

Pond Construction and Management

Description

This BMP addresses two types of ponds, both of which can serve multiple purposes. This BMP does not address Sediment Basins, nor detention/retention basins or ponds. There are separate BMPs for Sediment Basins, Extended Detention Basins, Wet Detention Basins, and Infiltration Basins.

Excavated ponds are constructed by digging a pit in a nearly level area. They are made for conditions which require a small supply of water such as a golf course hazard. These ponds may require a permit from the MDNR, Land and Water Management Division.

Embankment ponds are made by constructing an embankment or dam across a stream or watercourse where the stream is such that 6 or more feet of water can be stored. Larger volumes of water can be stored using embankment ponds rather than excavated ponds. The Department will require an extensive assessment and justification to support the construction of a pond or dam in a natural stream. MDNR Act 346 permits will be required.

Note: Act 300, the Dam Safety Act, 1989, P.A. 300, states that a dam with a height of six feet or more and impounding five or more surface acres, requires a permit from the Michigan Department of Natural Resources. A permit is also required to repair, alter, reconstruct, enlarge, remove and abandon a dam. Inspection reports are also required under the Act, either every three, four or five years, depending on the hazard potential rating.

Pollutants Controlled and Impacts

Ponds can be used for stormwater management, to attract wildlife, to revitalize landscapes of poor quality, offer recreational opportunities and aesthetics, and offer water hazards on golf courses.

Surface water runoff provides a source of water to maintain the level in the **excavated pond**. If water quantity is more critical than quality, the runoff can be used to maintain higher pond levels.

Properly designed and maintained **embankment ponds** provide a safe, reliable means of water supply, and may become the settling area for sediment and contaminants in the drainage area.

Application

Land Use

This practice is applicable to all land uses.

Soil/Topography/Climate

Embankment ponds should be developed on soils which have the ability to hold water. Clays and silt clays are most suitable; sands and gravels less suitable. In less suitable soils, embankment ponds can be "treated" or sealed with materials such as clay or bentonite to make them suitable. Determine the suitability of the soil by soil surveys or soil testing.

When to Apply

Ponds should be developed during the growing season to allow rapid revegetation along the shoreline. Although pond development during winter months should be avoided (since spring runoff may result in the greatest amount of soil erosion back into the pond), in certain soil types development may be limited to the winter months. Development should occur during periods of low precipitation.

Where to Apply

Build ponds in areas where the water supply is adequate for the intended use and where water can be stored and accessed easily. Also, site ponds where dam failure would not result in significant downstream flooding. Avoid areas where pollutant sources from other land use activities could reach the pond. Except when developing wildlife ponds, avoid rich, organic soils, when possible.

Relationship With Other BMPs

The best way to extend the life of a pond is via proper site selection, and by implementing erosion controls in the drainage area. Slope/Shoreline Stabilization may be needed to protect slopes from erosion and wave action.

Vegetation should be established as soon after the pond is developed as possible using Seeding and Mulching or Sodding and other related BMPs.

Specifications

Planning Considerations:

1. Conduct a site evaluation to determine the best location for the type of pond needed.

For embankment ponds, consider upstream drainage characteristics and how the pond will affect downstream flows, temperatures, etc. Also consider **hazard potential ratings**. All dams have a hazard potential rating, (either high, significant or low, depending on downstream impacts in the event of a dam failure). Ratings are based on the U.S. Army Corps of Engineers 1977-1981 National Dam Safety Program Inventory of Dams.

For excavated ponds, consider drainage characteristics, including depth to the water table. All excavated ponds should be constructed in low-erosion areas to blend in with the surrounding topography. Where possible, native vegetation should be preserved to give the pond a natural look, and to provide shade.

2. Determine soil type, and rainfall amounts and expected frequencies.

Design Considerations:

Ponds should be designed by registered professional engineers.

1. The overall design of the pond should be based on the site characteristics and the intended use of the pond.
2. If the pond is to be used for irrigation, determine irrigation needs and design the pond accordingly.

3. Consider using a more irregular pond shape to provide more edge effect. A shallow ledge 10-20 feet wide or wider along the pond perimeter can be created to promote wildlife usage.
4. Install wildlife nesting islands if they can be placed more than 200 feet from shore, and if the intended use of the pond is not jeopardized. Water depth between the shore and island should be a minimum of 2 feet to discourage predation. These will need to be approved as part of the permit review process.

Embankment ponds:

1. If embankment ponds are to be sealed or lined to prevent groundwater infiltration, follow specifications in the Pond Sealing or Lining BMP.
2. All ponds should be developed to accommodate the runoff from a one percent or 0.5% chance flood event, depending on the hazard potential rating.

Excavated ponds:

1. Water in excavated ponds usually heats up to temperatures exceeding those of most streams at the inlet or outlet. Warmer water released from the pond may be harmful to the downstream water body. To allow cooling, ponds which will eventually release water to trout streams should be discharged over rock-lined (Riprap) and/or Grassed Waterways before releasing to the stream. The length of the waterway should be such that the water released to the river is within a few degrees of the stream temperature. (Note that for trout, water temperatures over 70 degrees F are considered to be stressful, and those above 77 degrees are lethal).
2. Consider using "bottom draw" outlet structures so that cooler water from the bottom of the pond enters the stream.
3. Upon completion of excavation, a six-inch layer of topsoil that is seeded and mulched will assist in the re-vegetation of shoreline and shallow water areas.

Slope and Depth:

For fish ponds: the slope should be 3:1, average depth should be 8-10 feet, and the maximum depth 12 feet or greater. Consider flatter slopes or a fence for safety. For wildlife ponds: the slope should be 10:1 or greater, average depth should be 2-3 feet, and the maximum depth 6 feet or less.

Construction Considerations:

Embankment ponds:

1. Construction should be done in accordance with all pertinent Michigan laws, including the Wetlands Act.
2. Install upland BMPs to prevent sedimentation of the pond. Coordinate BMPs using the Staging and Scheduling BMP.
3. Construct the pond according to design.
4. Install pond liners following specifications in the Pond Sealing and Lining BMP.

5. Dredge spoils from construction of ponds, including those permitted in or adjacent to wetland areas, must be placed on an upland site, and stabilized to prevent erosion. Permits will not generally be issued for the disposal of spoils in wetland locations.
6. For ponds with dams. Trees and brush shouldn't be allowed to grow on the dam embankment. Remove trees for a distance of 30-50 feet from the edge of the pond to prevent organic matter from accumulating in the pond. Establish a windbreak of evergreens or bushes. See the Tree Protection BMP for information on how to protect trees which will not be cut, as well as to determine which trees to cut. Use Garlon or other suitable herbicides to control brush, following specifications in the Pesticide Management BMP.

Excavated ponds:

1. Install upland BMPs to prevent sedimentation of the pond. Coordinate these BMPs using the Staging and Scheduling BMP.
2. Use proper Land Clearing and Grading Practices, and, where possible, leave a natural Buffer/Filter Strip around the pond.
3. Construct the pond according to design.
4. Spoil Piles should be removed from the site, smoothed back gradually to provide an even slope to the pond, or used as Diversions or berms around the pond to divert nutrient-rich surface water away from the pond. If the spoils come from a wetland, replacing them in or on the shore of the pond will help establish wetland vegetation.

After Construction:

1. Areas around the pond should be stabilized following specifications in the Seeding and Mulching or Sodding BMPs.
2. A Buffer/Filter Strip should be left around the pond. No fertilizers or pesticides should be applied in the buffer/filter strip except where necessary. When using fertilizers and pesticides in the drainage area around ponds, follow specifications in the Fertilizer Management and Pesticide Management BMPs.
3. Where appropriate, a safety station, equipped with a long pole or flotation device, should also be placed around the pond for personal safety.

Maintenance

Ponds are small ecosystems and as such are easily impacted and change quickly. Consequently, continuous management of the pond may be necessary to maintain it for its desired uses. Maintenance of upland BMPs can prevent pollutants from entering the pond and shortening its lifespan.

Routine **mowing** around embankment ponds should be done to keep unwanted vegetation from growing on the impoundment. Mowing makes the embankment less attractive to burrowing animals, prevents development of seepage paths along roots, and helps prevent dam failure.

If wildlife benefits are desirable, only mow once every three years, between July 15 and September 1. This will discourage woody vegetation while maintaining nesting and winter cover.

For pond treatment of **weeds**, start by reviewing your fertilizer management plan to ensure you are following specifications in the Fertilizer Management BMP. Weed control can be done via harvesting, altering the water levels and chemical treatment. Contact the Soil Conservation Service, local Cooperative Extension Service or the MDNR, Land and Water Management Division for weed removal options. Note that any natural or artificial lake, pond or impoundment which has a surface area five acres or greater, has definite banks, bed and continued or recurrence of water, will require an Act 346 permit for weed removal.

Purple loosestrife (Lythrum salicaria) is an undesirable, exotic perennial which often becomes established in disturbed sites. Eradicate purple loosestrife before plants become established and develop a large seed bank. Eradicate by hand pulling or digging, if feasible. Otherwise, cut stems and paint with a 50% solution of Roundup or Rodeo during July or August. Only **spot treatment** of Rodeo or Roundup should be done because these are broad-spectrum herbicides which will kill virtually all vegetation (including trees) in the sprayed area. Garlon 3A is also effective on the weed. Apply all pesticides following specifications in the Pesticide Management BMP.

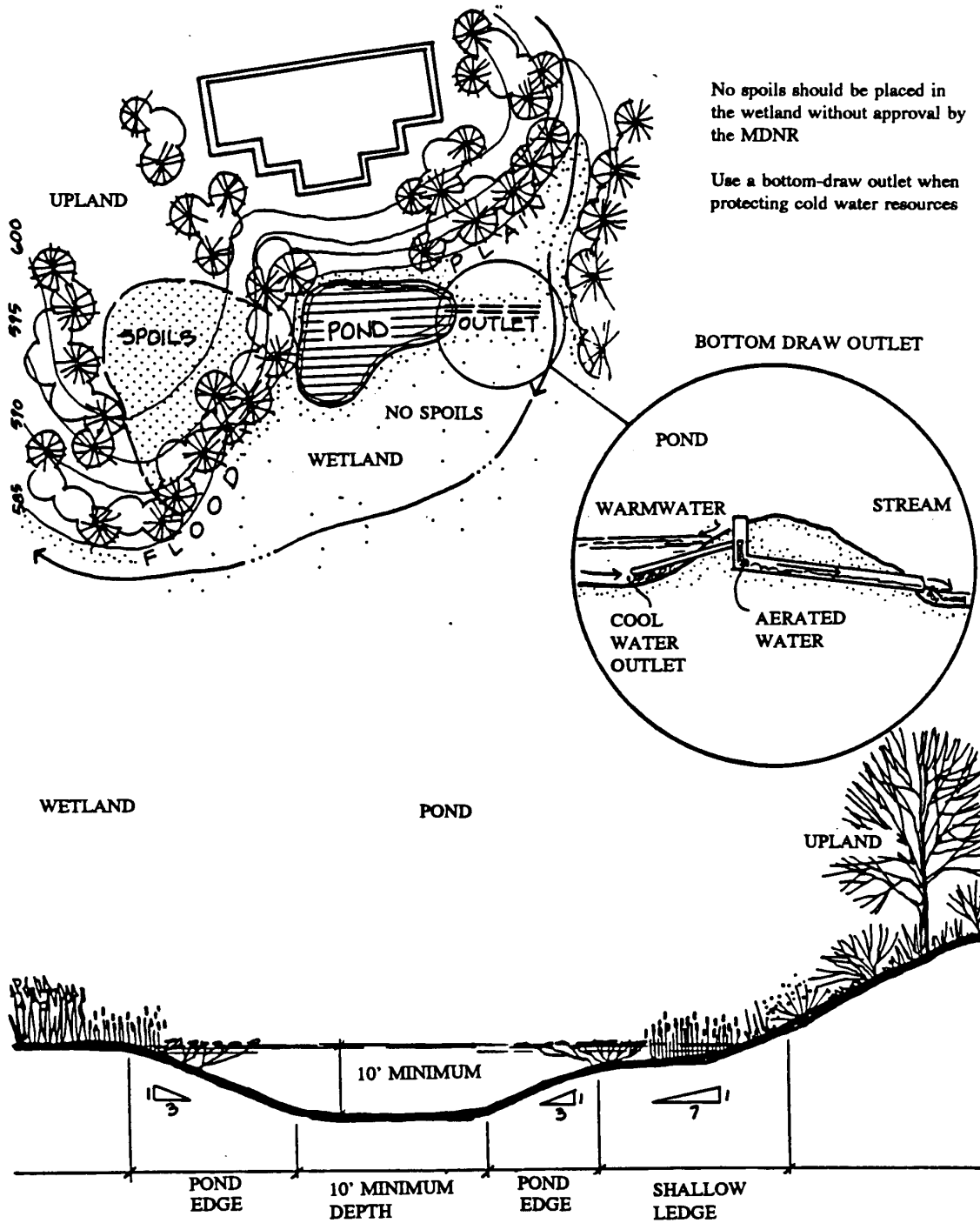
Permits from the MDNR, Land and Water Management Division, are required for herbicide treatment if standing water is present.

Ponds with **dams** require extra attention, since a break in the dam may affect the downstream riparian. Maintain barriers to prevent animals from accessing the pond. Fill any wash-outs that form and reestablish vegetation where erosion occurs. Maintain bank slopes and repair any muskrat damage.

Exhibits

Exhibit 1: Typical Pond Construction. Construction Project Evaluation Manual. Michigan Department of Natural Resources. 1987.

Exhibit 1 Pond Construction



Source: Construction Project Evaluation Manual. Michigan Department of Natural Resources, Land and Water Management Division.