

# WETLAND RESTORATION USING THE SURFACE WATER TECHNIQUE

## HOW TO BUILD A SURFACE WATER WETLAND

Soils suitable for holding surface water are high in clay and silt. To test whether the soil is clayey or silty enough to build a surface water wetland, locate the mineral soils. They are under the topsoil layer, which is dark colored and contains fine roots and decomposing vegetation. Take a 1 inch ball of mineral soil and moisten it with water. Mineral soils with high clay content feel smooth and sticky like a mashed Tootsie Roll, while silty soils feel like wet flour. Soils that have too much sand and gravel feel gritty. Press the ball between your thumb and forefinger and try to make a thin ribbon. If you can make a ribbon that is at least 2 inches long before it breaks, then the soil can be sufficiently compacted to hold surface water (Biebighauser, 2007).



1 Biologists surveyed Pool 7 and developed a restoration plan more than one year before construction.



2 A soil auger was used to locate the water table and to extract soil samples. Clayey soils were found at Pools 5, 6, and 7 in varying amounts.



3 Making a ribbon out of clayey mineral soils over two inches long.



4 Pools 5 and 6 were maintained as control sites because they hold water long enough to support fairy shrimp, a vernal pool indicator. Photo shows Pool 6 on April 20, 2010 after 40 inches of snowmelt.



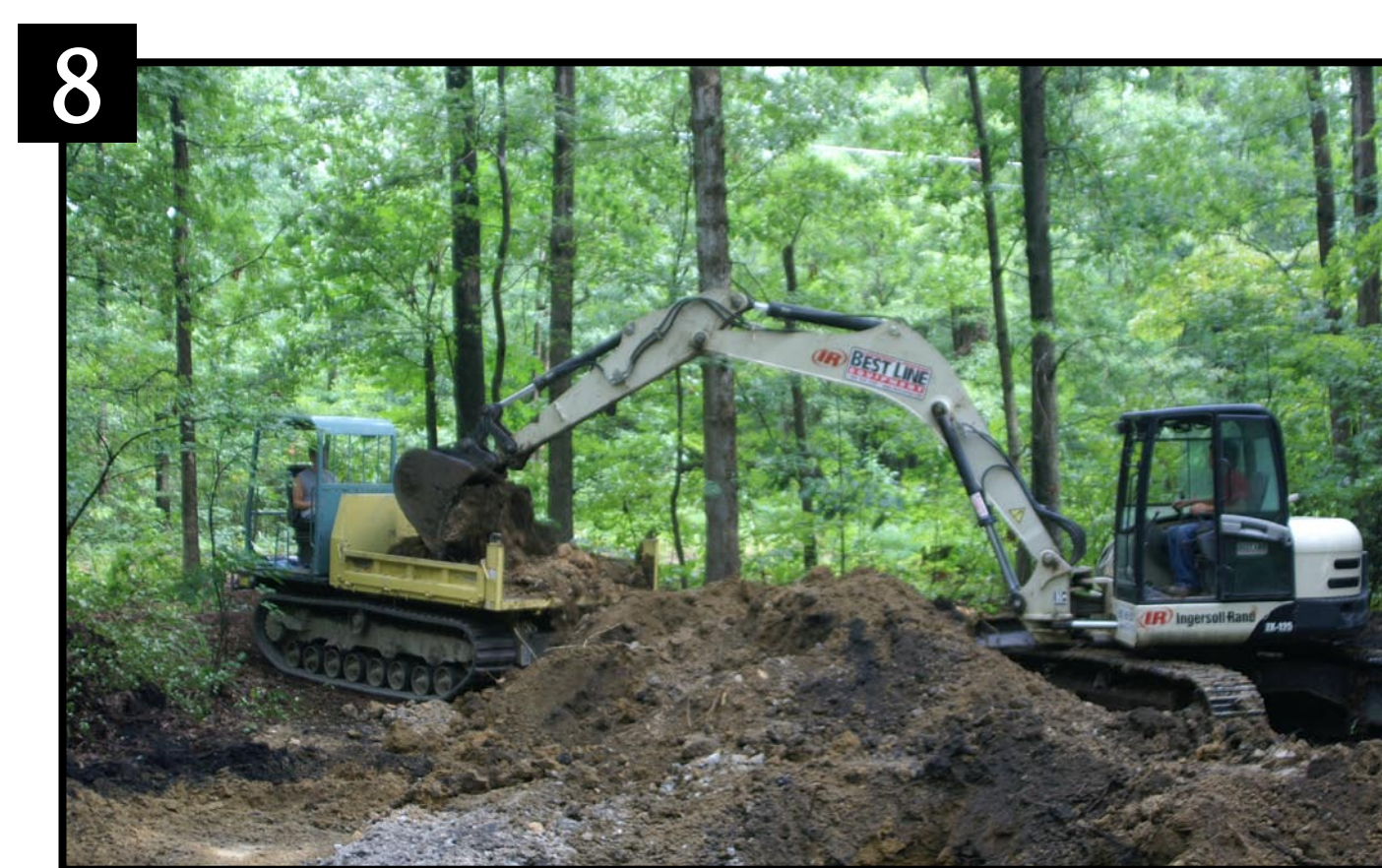
5 Pool 7 held approximately 10 inches of water on March 14, 2010 after 40 inches of snowmelt.



6 Although Pool 7 had clayey soils, it held water poorly and did not support aquatic animals or amphibian egg masses. Photo of Pool 7 on April 20, 2010, still dry after 40 inches of snowmelt.



7 As in the liner and ground water techniques, the leaves and topsoil were removed and reserved. Twelve inches of sandy loam mineral soil were removed and taken to a restoration site on private property.



8 A dump truck or Yanmar as seen in this photo is recommended for removal and placement of excess soil.

## PROTECTING PENNSYLVANIA'S VERNAL POOLS

Best Management Practices (BMPs) are strategies landowners can use to protect vernal pools and their associated wildlife. The goal is to protect vernal pool species over the long term by defining compatible land uses and beneficial management activities. Key recommendations are listed to the right for three management zones that were defined in Kiosk 3 at Pools 2 and 3. The strongest protections are recommended for the pool basin and surrounding 100 feet of upland (i.e., the pool envelope). The surrounding 1,000 feet of upland, called the terrestrial habitat, can support more diverse land uses, but is still a critical management zone because this is where vernal pool animals live outside of the spring breeding season.



9 The sandy loam covered a layer of loose clay, which was removed to a depth of 3 feet and reserved. Compacted clay over sand and sandstone rock was found beneath the loose clay.



10 The loose clay soils were returned to the pool basin in 4-inch layers. Each layer was compacted with the bucket on the excavator.



11 The excavator pushed two large trees and other woody debris into the completed wetland to provide habitat for salamanders and discourage the use of motorized vehicles within the wetland.



12 The removal of two trees also enlarged the tree canopy opening over the pool. This will allow more light in and will promote the growth of marshy aquatic plants.



13 The completed basin prior to seeding and mulching with straw.



14 Water flowing down a grassy Right-Of-Way was directed into the pool by creating a shallow dip at the lowest point in the ROW upslope from the wetland.



15 One day after construction, the wheat and straw provided erosion control during a steady rainfall. The newly compacted clay layer slows the rate at which water seeps into the ground.



16 The completed basin is 60 feet in diameter and has an average depth of 17 inches.

## VERNAL POOL BEST MANAGEMENT PRACTICES

- Prevent soil compaction, ruts, or other disturbances, and retain or encourage native plants in the terrestrial habitat, envelope and pool basin (especially the latter two).
- Maintain or create a mostly closed tree canopy with a 5-10 inch diameter at breast height or greater size-class that will provide shade, deep leaf litter, and woody debris in the pool envelope.
- Do not remove trees and branches that fall naturally into pools because they are the foundation of the food web and provide shelter for vernal pool animals.
- Do not cut down all dead standing trees or remove all trees and branches that fall naturally onto the forest floor in the envelope and terrestrial habitat.
- Do not introduce fish or bullfrogs that can outcompete native vernal pool animals.
- Avoid treating the vernal pool waters with mosquito control agents. Avoid using any pesticides, herbicides, or other chemicals such as road salts in or near the pool basin.
- Logging should not take place within 100 feet of a vernal pool or vernal pool complex. Maintain a partially closed forest canopy (50-75%) within the terrestrial habitat.
- Vernal pools should be connected by wide (400 feet or more) forested travel corridors.
- Identify roads that intersect large spring amphibian migrations. Seek permission to close these roads during rainy nights in early spring or enlist volunteers to move amphibians across these roads.

## ARE VERNAL POOL INDICATOR ANIMALS USING THIS WETLAND?



ED THOMPSON

Jefferson salamander egg masses are always clear and made of a soft jelly. They are generally small and linear in shape. A very thin milky white ring encircles individual embryos.



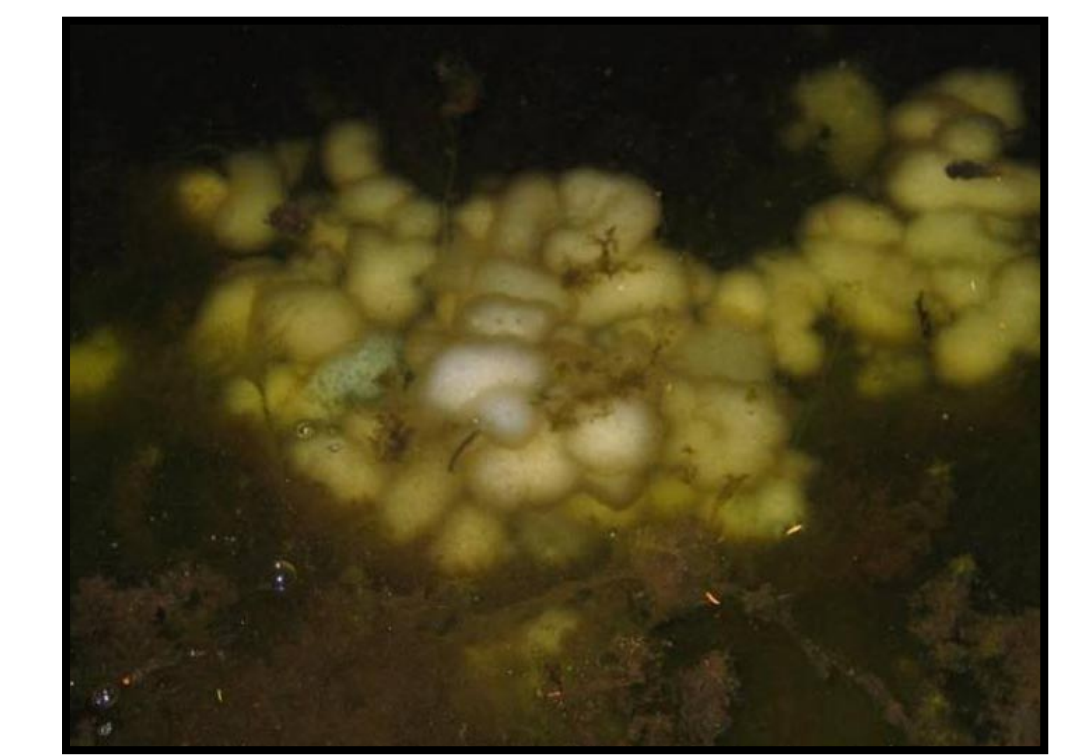
ED THOMPSON

Spotted salamander egg mass (left), Jefferson salamander egg mass (right).



B. LEPPON/PNH

Spotted salamander egg masses can be clear or opaque white, with a firmer jelly and more rounded shape than Jefferson's egg masses. A thick milky white ring encircles individual embryos.



K. KLEINER

Only the spotted salamander lays cloudy white egg masses, but they will lay clear egg masses, too.



S. RAY/PNH

Wood frog egg masses float freely and are often laid as communal rafts, as seen in this photo.



J. RAY

Fairy shrimp are small crustaceans that are only found in vernal pools. Eggs can lie dormant for decades in a dry pool basin.

### Literature Cited:

Biebighauser, T. R. 2007. Wetland Drainage, Restoration, and Repair. The University Press of Kentucky, Lexington.