

13. POND HABITAT MANAGEMENT

A farm pond can provide years of enjoyment if it is carefully planned and managed.

While no current estimates exist for the number of private (a.k.a., farm) ponds in Vermont, there are undoubtedly thousands of ponds dotting the landscape with the number increasing annually. Farm ponds are built for a variety of purposes: recreation (fishing and swimming); water supply (livestock watering, irrigation, fire protection); wildlife habitat; landscape enhancement; and water storage (flood control, storm water runoff, sediment retention). A farm pond can provide years of enjoyment if it is carefully planned, constructed, and managed. However, not all uses are compatible with one another. You should think carefully about why you want to invest the money and time into constructing a new pond.

As an example, a pond that livestock use to access drinking water is not likely to provide good fishing and certainly is not compatible with swimming. Likewise, if your primary use is to support trout for recreation and food, prerequisite requirements need to be considered before breaking ground otherwise you may well be sorely disappointed by the outcome. The discussion of farm ponds in this chapter will focus on their use as fish and/or wildlife habitats.



Figure 13.1
Hamilton Pond is an example of an excavated pond.

TYPES OF PONDS

Generally ponds fall into two categories: embankment ponds and excavated ponds. *Embankment ponds* are typically constructed by damming a stream or a ravine to catch surface runoff or in some cases spring outflow. *Excavated ponds*, on the other hand, involve digging a basin below ground level allowing water to be supplied by overland runoff, the water table, a spring or drilled well (see Figure 13.1). The damming of streams, whether intermittent or perennial, can be detrimental to natural stream ecosystems — the animal and plant life they support, including public fisheries — as well as natural stream channel forming and maintenance dynamics. For example, in-stream ponds often increase stream temperatures, degrade stream habitat, and restrict the

movement of trout and other aquatic populations. The construction of ponds on streams or in wetlands requires prior review and may be subject to state or federal regulation (specific contact information provided in this chapter under **Permits and Technical Assistance**).

SITE SELECTION

As in the real estate trade, the “location, location, location” axiom is equally important to proper pond design and construction. Location and size of the pond will be dictated by the lay of the land (topography), soil structure, and quantity and quality of the available water. Porous gravelly soils lacking sufficient clay can make it nearly impossible to hold water or at best maintain a desired water level throughout the year. Sites with shallow underlying bedrock can constrain excavation and prevent constructing a pond with adequate depth. While there are solutions to both situations, they can increase construction costs substantially. Your local office of the U. S. Department of Agriculture, Natural Resources

Conservation Service (formerly Soil Conservation Service) may be able to provide assistance with identifying the best location for a pond on your property.

Available water is also critical, but is frequently given inadequate attention during pond siting. Not only must water be ample without being excessive, it must come from a reliable source and be of high quality especially if your objective is to raise trout.

The placement of ponds on streams or in wetlands may have negative effects on critical fish and wildlife habitats; endangered, threatened or rare species; unique natural communities; as well as the natural physical and ecological functions of these landscape features. From a pond management perspective, on-stream ponds are faced with problems, such as retention of natural sediment load carried by streams requiring periodic costly dredging and permit acquisition and increased vulnerability to aquatic nuisance species and difficulties associated with their control. Therefore, the Vermont Fish and Wildlife Department does not recommend — and in some cases may oppose — construction of ponds in critical habitats. In addition, Vermont's Stream Obstruction Law (10 V.S.A. Section 4607) prohibits the installation of a structure that prevents fish movement, such as a rack, weir or other obstruction, unless an approval has been granted by the commissioner of the Vermont Fish and Wildlife Department. Projects where this is commonly an issue include culvert installation and dam construction or reconstruction. In cases where other agency permits are required, such as a dam order or stream alteration permit, this issue is addressed as part of that permit process. In cases where other permits are not involved, a request may be sent to the department. This is usually the case only if the stream involved is in a small watershed with a drainage area less than 10 square miles. For more information on the application procedure and required information, contact a permit specialist in the Agency of Natural Resources.

DESIGN CONSIDERATIONS

Ponds with the best potential for fish management and fishing measure at least 1 acre in size. However, most Vermont farm ponds are smaller with maximum water depths less than 10 to 12 feet. Consequently, average pond depth is much less (< 6 feet). At best such small farm ponds end up being marginal habitats for coldwater dependent fishes, such as trout, and are difficult to manage for quality size warm water fishes, such as bass and sunfish. Shallow ponds are particularly prone to warming up with lowered dissolved oxygen levels during the summer months reducing the amount of habitat needed to support trout. Oxygen depletion during the winter months can also occur after the pond ices over and snow accumulates on top shutting off light penetration. Extremely shallow ponds may even freeze to the bottom.

Additionally, shallow ponds are more vulnerable to promoting aquatic vegetation growth that is capable of spreading throughout the water body. Excessive vegetation not only interferes with other pond uses, such as swimming or aesthetics, depending on the type of plant it can add annually large volumes of organic matter to the pond. Decomposition of this organic material may lower dissolved oxygen below levels needed to support fish life, possibly resulting in periodic fish kills. So from a fish rearing viewpoint the largest, deepest pond your budget can support is the best path to follow. A minimum of 25 percent of the pond bed area should be at least 12 feet deep.

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Most ponds are excavated with shallow, low slope shore areas that can be conducive to allowing aquatic vegetation to take hold and provide wading fish-eating birds (e.g., herons) easy access to a meal. A couple design features can help address this. The pond shoreline can be excavated to have a minimum water depth of 3 feet. Or, the pond basin can be constructed with 3:1 side slopes. **Caution:** If the pond is also to be used for swimming, particularly by young children, deep water along the shore should not be provided for safety reasons.

Important design features of any farm pond are the built-in water control structures. These include the water control stand or drain pipe and an overflow emergency spillway. The primary function of the drain pipe is to maintain a desired pond water level during periods of normal or typical water inflow. If properly designed it also allows draining the pond to conduct maintenance when necessary. The emergency spillway on the other hand provides an alternate route to release excessive inflow such as from high spring runoff and flood events, thus lessening damage or even failure of the dam structure. Dam failure may result in loss of property, including land, buildings and roads, and possibly human life. Therefore, a professional engineer should be consulted to develop a pond design that not only will best achieve your own objectives but will be structurally sound and safe.

FISH MANAGEMENT

If your interest is managing the pond for fishing, design and environmental considerations touched upon previously will determine whether the pond is best suited for coldwater fish (trout) or warmwater species (bass, sunfish, and so on). To manage the pond for quality or catchable size fish, you must be able to exert effective control over fish abundance. This is most easily achieved in ponds stocked with trout, as most ponds do not provide all the necessary conditions for trout to reproduce naturally; therefore you control population size simply by adjusting the number of fish stocked and managing for any losses resulting from fishing, predation, or old age mortality. On the other hand, if spring seeps are present in the pond and the bottom consists of coarse sand and gravel, conditions may be suitable for natural brook trout spawning, but rarely does fish production in these situations attain problem proportions.

In contrast, bass, sunfish and other warm water fish are more apt to find habitat in the typical farm pond more suitable and thus reproduce freely. Consequently they require effective population control to maintain the appropriate balance between populations of predator fish (bass) and forage fish (sunfish, minnows). This may sound easier than it actually is, but inappropriate population and harvest management can lead to stunting (population excessively dominated by small size fish) and/or too few game fish to provide good fishing. All things considered, managing a pond for trout is simpler with more predictable outcomes than warm water species.

Trout require water that is relatively free of pollutants, is high in dissolved oxygen (> 5 ppm), and maintains cool temperatures (< 70°F) consistently throughout the year. The summer season tends to be the critical period of the year when these factors may be difficult or impossible to maintain, which results in fish stress leading to poor fish health and possible fish mortality. Surface waters, such as streams, all too frequently are not reliable water sources to deliver the required quantity of cool water to prevent excessive fish losses. Springs or a drilled well may be better options.

Trout must be purchased from a private hatchery that has been inspected for possible diseases by the Vermont Fish and Wildlife Department Fish Health Program. (For a list of in-state and out-of-state private hatcheries that are certified to sell and transport trout into Vermont contact the department at (802) 828-1000 or consult the website provided in Resources.)

Be aware: In Vermont it is illegal to capture fish, including trout, from the wild and transport them alive for stocking a pond without prior approval of the department to do so. Moving wild fish can introduce harmful diseases and parasites to your pond as well as to public waters threatening the health of captive fish and wild fish populations.

Table 13.1 below is intended to provide general guidance on the number of trout to stock into your pond and when. Fish numbers given are not absolute but may be adjusted to take into account your particular situation: habitat quality, the rate at which fish are harvested, and the cost of the fish. These numbers are for ponds where the fish are not provided with supplemental feed.

Table 13.1
Guidelines for trout stocking numbers of ponds

AGE CLASS	SIZE	# PER ACRE	WHEN TO STOCK	COMMENT
Spring fingerling	2–3"	200–300	April, May	Recommended only for ponds with no other fish
Fall fingerling	5–6"	50–150	Sept., Oct.	For initial stocking and restocking
Spring yearling	6–7"	50–150	May, June	For initial stocking and restocking
"Adult"	Over 7"	25–50	Spring or Fall	For initial stocking and restocking; can be expensive

Source: Schrouder, J. D., C. M. Smith, P. J. Ruzs, R. J. White, and D. L. Garling. 1989. Managing Michigan ponds for sport fishing. Michigan State University Cooperative Extension Bulletin E-1554, East Lansing.

Spring stocking is generally recommended as opposed to other times of the year. The two most frequently stocked species in Vermont farm ponds are rainbow and brook trout. Because rainbow trout can tolerate slightly warmer water than brook trout, it may be the best one to stock in a pond that may approach the upper thermal limit for trout during the summer season. Brown trout may be offered for sale by some private hatcheries but are not recommended for stocking small ponds. They are generally more difficult to catch, therefore living to an older age and attaining sizes capable of feeding on smaller stocked trout.

Ponds that provide year round requirements for trout assuring good survival may only need to be stocked every other year or so. If your pond has characteristics that do not promote trout surviving through the summer (too warm water temperatures, insufficient dissolved oxygen), you may want to consider put-and-take stocking, i.e. purchase harvestable size (> 6 inch) trout in the spring of the year and fish them for consumption before midsummer losses occur. Under this type of management the pond will need to be restocked annually.

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If the pond supports fish, stocked or otherwise, fish-eating mammals and birds, such as otter, mink, mergansers, and herons may become regular visitors.

If your pond does not provide the environment needed by trout, the alternative is to stock it with warm water fishes. However, introducing bass or any other fish other than trout to your pond cannot be done legally without first obtaining approval of the Vermont Fish and Wildlife Department. Vermont law prohibits the stocking of any fish other than trout into waters including private ponds that have connections (water discharge) to waters of the state. A department fisheries biologist will determine whether the introduction of bass or other species poses a threat to fisheries occurring in public waters should they escape from your pond.

In more recent years releasing goldfish and koi (ornamental carp) into private ponds has become popular. However, these fishes are nonnative species in Vermont that have the potential of becoming aquatic nuisances. Should they escape your pond, they may become established in natural waters. Once acclimated to your pond or in the wild they are difficult and costly to control and can deteriorate water quality, such as by promoting turbid or muddy water and algae growth. Goldfish and koi are best left in an aquarium or in a completely self-contained garden pool. No aquarium fish should be released into the wild or in situations where they may have access to state waters.

WILDLIFE MANAGEMENT

A farm pond will invariably become habitat for a variety of other wildlife (frogs, newts, turtles, aquatic insects and other invertebrates, birds and mammals). This is natural and should be expected as ponds, unlike artificial swimming pools, can provide many of the habitat needs of wild animals including food, water, shelter, and breeding areas. If the pond supports fish, stocked or otherwise, fish-eating mammals and birds, such as otter, mink, mergansers, and herons may become regular visitors. Use by wildlife can be very rewarding for nature observation and education. Adopting the following practices will make your pond more suitable habitat for wildlife:

- Refrain from maintaining the entire shoreland in mowed lawn.
- Plant native shrubs, flowering plants and grasses along the shoreline to provide wildlife with food, shelter and nesting sites. Fruit-producing trees and shrubs are particularly attractive to wildlife.
- Retain some dead trees (snags) in the vicinity of the pond. These can serve as natural nest trees for certain cavity nesting birds.
- Place nesting boxes designed to attract tree swallows, wood ducks, and other cavity nesters.
- Leave a few downed dead trees, logs, and boulders in shallow water to serve as sun basking sites for turtles and refuge cover for fish.
- Be cautious with some emergent and submergent plants in shallow areas not used for swimming benefit fish and wildlife. Because cattails and water lilies can become invasive, they are not recommended in farm ponds.
- Construct or purchase a bat house to locate near your pond. Bats nightly consume tremendous quantities of flying insects.

Of course wildlife may include “unwanted” species that are incompatible with your primary uses of the pond. Examples are the otters or heron that makes daily forays to feed upon the trout you stocked, or the snapping turtle that takes up residence in a pond intended for swimming. Should these situations develop, effective solutions can be challenging. Nonlethal deterrents, such as electric fencing and predator scaring devices, are available; however, their effectiveness can vary

considerably. Lethal control (trapping or shooting) may be appropriate but is legally controlled and must have prior state, or in some cases federal, approval.

Occasionally farm ponds attract beaver, which can pose problems with regard to keeping pond discharge structures free of woody debris. Beaver also can cause destruction of nearby trees and shrubs and bring health concerns associated with the *Giardia* parasite which may be spread to humans and pets through the ingestion of infected water. Pond owners faced with nuisance beaver should consult the document *Best Management Practices for Resolving Human-Beaver Conflicts in Vermont* available on the Vermont Fish and Wildlife Department website (link provided in **Resources** below).

PERMITS AND TECHNICAL ASSISTANCE

If you are contemplating building a new pond, renovating an existing one, or carrying out certain forms of management, note that in many cases state and even federal permits may be required. Permits are necessary to protect the public's safety; maintain environmental quality; and avoid negative impacts to certain fish, wildlife, plants, and unique natural communities. Frequently, a representative of the agency charged with issuance of the permit will arrange to visit the proposed pond site to determine whether a permit is needed and if so under what conditions the project can be permitted to move forward.



RESOURCES

U. S. Department of Agriculture, Natural Resource Conservation Service. *Farm Pond Ecosystems*. <ftp://ftp-fc.sc.egov.usda.gov/WHMI/WEB/pdf/TechnicalLeaflets/FarmPond.pdf>

Vermont Department of Environmental Conservation. "Aquatic Nuisance Control Permit." http://www.anr.state.vt.us/dec/permit_hb/sheet30.pdf

—. "Stream Alteration Permits." http://www.anr.state.vt.us/dec/permit_hb/sheet32.pdf

—. "Wetland Conditional Use Determinations." http://www.anr.state.vt.us/dec/permit_hb/sheet29.pdf

—. "What You Should Know about Constructing a Pond or Dam." http://www.anr.state.vt.us/dec/permit_hb/sheet32_1.pdf

Vermont Fish and Wildlife Department. "Managing Problem Beaver." http://www.vtfishandwildlife.com/library/reports_and_documents/Furbearer/Best_Management_Practices_for_Human-Beaver_Conflicts.pdf

—. "Pond Stocking Information." http://www.vtfishandwildlife.com/library.cfm?libbase_=Factsheets/fisheries/Pond_Stocking_Information

University of Vermont, School of Natural Resources. "Algae in Farm Ponds." <http://pss.uvm.edu/vtcrops/articles/Algae.pdf>

Bat Conservation International. Bat House Construction Design. www.batcon.org

Beaver also can cause destruction of nearby trees and shrubs and bring health concerns.