



Build Your

by Thomas R. Biebighauser

Perhaps the most important project you can complete to help wildlife in a woodland is to build a wetland. Every animal from white-tailed deer, waterfowl, frogs, and salamanders will benefit from having a shallow water habitat in the forest.

Wetlands don't have to be large to help wildlife. One that is only 18 inches deep and 30 feet across can help wood ducks, spotted salamanders, and wild turkey. Properly constructed, a wetland can be expected to last for thousands of years. Provided your land has soils that are high in clay, a wetland can be built for under \$1,500.

Techniques are now available for building a wetland just about anywhere on a landscape. Mountain ridge tops, benches, small bottomland fields, mined areas, and even transmission line right-of-ways can be turned into a wetland. The good news is that you don't have to be an expert to construct a wetland. Following these simple steps will lead to success.

When looking for a place to build a wetland, search for land that appears level, whether in an open field, young forest, or canopy gap within an older forest. An area that is 80 feet in diameter or larger will provide enough space for building a wetland that appears natural.

There is no need to interrupt a stream to build a wetland. Avoid the high costs and negative environmental impacts associated with damming a stream by choosing a location on higher ground. Building a wetland on a dry ridge is a good idea. You'll supply much-needed water to wildlife and can avoid problems associated with buried gravel often found along streams.

Select an area that changes 3 feet or less in elevation from upper to lower edge. If the ground looks flat enough to pitch a tent on for a good night's sleep, then it is level enough to build a wetland. It's always better to stair-step several shal-

lower wetlands down a steep slope than to build one large one with a huge dam.

Use plastic flagging to mark the perimeter of a construction site that is at least twice as large as the surface area of water planned in the new wetland. The added space will be needed for piling woody debris, vegetation, and topsoil and for building a dam with gradual slopes. Don't be afraid to remove some trees to create a wetland. In many cases, they are now only growing on a site because it was historically drained.

Determine whether the wetland you are building will be supplied by surface water or by ground water (see key below). A surface water wetland holds rainfall like a cereal bowl, that is, within a depression of packed soils that are high in clay and a dam that prevents water from flowing downhill. A ground-water wetland contains water like a large hand-dug well, exposing a high water table present near the surface.

Wetland Construction Strategies Key

Use the following key to identify the best construction method to use in building a vernal pond. This key uses information you obtain by testing the soil at the construction site. Start by reading both A's to see which one applies to your area.

If....

- (A) Water seeps into the test hole from the bottom and sides and rises near the surface: **Use the Ground-Water Strategy**
- (A) Little if any water seeps into the test hole... (go to step B)
- (B) Soils high in clay (you can make a ribbon 2 inches or longer): **Use the Surface-Water Strategy**
- (B) Soils not high in clay: **Use a Synthetic Liner**



Own Wetland

Photos courtesy: Thomas R. Biebighauser

An indication of the type of wetland that can be built may be determined by using a post-hole digger to dig a hole at least 3 feet deep near the center of the worksite. Watch to see if water seeps into the hole from the bottom and sides. If the hole fills partially or completely with water, a high water table is present, and a wetland can be built that will fill with ground water.

When considering the possibility of building a surface-water wetland, the amount of clay in the mineral soil must be determined. Mineral soil is located below the topsoil layer, which is dark colored and contains fine roots and organic material. Soils suitable for holding surface water are high in clay and silt. Soils with enough clay feel smooth and sticky like a mashed Tootsie Roll, while those with silt feel like wet flour. Soils that have too much sand and gravel feel gritty.

A simple test can be used to determine if the clay and silt content is high enough to build a surface-water wetland. Make a 1-inch ball of soil, add some water, and then try to form a thin ribbon between the thumb and forefinger that is 2 inches long or longer before breaking. If you can make a ribbon that is at least 2 inches long before it breaks, then the soil has enough clay and silt to be shaped and packed to hold surface water. Both natural and restored wetlands maintained by surface water have dams consisting of compacted clay that prevent waters from flowing downhill to a stream or river.

Before you begin construction, obtain necessary permits and approvals. Permits are generally required when building in a floodplain or within an existing wetland. Additional approvals may be required concerning archeological resources and federally endangered species.

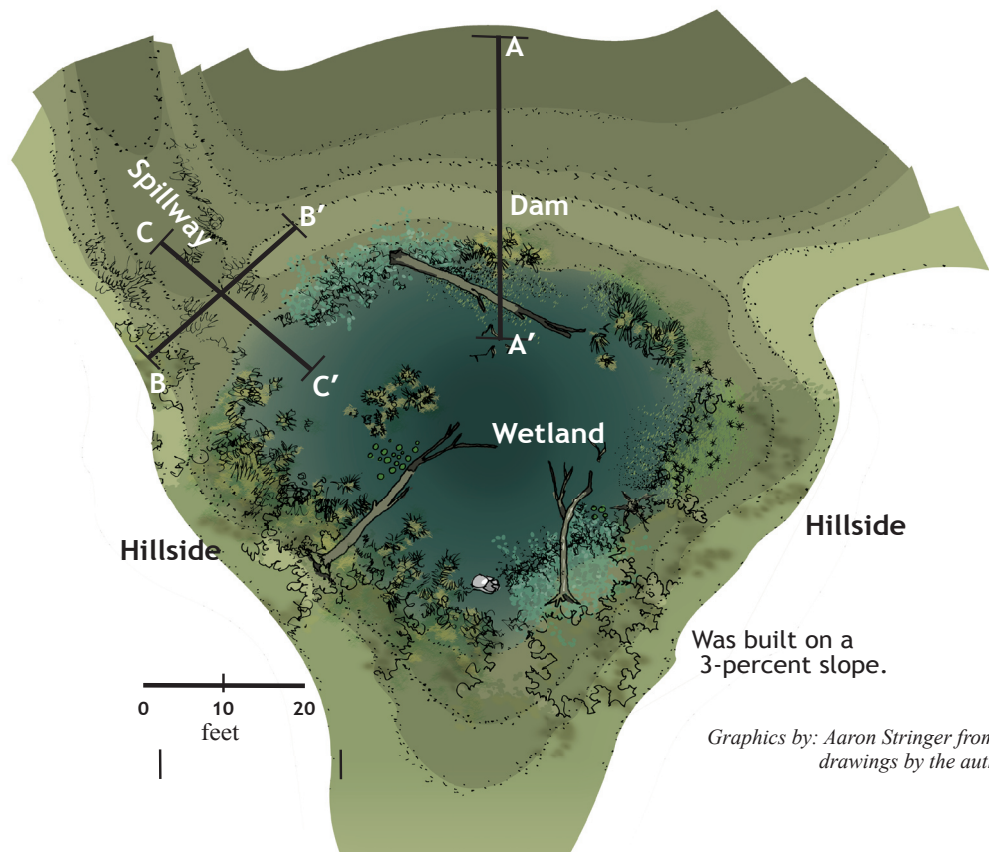
Let's assume you've found a location that has enough clay to build a surface-water wetland. These wetlands

should be built only when soils are dry enough to shape and pack, which usually corresponds to when farmers are in their fields working. Avoid building during drought as dry soils cannot be packed, and loose soils will not hold water.

Hire an experienced heavy equipment operator to build the wetland. A combination of an excavator and dozer works best for construction. The dozer should be equivalent to a Cat D5G, having 90 HP or greater, weighing at least 20,000 pounds, with metal tracks, a 6- or 7-way blade, and an inside C-frame. The excavator should be equivalent to a Kobelco 135SR or larger model having 90 HP or greater, metal tracks, weighing at least 28,000 pounds, and a bucket that is 42 inches wide or greater.

Begin construction by clearing vegetation and hiding it in small piles behind trees along the lower edge of the work site so it will not dominate the view of your new wetland. Save any large trees that are removed for placement in the completed wetland.





Once vegetation has been removed, use a simple construction level and survey rod to determine the location and elevation of the dam to be built. Begin by setting up the construction level on higher ground overlooking the work site. Choose a point along the uphill edge of the cleared area where you would like water to reach in the new wetland. The reading on the rod at this point will equal the elevation where water will reach in the new wetland and will be the same as the spillway elevation, which we will call “S.” Mark the beginning of the dam and the spillway location by walking to one side of the flagged area and finding where the elevation is equal to S, placing a wire flag in the ground at this point. Now walk over to the other side of cleared area, mark where the elevation is also equal to S, and set a wire flag at this point. Next, mark where the wetland dam and core will be located by adding flags between these two flags, forming a line with a gentle arc that bows downhill. This line marks the center of the dam to be built and should be at least 40 feet uphill from the lower edge of the cleared area so there will be enough room to place topsoil and a gradual slope on the backside of the dam. The elevation of the dam will be equal to “S” plus 12 inches for that portion of the dam that will be built above the water level in the new wetland.

After the location of the dam has been marked, use the dozer to remove roots and topsoil, pushing approximately one-half of the material downhill along the lower edge of the cleared area and the other half uphill in piles that are out of the way. The excavator should then be used to dig a trench for the core along the entire length of dam to be built. The trench should be dug as wide as the blade is on the dozer and extend down into the ground so that the bottom is based on bedrock or an impermeable layer of clay. The core must be dug below the bottom of all crayfish burrows and interrupt and block all buried drain lines, gravel layers, sand pockets, buried shrubs, and trees. An average depth for the core trench is 6 feet on ridge tops and 12 feet deep or more near streams and rivers.

Fill the core with soils that are high in clay. Use suitable soils removed from digging the core trench, and scrape additional clay from the area in front of the dam. Spread the clay in layers 12 inches thick or less within the trench, and run over each layer four times or more for compaction. Build the dam the same way over the top of the filled core trench. The top of the dam should be level and be at least as wide as the blade on the dozer. Placing gradual slopes (10 percent or less) on both the front and back of the dam will ensure longevity, increase plant diversity, and improve the appearance of the new wetland.

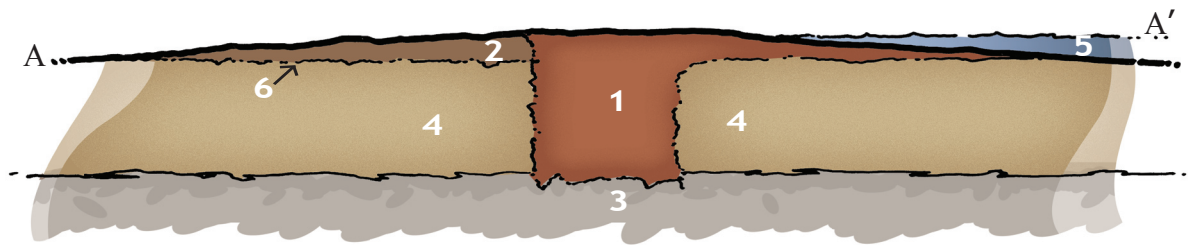
Decide how deep you would like the water to be in your new wetland. Wetlands that are 18 inches deep or less can be expected to dry in drought years and will provide critical habitat to frogs, toads, and salamanders that can’t compete with fish. Deeper wetlands may contain water year round and will provide drinking water to deer, wild turkey, and bats in time of drought. Make sure the heavy equipment operator is aware of your desired maximum depth for the new wetland.

Build your wetland with an interesting and irregular shape, avoiding rectangles, squares, and straight lines that appear artificial. Generally, the more gradual the slopes and the wider the top of the dam, the better it will blend with its surroundings.

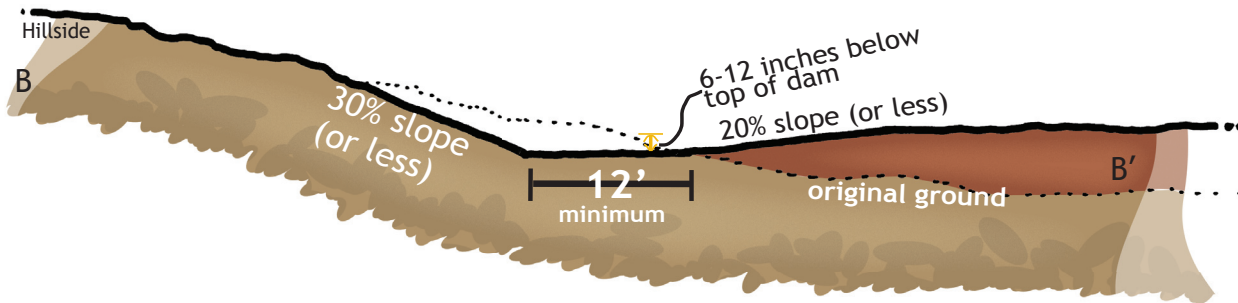
Construct a gradually sloped spillway that is at least 12 feet wide to carry overflow from the wetland and around the dam. The spillway should be located on undisturbed ground at one end of the dam along the upper edge of the cleared area. The elevation of the spillway should be from six to 12 inches below the top of dam to handle overflow. Waters leaving a wetland over the spillway should follow a gradual path downhill away from the dam so as not to cause erosion.

Spread topsoil over the dam and the bottom of new wetland. The topsoil will promote the rapid growth of plants on exposed

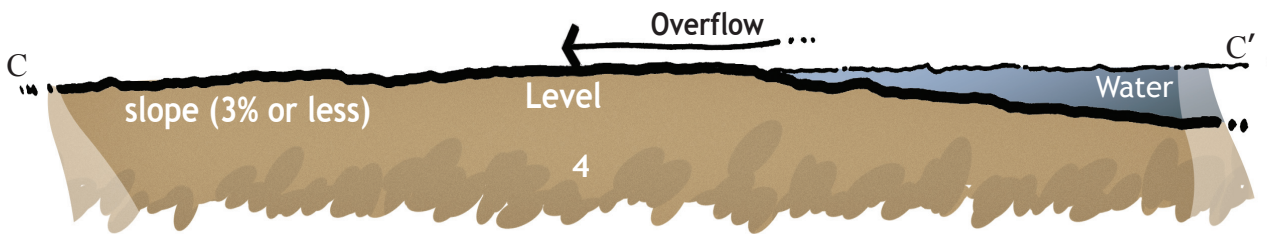
**Profile A
Dam**



**Profile B
Spillway Construction**



**Profile C
Spillway Path Construction**



Note: The spillway path follows undisturbed ground.

The following numbers correspond to the labels in each graphic:

1 = Packed silt-clay groundwater & dam (10% slope or less)	4 = Undisturbed ground
2 = Backside of dam (10% slope or less)	5 = Wetland
3 = Bedrock or impermeable clay base	6 = Topsoil

soils above the water level, and they may contain dormant aquatic plant seeds that will grow in your new wetland. Place logs and branches in and around the wetland to improve habitat for birds, salamanders, and turtles and to prevent damage caused by unwanted off-highway vehicle users. Apply wheat seed over exposed soils above the water line, and cover with a layer of straw. You may also wish to seed exposed soils with a permanent mixture of native species consisting of Indian grass, big bluestem grass, switchgrass, and partridge pea.

Individuals who have built a wetland in their woodland say it is one of the most gratifying projects they've ever completed. To learn more about the highly effective techniques for building wetlands of any type, you are encouraged to read Tom Biebighauser's new book *Wetland Drainage, Restoration, and Repair*, published by the University Press of Kentucky. Tom has built more than 1,000 wetlands in the United States and Canada and teaches hands-on workshops where participants learn more about wetlands by taking part in their construction.

About the Author:

Thomas R. Beibighauser is a Wildlife Biologist for the US Forest Service and has built over 1,000 wetlands in 10-States and two-Canadian Provinces. He teaches unique hands-on workshops where individuals learn how to build wetlands by participating in their restoration.

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