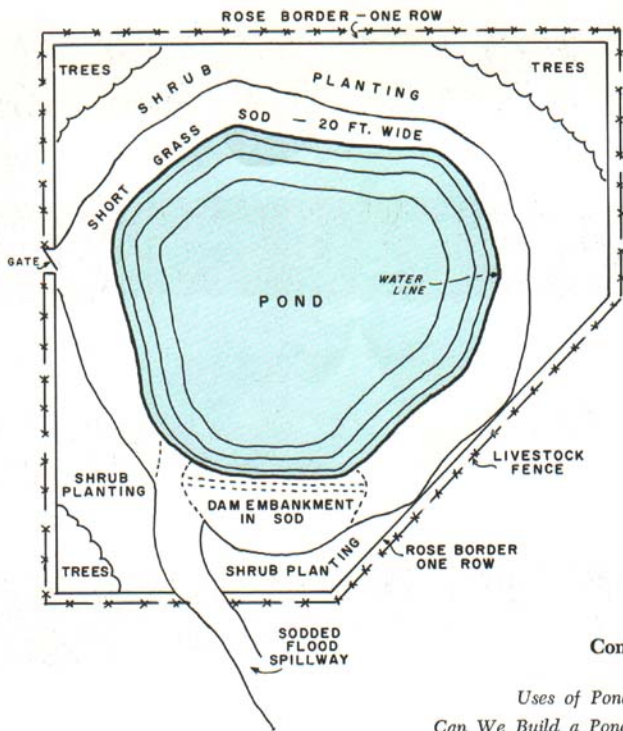


FILE COPY
DON'T FORGET
PONDS

for work

and fun



Plan View of Pond

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Ponds for Work and Fun



AS THE WATER WONDERLAND Michigan certainly does not suffer from a lack of water. Its 11,000 inland lakes also provide an ample impounded supply. Yet many rural landowners feel that a pond offers direct and indirect benefits.

Several reasons for constructing a pond on your property are discussed in this bulletin. Recommendations are given for developing one pond for a specific purpose or for many uses. It can be a major help with much of the farm work and will serve as a recreation center for the whole family.

Many landowners have built ponds. Others would like to but hesitate because they lack information on benefits, cost, and how to go about it. These problems are discussed and also some cost-share programs are outlined.

By Julian P. Donahue, member of the Honors College, Michigan State University, and C. R. Humphrys, Associate Professor, Department of Resource Development.

Cooperative extension work in agriculture and home economics, Michigan State University and the U. S. Department of Agriculture cooperating. N. P. Ralston, Director, Cooperative Extension Service, Michigan State University, East Lansing. Printed and distributed under Acts of Congress, May 8 and June 30, 1914.

USES OF PONDS

Ponds can be built to meet one specific need or a combination of many. Needs or uses most common in Michigan are

- water supply for livestock
- water for orchard-spray
- irrigation water for cropland
- fish for food or recreation
- home for wildlife and waterfowl
- center for family fun

swimming	boating	fishing
wading	hunting	nature study
picnicking	ice skating	loafing

Other important benefits derived by development of a pond are

- maintaining a desired level in the water table.
- control of erosion and excess water runoff.
- source of income from sale of fish and minnows, or fishing and recreation rights.
- an increase in property value.
- beautify your property.
- store water for fire protection.
- provide water for frost protection of certain small fruit.

CAN WE BUILD A POND?

In deciding whether or not to construct a pond, you should consider the following points:

Location

The easiest and least expensive pond to build is one located in a saucer-shaped area with three sides, with a slope of 4 to 8 feet per 100 feet, and with a narrow outlet. The cost of a pond dug from a level area may be so high as to discourage the construction.

(As a source of water for fire protection, the pond should be located within 500 feet of the farthest protected building.)

Type of soil

The location should have the following characteristics in order to maintain a good pond:

A large amount of clay in the subsoil to prevent seepage and leakage.

No rocky outcrops which might involve seepage losses.

Deep soil – a pond constructed within 2 feet of the bedrock might lose a considerable amount of water by leakage.

A clay supply for use in the center of the dam (core) to prevent seepage through the dam.

If you are in doubt concerning the makeup of your soil, the Michigan State University Soil Science Department will test a soil sample for a nominal fee.

Source of water

A *spring* provides the best quality water for a pond.

A *stream* supply is good. Water is *diverted into* the pond as needed and *the stream is not dammed up*. A dammed stream would soon fill the pond with sediment, requiring either a costly re-excavation of the pond or its abandonment. You will need the approval of the County Board of Supervisors to build a dam in a stream. In some locations it may be easier to pump water from a nearby stream rather than to divert the water from a stream.

Water runoff will supply enough water for the pond if there are 10 to 20 acres of field in the pond watershed for every acre of pond (or 20 to 40 acres of forested watershed for every acre of pond). A watershed here would mean all the land lying above the pond that could supply surface water to the pond.

You can also construct the pond by excavating an area to a depth below the normal water table. The water will then fill the depression naturally.

Pollution

The pond should not be located in an area where pollution from household waste water, barn waste, or sewage can get into it.

CONSTRUCTING THE POND

Certain features of a pond are the same no matter what the purpose is. A good pond employs general specifications on the dam, outlets and spillway, and on erosion control practices.

The dam is the most important part of the whole pond. Often it is the only part that requires great planning and labor. Dam specifications include:

Top — Make at least 8 to 10 feet wide to enable machinery to cross over it.

Sides — The pond side of the dam should have a slope of 3:1 (one foot rise for three feet horizontal distance) and the other side should have a slope of 2:1.

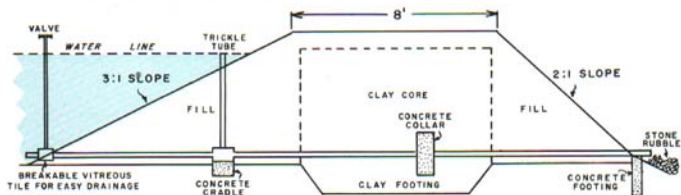
Core — The core is the center of the dam; it prevents leaking. A dam constructed entirely of soil containing a large percentage of clay will not need a core. If the earth is otherwise porous, a clay core must be provided.

The core extends from the top of the dam — and may be as wide as the top — all the way through the dam and down below the ground level, until it reaches an impervious clay layer. Careful construction of the core prevents later dam failures or losses. Several bulletins are listed in the attached bibliography that explain the details of construction.

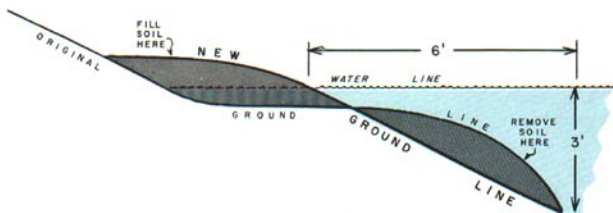
Trickle tube — This is a pipe which carries normal excess flow from the maximum water level inside the pond (which is two feet below the top of the dam) to the opposite side of the dam, or the drainage area.

Areas not supplied by springs or seepage and having a watershed of less than 5 acres do not require a trickle tube.

Drainpipe — The drainpipe is not an essential but it will surely be missed later on. It is laid horizontally through the dam, with the



Cross Section of Dam



How to Modify Slope of Shore

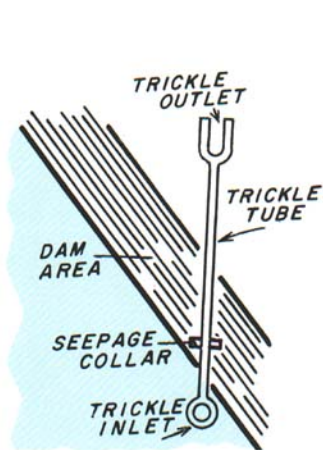
inlet at the deepest part of the pond. It drains through the pond to the drainage area on the low side of the dam. The opening on the pond side may be closed with a section of vitrified tile, and broken when drainage is required.

The trickle tube and the drainpipe may be joined in an inverted T-formation, thus economizing on costs. The outlet(s) for the drainpipe and trickle tube should drain onto a wide and deep apron of stone constructed on the downstream side of the dam, to slow the water and prevent erosion.

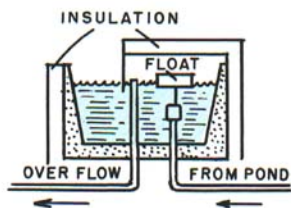
Emergency spillway — The spillway is one of the most important parts of the dam. If it is not properly constructed, the dam may wash out after the first heavy rainfall.

The spillway should be covered with a dense sod-forming grass such as fescue or Kentucky bluegrass. It should be *wide* and *shallow*.

Since the trickle tube removes the normal excess flow, the spillways — one located on either end of the dam — see action only during periods of high rainfall and heavy runoff. Normally, since the waterway will be wet only during brief periods, the sod cover may be maintained easily and is not likely to be drowned.



Trickle tube construction (top view) showing diagonal orientation to the dam. Diagonal positioning through the dam provides more surface contact with the clay core and reduces the possibility of a leak developing along the tube. Water area to left.



Water for livestock. Cross section of an insulated stock water tank. A pipe carries water from the pond to the tank.

Protection from erosion — The entire exposed area resulting from pond construction should be immediately seeded to a sod-forming cover and mulched to prevent erosion of the dam and the sides of the pond. Pond owners may get cost-share aid in the establishment of cover on the pond through the Agricultural Conservation Program.

Agricultural Conservation Program ponds must benefit agriculture. They must be primarily for irrigation or livestock. The need for either of these uses *must exist and be apparent*. Recreational uses are considered to be incidental to the primary use.

Suitable practices may include the following:

Practice A-2. Permanent vegetative cover.

Practice A-8. Tree and shrub planting for erosion control and wind-breaks.

Practice C-1. Special purpose vegetation for protection against erosion.

Practice C-8. Streambank or shore protection, channel clearance, enlargement or realignment, or construction of floodways, levees or dikes to prevent erosion or flood damage to farmland.

Not all practices are available in every county, nor is the cost-share amount the same for every county. For complete information, contact the Agricultural Stabilization and Conservation Committee office nearest the pond site. See listing of ASC committee offices in the appendix.

If you wish to request cost-sharing, *do not* begin a practice until entering upon an agreement with the Agricultural Conservation Program.

Qualified aid for construction — The limited information presented here is intended to convey an idea of the various aspects of pond construction. No matter how simple the pond appears to be — DO NOT ATTEMPT CONSTRUCTION WITHOUT OBTAINING QUALIFIED AND FREE TECHNICAL HELP FROM THE SOIL CONSERVATION SERVICE OR AID FROM A QUALIFIED ENGINEER. A list of soil conservation districts is contained in the appendix.

Services of Extension Specialists are available to all County Extension Directors.

POND FOR IRRIGATION



Irrigation of cropland is necessary in some areas of Michigan for the production of regular and specialized crops. An irrigation pond should be tailored to the needs of the individual crop, especially as to the amount of water consumed.

Find out if your county is represented in a Soil Conservation District. If it is, you can get information and help from the Soil Conservation Service (SCS) for building an irrigation pond.

The Agricultural Conservation Program has a cost-share program, under certain conditions, for irrigation pond construction. The amount of the cost-share varies from county to county. You can get complete information from the county committee office of the ASC. Ask about Conservation Reserve Practice, C-14, as it applies to the particular county in which the pond is to be constructed.

DO NOT BEGIN CONSTRUCTION UNTIL AN AGREEMENT HAS BEEN REACHED WITH THE AGRICULTURAL CONSERVATION PROGRAM OFFICE.

Complete technical aid and recommendations will be provided once an agreement has been reached. See appendix for appropriate address.

WATER FOR LIVESTOCK



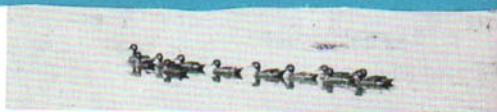
You may want a pond to provide water for livestock. It is little different from any other pond. The only variation would be a pipe to carry water from the pond to the tank. **Do not permit stock to drink directly from the pond.** As with all other types of ponds, the pond itself should be fenced to keep livestock out. Livestock can rapidly ruin a pond if allowed to graze the banks and muddy the water.

Cost-share – The Soil Conservation Service judges the need and practicability of a livestock-watering pond or pit. The individual requesting cost-share aid should inquire at his County Office. The SCS may give technical aid to those taking part in the Agricultural Conservation Program. Such a participant need not be a Soil Conservation District cooperator. However, he is encouraged to become one so that he can work this one practice into other soil and water conservation practices on his farm.

The Soil Bank Program provides cost-share for livestock-watering ponds under Conservation Reserve Practice B-7, "Farm Ponds for Livestock." The cost-share varies from county to county or may not be available at all. To see about the program for your county, contact the County ACP committee. See appendix for address.

DO NOT BEGIN CONSTRUCTION UNTIL AN AGREEMENT HAS BEEN REACHED WITH THE AGRICULTURAL CONSERVATION PROGRAM OFFICE.

POND FOR WILDLIFE



Muskrat pelts valued at nearly half a million dollars are harvested each year from southern Michigan ponds. Besides the obvious financial advantage, a pond for wildlife will encourage the production of game animals, wildfowl and songbirds. The value that songbirds provide by mere presence, and the value of weed seed and insects they destroy is impossible to measure.

A pond constructed to benefit wildlife would have:

- A large percentage of shallow water and weedy areas. This will provide nesting environment during the summer for migratory waterfowl and year-round habitat for muskrats.

- Proper and sufficient plantings of trees, shrubs and aquatic plants. These will provide food and shelter for wildlife.

Aquatic plants usually volunteer, that is, establish themselves without the aid of man. If environment is right, they will freely invade the area, the seed being carried by wind, by aquatic wildlife, or by a stream if one flows into the pond.

In Michigan, among the best aquatic plants for wildfowl food and nesting cover are wild celery, sago pondweed, and bushy pondweed. Others as beneficial will probably volunteer in a few year's time, so do not hurry to plant aquatic plants. Trees and shrubs, however, should be planted and encouraged. As soon as possible, plant a shrub or tree border suited to local conditions and known to benefit wildlife.

Don't plant trees closer than 100 feet to the waterline. Plant space between pond and trees with clumps of shrubs for landscaping and as food and shelter for wildlife. See appendix for suitable trees and shrubs.

Plant trees far enough away from, and *high enough* above the ground water level so they won't drown from an excess of water.

Trees or shrubs should not be planted on the dam.

● A stable water level. A fluctuating water level makes it hard to establish a good muskrat colony and good plant growth.

For wild fowl

If considering a pond for wild fowl only, look into aspects of size and construction.

Ponds of one acre or even smaller will attract the dabbling (surface feeding) ducks. Of course, larger areas up to 25 acres or more are more suitable.

You can build a pond for wildfowl by leading water into a low spot through ditches, or by pumping water from a lower level. In soft, swampy soils, blasting may be used effectively.

Fish and Wildlife Service specialists recommend that a pond constructed by blasting be in the shape of a horseshoe, or circle, with a fair-sized island in the center surrounded by water in a 40 foot channel. Explosives manufacturers can give further information on pond blasting.

Combination ponds for fish and wildlife

A deep pond for fish and a shallow pond for wildfowl, muskrats, and other animals can hardly be incorporated into one pond. One suggestion is either to drain or pump water from a fish pond onto a suitable area for a wildfowl or muskrat pond, or simply to flood an area, such as a field. Aquatic vegetation will soon establish itself. Stocking with minnows should take care of any mosquito problem.

The depth of this flooded area should be from one-half to 2 feet, preferably around 1 foot, and at least an acre in size. In the winter the water level should be raised to about 2 feet to provide protection for muskrats. Don't encourage fish larger than minnows since they won't grow to full size. The flooded area should be created and used solely for wildlife. Most landowners will probably want such multiple use ponds.

Department of conservation aid

Plan a good supply of trees and shrubs for wildlife food and cover. Cost is of major importance here. For areas over 5 acres in size it is possible to obtain free planting stock and assistance. To do this, you

enter into an agreement with the Michigan Department of Conservation to promote and encourage sound wildlife management.

Major points of the wildlife habitat improvement program are:

1. This program applies only to farms or lots over 5 acres in size, and is limited to the Lower Peninsula, *south* of a line drawn from Bay City to Muskegon and including Huron County.
2. The Game Division agrees to:
 - a. Provide a free survey by one of the Division's technicians to determine what is needed and where. From his visit and from aerial photographs, the technician makes a map of the property.
 - b. Prepare a long-range improvement program tailored to the needs of the landowner and the land.
 - c. Furnish, at no cost to the landowner, the trees, shrubs, seeds and other materials as are deemed necessary or desirable for wildlife.
3. The landowner enters upon a non-binding contract agreeing to:
 - a. Protect the land from grazing, fire, and all other destructive agents for 10 years after improvement is completed.
 - b. Plant and maintain materials as supplied by the Department of Conservation.
 - c. Make no direct charge for hunting privileges. The right to refuse or grant hunting privileges shall remain with the landowner or lessee.
4. The materials supplied by the Conservation Department may not be used for landscaping and cannot be sold with roots attached.
5. For further information, and for a request form, write directly to the Michigan Department of Conservation, Lansing 26, Michigan.

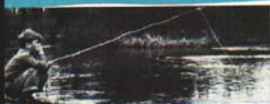
Cost-share

The Agricultural Stabilization and Conservation program may share the cost of a farm pond created for wildlife under Conservation Reserve Practice G-2, "Management of Water and Marsh Area to Benefit Fish and Wildlife."

You can get complete information on this and other Conservation Reserve Practices from the state or local office of the Agricultural Stabilization and Conservation Committee. See appendix. Make specific reference to the county in which the pond is to be constructed, for cost-shares vary from county to county and year to year.

CONSULT THE AGRICULTURAL STABILIZATION AND CONSERVATION PROGRAM OFFICE AND MAKE COMPLETE COST-SHARE ARRANGEMENTS BEFORE BEGINNING CONSTRUCTION.

POND FOR FISH



It appears that, in the past, the fishpond as a source of food has received too much emphasis. Now the trend seems to be toward using it for family recreation and as a source of income: owners can sell fishing rights, minnows, and harvest of fish. Also, the fishpond will result indirectly in more food for wildlife, such as mink, muskrat, raccoon, and various water-loving birds.

Major considerations of construction and management are listed below. Contact the Fish Division of the Michigan Department of Conservation, Lansing 26, Michigan, for detailed information and help.

Construction

The following points are essential to efficient fish production in a pond:

Depth — In Michigan, one-fifth of the pond area should be at least 10 feet deep to avoid winter kill and to provide a cool spot during the summer. The balance of the pond should be 3 feet deep, except possibly for a *very narrow margin* of shallower water.

Size — The pond should be at least one-quarter acre in surface area. One acre is large enough for a normal home pond and will provide sufficient fishing. The family pond should usually be no larger than 2 to 3 acres.

Seepage — This should not be more than the volume of the pond every 30 days.

Water quality — Make sure that sewage or waste does not affect the water quality. The pH (an index of acidity or alkalinity) should be

at least 5.0. You can get simple inexpensive kits for testing the acidity of soil and water. Write to the Soil Science Department, Michigan State University, East Lansing. Avoid old quarry, strip mine and gravel pit locations if the water is too acid or too alkaline. Have the water tested if there is any doubt.

Spawning beds — Provide a shallow margin for spawning. The three-foot depth of the normal pond will suffice. The sides of a steep-sided quarry may be blasted to provide spawning shallows.

Drainage — Install a drainpipe to completely or partially drain the pond when the need arises. You can drain the pond so as to harvest all fish at once, to harvest minnows, or to eliminate all fish in order to restock with a more desirable species.

Stocking

When the pond is built, you should start fish production at once. The State of Michigan normally does not supply fish for stocking in private ponds as the large amount of public water makes this unnecessary. Wild fish, caught by legal methods, may successfully be placed in a pond.

Species of fish — The species to use will depend upon the uses to which the pond is to be put. A standard stocking mixture is largemouth bass and bluegills. To provide food-fish and minnows you should get a mixture of bullheads and either golden shiners or fathead minnows — or any species of minnow with a high market demand. Bullheads do not feed on minnows, while if you stock bass, your minnow production will be low. Keep exotic species out of the pond — such as gold fish, muskies and salmon.

Stocking involves no hard and fast rules since all ponds are different. Consult the Fish Division of the Department of Conservation for individual stocking recommendations.

Management

Good fish production requires continuous management. You should practice the following:

Fish the pond often and intensively. Only in this way can you prevent overabundance or stunting.

Keep the pond free from waterweeds (see below).

Destroy most of the bluegill beds by scattering or removing the eggs. Look for the nest beds in shallow areas. A few nests will produce enough young.

Remove excess bluegills by seining, where this is practical.

Drain the pond to remove excess fish.

Be cautious about considering chemicals. The use of poisons is subject to many legal questions. So consult the Department of Conservation before attempting to poison your pond.

Do not overemphasize the use of fertilizer for small plant growth. In general, fertilizing ponds is not recommended in Michigan as a general practice. In Michigan's hard-water ponds, fertilizer has not produced the weed-killing results that it has in the South. Michigan tests show that increased winter-kill of fish has resulted from applying fertilizer. This practice however, has a definite advantage in minnow production when the fish are harvested before winter.

Before you undertake any management practices, get advice and recommendations from the Fish Division of the Michigan Department of Conservation.

Waterweeds

All waterweeds are undesirable in a fishpond. They

- interfere with fishing.
- impart a "fishy" taste to the fish.
- foster the breeding of mosquitoes.
- use up the pond fertility without providing food for the fish.
- encourage over-population of small fish, which is undesirable.

Types of water weeds are classed and treated as follows:

Submerged waterweeds—These weeds grow chiefly below the water surface. Where fertilizer effectively increases microscopic plant life, it may also prevent submerged weeds. The dense growth of the minute plants will shade out the submerged weeds. Where submerged plants are already established, they must first be killed and then fertilization may prevent further growth.

Floating waterweeds — These plants have floating leaves. Fertilization may prevent them from taking root.

Marsh or emergent plants — These often grow along the shoreline. Cattail is a good example. You can get rid of them by a repeated pulling up by the roots. However, if confined to a very narrow border around the pond — which will be the case if the pond is properly constructed — they should do no harm.

All types of waterweeds can be controlled by poisoning but be sure to get information first from the Department of Conservation.

Fishing rights

Rules by which the Michigan landowner may manage his own pond are:

a. If the pond is connected with public water, and the public and private water are not separated with a fish screen, the pond owner must abide by all State fishing regulations concerning size, season, limits, methods of taking and other State regulations.

b. If the private pond is in no way connected with any public body of water (streams included), then the owner may fish and manage his pond in any manner he chooses.

Cost-share

You may be able to share a large part of the cost of fishpond construction through the Agricultural Stabilization and Conservation Program under Conservation Reserve Practice G-3, "Constructing Dams or Ponds for Fish."

To qualify, you must carry out the good practices of fish-pond management listed above. The amount of cost-share varies annually from county to county.

DO NOT BEGIN CONSTRUCTION UNTIL YOU HAVE MADE AN AGREEMENT WITH THE ASC PROGRAM SERVICE.

POND FOR RECREATION



In the past, few ponds have been created solely for recreation. But the trend is to build in recreation factors right from the start. Any pond, regardless of its main use, can be readily adapted to meet the recreational needs of a family.

Boating – Does the family like boating? Consider this when planning the pond. Be sure there is enough deep water for unobstructed travel.

Ice skating – Shallow water freezes faster than deep water. So be sure to provide enough shallow water area if you want to use the pond for skating. However, if the water is shallower than 3 feet, weeds may impair the skating quality.

Swimming – Provide enough deep water for diving and a good swim area, plus intermediate depths and shallow areas for the young swimmers.

Wading – You may want to set aside a small quiet shallow-water area for the youngsters (or oldsters). Be sure it is properly fenced to prevent access to deep water.

Safety features – Be sure to provide safety features to protect people and livestock. The pond area should always be fenced to exclude people and livestock. Natural vines will usually volunteer to cover the fence in a short time, or suitable vines may be planted. (Some are listed in appendix)

Nature study – Any wet area, whether it is a marsh, bog, pond or swamp, offers a rich source of natural history material. The children and all the family can enjoy seeking out the exciting secrets of nature.

A quiet nature spot also offers inspiration and rest from a busy world.

Outdoor family room — While landscaping the pond, set aside a family picnic and recreation area. It should take little additional labor. Why not build a fireplace too, perhaps from local materials if suitable. If you build one, avoid creating fire hazards.

Scenic values — The scenic and aesthetic value of a pond cannot be put down in so many words or figures. With its plants and wildlife, it may offer just that degree of seclusion and solitude that many humans need or desire. There is a great pleasure in watching the nesting birds, the busy muskrats in the evening, the migrating pair of ducks as they stop overnight on their journey southward. Some people keep a record of the different species of birds seen on the property. Values such as these cannot be calculated but they are just as necessary to many people as food and water.

FRINGE BENEFITS

Besides more elaborate purposes of pond development, the owner may realize less emphasized uses and benefits from his pond.

Fire protection — If the pond is to be used for fire protection, it should be

- a. Within 500 feet of the farthest building to be protected.
- b. Adjacent to an all-weather road.
- c. At least 8 feet deep within 15 feet of the roadway. You will need some suitable method of pumping water from the pond, such as a brine barrel, oil-soaked plug, or a suitable hydrant equipped with the standard 4½ inch steamer connection. A 4 inch pipe may extend into the dam, and a gravel filter or screen placed on the inlet end. A dry hydrant should be at least 5 feet above the water, but not more than 20 feet above the water level.

Source of water for orchard spray — To serve this purpose, the pond should be:

- convenient to the orchard.
- capable of holding three times the anticipated total seasonal needs.
- at least 8 to 10 feet deep to hold down evaporation loss and weeds.

Increase in property value — Increased property value by addition of a pond cannot be measured directly but should not be minimized. A well-located and landscaped pond undoubtedly adds to the value or salability of your property.

Sale of minnows for income — A pond developed for minnow production should have

- a drain — essential for harvesting minnows economically.
- an unobstructed, level bottom to facilitate seining, if it is used.
- no species of fish, such as bass, that would prey upon minnows for their food. Bullheads offer no competition, and they supply edible meat and sport for the family.

Successful fertilization will encourage more plankton and algae which provide for small animals and insects, which in turn provide food for the minnows.

To avoid winter-kill, harvest the minnows in the fall. Winter kill is the result of low oxygen supply caused by a high rate of decomposition (oxidation of organic material uses up the oxygen supply), with the snow and ice on the pond surface usually acting as a seal.

You will always derive certain additional benefits from a pond whatever its major purpose. These include:

- Maintaining a high and relatively constant water table. A higher water table provides more moisture for plants and a steadier level of water in wells.
- Emergency water supply.
- Reduced fire danger in the immediate area.

POND MANAGEMENT

After the careful planning and hours of hard work that go into the construction of a pond, it is foolish to let it deteriorate. A pond requires little care, but the following practices should be observed:

- Protect the dam, the banks, and all other unprotected areas. Establish and maintain sod, trees and shrubs to prevent erosion.
- Keep the spillway in sod. Repair any bare spots immediately.
- Practice proper soil and water conservation measures on the pond watershed. This will keep the pond young and prevent costly and ruinous sedimentation.
- Manage the pond *continuously* in accordance with the program originally decided upon. This includes, for example, *continuous* harvest of fish from a fish pond.

A final reminder — DON'T plant trees on an earth fill dam. Don't let muskrats burrow in an earth fill dam.

Trees and Shrubs
Suitable for Landscaping and Wildlife

Species	Varieties and Notes	Number of bird species attracted
LOW SHRUBS (3 TO 6 FEET HIGH)		
Barberry, Japanese <i>Berberis Thunbergii</i>	Excellent nesting, food fair, generally better in the winter.	52
Barberry, Wild <i>Berberis vulgaris</i>	Fair food, year round.	52
Bayberry <i>Myrica pensylvanica</i>	Avoid limestone soils; fruit July to May; excellent food.	73
Coralberry <i>Symphoricarpos orbiculatus</i>	Good year-round food.	
Snowberry <i>Symphoricarpos albus</i>	Good year-round food.	35
Roses <i>Rosa</i> spp.*	Multiflora, Rugosa, (Other spp.) Fair nesting, good winter food.	Multiflora 25 (others) 40
Cherry <i>Prunus</i> spp.	Choke, Pin, Wild Black; food June to October; high quality food, popular.	75
MEDIUM-HIGH SHRUBS (6 to 12 FEET HIGH)		
Southern Arrow-wood <i>Viburnum dentatum</i>	Good cover, nesting, early fall food.	30
Withe-Rod <i>V. cassinoides</i>	Grouse, finches; many birds; Sept.-Nov. fruit.	35
Hobblebush <i>V. alnifolium</i>	Grouse, thrushes; July-Oct. fruit.	37
Black Haw <i>V. prunifolium</i>	Good cover, nesting; June-May fruit.	35
Highbush Cranberry <i>V. trilobum</i>	Native species best; fair cover.	
Squashberry <i>V. edule</i>		
Elaeagnus, Autumn <i>Elaeagnus umbellata</i>	Eaten by thrushes, etc.; good nesting, cover.	
Fragrant Sumac <i>Rhus aromatica</i>	Good cover, nesting, food; winter food available.	
Inkberry <i>Ilex glabra</i>	Good late winter food; fair food; cover, nesting; evergreen foliage.	40

*Spp. is abbreviation for species.

Compiled from "The Audubon Guide to Attracting Birds," by John H. Baker, ed.; "Beginner's Guide to Attracting Birds," by Leon A. Hausman; and "Fish Ponds for the Farm," by Frank C. Edminster.

Species	Varieties and Notes	Number of bird species attracted
Red-Osier Dogwood <i>Cornus stolonifera</i>	Medium high shrubs, use only on damp soil; fruit July to October.	95
Privet <i>Ligustrum</i> spp.	Good food, cover, nesting; Amur and Common best; winter.	
Black Alder or Winterberry <i>Ilex verticillata</i>	Grouse favorite; fair cover, nesting; food good; fall, winter.	50
Yew <i>Taxus</i> spp.	Good for grouse; ground cover; good food, cover; food fair.	

TALL SHRUBS (OVER 12 FEET HIGH)

Black Haw <i>Viburnum prunifolium</i>	Good cover, nesting; June to May fruit.	35
Flowering Dogwood <i>Cornus florida</i>	August to February fruit.	85
Mulberry <i>Morus</i> spp.	Summer food; French is shrub; others are trees.	60
Hawthorn <i>Crataegus</i> spp.	August to April fruit.	35
Holly <i>Ilex</i> spp.	Fair nesting, cover, food; evergreen.	50
Nannyberry <i>Viburnum Lentago</i>	May be small tree; many birds are attracted; fruit Oct.-June.	30
Russian Olive <i>Elaeagnus angustifolia</i>	Grows large; fair food, cover, nesting; winter fruit; leaves silvery-sheened; adapted to some areas.	

BROAD-LEAVED TREES

Birch <i>Betula</i> spp.	The <i>papyrifera</i> is best for ornamental; birds eat insects; nesting; winter fruit.	
Cherry <i>Prunus</i> spp.	Often distracts birds from other fruits; summer and fall fruit.	75
American Elm <i>Ulmus americana</i>	Excellent nesting for orioles; no food value; some insects; beware of Dutch elm disease.	
Hackberry <i>Celtis occidentalis</i>	Fair cover, nesting, good food.	42
Maple <i>Acer</i> spp.	Sugar, Red, Box Elder, Silver; fair cover, nesting; little food.	
Mountain Ash <i>Pyrus americana</i>	Favorite of winter waxwings, robins; fair cover, nesting; food good.	20

Species	Varieties and Notes	Number of bird species attracted
Mulberry <i>Morus</i> spp.	Summer food; good cover; nesting, excellent food.	60
Oak <i>Quercus</i> spp.	Fair cover, nesting; ducks eat many acorns.	

CONIFEROUS TREES

Cedar (Various genera and species)	Red—year-round food; White—cones for winter finches, good cover, nesting; fair food; favorite deer food.	52
Eastern Hemlock <i>Tsuga canadensis</i>	Excellent cover, good nesting and good food.	
Pine <i>Pinus</i> spp.	Good food, cover, nesting; Austrian and Norway well adapted; White good for roosting owls.	
Spruces <i>Picea</i> spp.	White (<i>P. glauca</i>) excellent nesting, good food, cover; others good food, cover and nesting.	

VINES

Vines round out nicely, provide bird food, cover. Planted around fallen trees they encourage use by grouse as a drumming log.

Virginia Creeper <i>Parthenocissus quinquefolia</i>	Fair cover, good nesting, excellent food in late fall and winter.
Bittersweet <i>Celastrus scandens</i>	Poor cover, nesting, good food in winter.
Grape <i>Vitis</i> spp.	Fair cover, nesting, good food, fall and early winter; bark used for nesting by catbirds and cardinals.

Plants used successfully at the Roosevelt Sanctuary demonstration area at Oyster Bay, Long Island, N. Y. are:^{*}

Tartarian honeysuckle: <i>Lonicera tatarica</i>	Bayberry: <i>Myrica pensylvanica</i>
Chinese Christmas berry: <i>Photinia villosa</i>	Shadbush: <i>Amelanchier canadensis</i>
Turquoise berry (Asiatic sweetleaf): <i>Symplocos paniculata</i>	Arrow-wood: <i>Viburnum dentatum</i>
Privet: <i>Ligustrum</i> spp.	Honeysuckle: <i>Lonicera</i> spp.
Inkberry: <i>Ilex glabra</i>	Silverthorn: <i>Elaeagnus longipes</i>
Black Alder: <i>Ilex verticillata</i>	Flowering dogwood: <i>Cornus florida</i>

^{*}From "The Audubon Guide To Attracting Birds," ed. by J. H. Baker, Garden City, New York, Doubleday, Doran and Co., Inc., 1941.

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- * U.S.D.A. (United States Department of Agriculture).
 † U.S.G.P.O. (United States Government Printing Office).

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