Sport Fish Identification Guide
https://wildlife.ohiodnr.gov/portals/wildlife/pdfs/publications/id%20guides/pub334.pdf

Ponds and Legal Liability in Ohio Law Bulletin:
https://farmoffice.osu.edu/sites/aglaw/files/site-library/Pond%20Liability%20law%20bulletin.pdf

Soil Scientist & Evaluators
http://www.pchd.org/Soil%20Scientists%20List%202-13-18-1.pdf