

Alternatives to Riprap Filtration and Shoreline Stabilization

There are many alternatives to stone riprap. The most common alternative is called bioengineering to control erosion, lower nutrient loads and improve water quality. This alternative to stone riprap is not just about plants. It is crucial to understand what types of plants to use and how to plant them. Both the Federal government and the State of Ohio have well established standards and planting guidelines for native species published in the USDA NRCS *Engineering Field Handbook*. We are going to focus on the most common bioengineering options for both filter strips and shoreline stabilization suitable for Lake Lorelei (LL).

Stone riprap is a widely used form of shoreline stabilization and has been in use for some time (Howard 1). The vast majority of residents in LL will use conventional stone riprap. Some may need to find alternatives to riprap for physical, aesthetic or cost reasons (Legend 26, ODNR 1, USDA SCS 1).

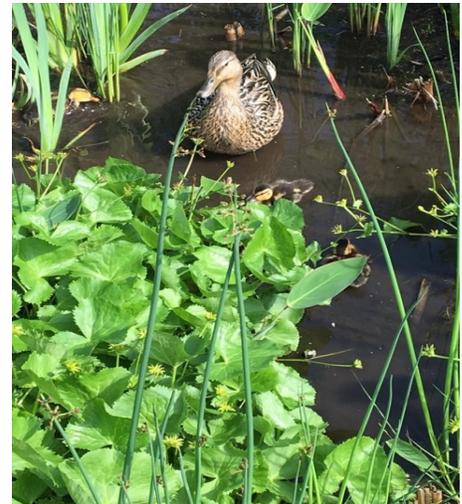


Lake Grunwald

USDA advocates alternatives to stone riprap for erosion control. Some of these are wattles, gabion baskets, GreeneArmor, fiber tubes and hydroseeding. (USDA NRCS 32) Hydroseed is a form of bio engineering and is useful for both stream banks stabilization and filtering strips (SCS 5). Bioengineering reduces the cost and impact on the environment. "...Root systems reinforce the soil mantle and remove excess moisture from the soil" (WSDOT)



Yellow Flag Iris Flowers in Wetland (Beware of Invasive Species) (Lamoureux)



Alternative riprap methods are friendly to wildlife.

The technique of streambank bioengineering focuses on utilizing natural living structural components for bank stabilization and erosion control (USDA NRCS 54). Some of the most common components of bioengineering recommend the use of woody plants and grass vegetation. Purposes include slowing water velocity and preventing transportation of sediment, unwanted nutrients and soil drainage into the lake. As opposed to stone riprap, the technique of streambank bioengineering is more friendly to local wildlife habitat and can be a good attractant for wildlife and fish. Living riprap alternatives have added benefits for those who live on a lake and enjoy fishing. (SCS 5, USDA NRCS 4,5).

Bioengineering filtering strips are defined as "a strip or area of herbaceous vegetation that removes contaminants from overland flow" (USDA NRCS 5).

Key aspects to the strips are to filter containments and nutrients, such as phosphorus, through permanent vegetation

Streambank Soil Bioengineering

- **Streambank soil bioengineering uses plants as the main structural components to stabilize and reduce erosion on streambanks rather than just for aesthetics.**
- **Successful establishment of the plants, both herbaceous and woody, is extremely important.**




(Lorman)

and lessen the amount of suspended solids and sediment in surface water. (USDA NRCS 3). Filter strips can be designed to have a 10-year life span and only need maintenance every other year (USDA NRCS 1).

One of the most popular choices for permanent vegetation are willows because they have rigorous root systems, are easy to plant, inexpensive and grow quickly. These features make them particularly well suited for Brown County. There are dwarf willow varieties such as “bankers Willow”. But many other plant options are recommended by USDA Natural Resources Conversation Service and ODNR.

Recommended bioengineering options include specific species of:

- Dogwood
- Ash
- Sycamore
- Burch
- Cottonwood
- Buttonbush
- Willow and many more.

For a larger list of species see Table 16B-1 at

<https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=17553.wba>



Salix Purpurea “Streamco” Willows
(Bluestem Nursery)

Table 1

Recommended Woody Species for Streambank and Shoreline Protection

Any deciduous hardwood species listed in the corresponding Woodland Suitability Group in Section II-F of the Technical Guide for the applicable soil type is suitable for planting as barefoot stock in Zones 2 and 3.

*These species are suitable for use as dormant woody cuttings, stakes or posts. All species of Willow and Cottonwood do not require hormone treatment for rooting.

Plant Zone 1 - Below normal water line to upper limit of saturation area kept moist by capillary water movement. This zone includes the greatest potential for periodic inundations and the least moisture stress.

Plant Zone 2 - Area from upper limit of Zone 1 to 2-3 feet from the top of the bank. This area may be subject to rapid drying and greater moisture stress.

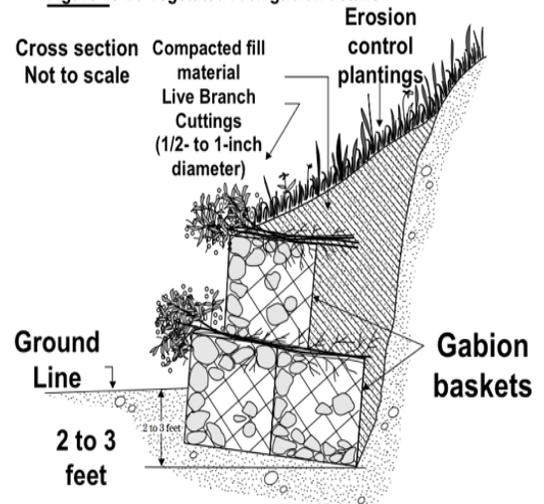
Plant Zone 3 - Area 2-3 feet below the top of the bank to a minimum of 30 feet into the the floodplain (riparian area).

<u>Plant Zone</u>	<u>Common Name</u>	<u>Genus Species</u>	<u>Growth Form</u>
1	*White Willow	Salix alba	Tree
1	*Black Willow	Salix nigra	Tree
1	*Bankers Willow	Salix cottettii	Shrub
1	*Purple-Osier Willow	Salix purpurea	Shrub
1	*Sandbar Willow	Salix interior	Tree
1	*Carolina Willow	Salix caroliniana	Tree
1	*Peach-Leaved Willow	Salix amygdaloides	Tree
1,2,3	*Buttonbush	Cephalanthis occidentalis	Shrub
1,2,3	*Red-Osier Dogwood	Cornus stolonifera	Shrub
1,2,3	Silky Dogwood	Cornus amomum	Shrub
1,2,3	Flowering Dogwood	Cornus florida	Tree
1,2,3	Green Ash	Fraxinus pennsylvanica	Tree
1,2,3	*Sycamore	Plantanus occidentalis	Tree
1,2	Baldcypress	Taxodium disticum	Tree
1,2,3	River Birch	Betula nigra	Tree
1,2,3	*Eastern Cottonwood	Populus deltoides	Tree
1,2,3	*Swamp Cottonwood	Populus neteropnylla	Tree

Methods for planting living erosion control include use of living plants or the use of dormant woody cuttings, stakes or posts. Plants may also be used in conjunction with other erosion control structures such as riprap or gabion baskets.

Shorelines are divided into zones based on a variety of factors that influence water level. The table to the left includes the government developed standards that are the best for our area including species, zone and suitability for bare root or woody cutting installations.

Figure 18-20 Vegetated rock gabion details



Note:
Rooted/leafed condition of the living plant material is not representative of the time of installation.

(210-EFH, October 1992)

18-33

The committee recommends both grass and colorful native species, many of which can be found at specialty nurseries. Local nurseries may have some of these plants but not all. The Ohio EPA maintains lists of specialty nurseries and seed sources.

<https://archive.epa.gov/greenacres/web/pdf/oh-resor.pdf>

For A Larger List Visit https://www.oipc.info/uploads/5/8/6/5/58652481/alternatives_to_ohio_invasive_plant_species.pdf

Colorful Species

- Swamp Milkweed
- Turtlehead
- Boneset
- Queen of the Prairie
- Sneezeweed
- Rose Mallow
- Northern Blue Flag
- Iris
- Blazing Star

Grasses

- Tussock sedge
- Fox sedge
- Rushes
- Big bluestem
- Little bluestem
- Indian grass
- Switchgrass



Shoreline stabilization is defined as a form of erosion control to protect stream banks and shorelines (USDA SCS 1). This relies on the roots of plants, shrubs and trees to prevent erosion and loss of soil (USDA NRCS 2). It is important to only use native species as recommended by Ohio's Natural Resources Conservation Service, to prevent establishment of noxious species that could destroy local wildlife habitat such as yellow flag (NRCS 5, SCS 5, USDA NCRS A, USDA SCS 1). The advantages are cost effectiveness, nutrient filtering, enhanced wildlife habitat, and aesthetic of living plants. In fact, nothing is more effective at filtering out nutrient loads than living plants. (NRCS 1,5 ODNR 1, USDA SCS 1)

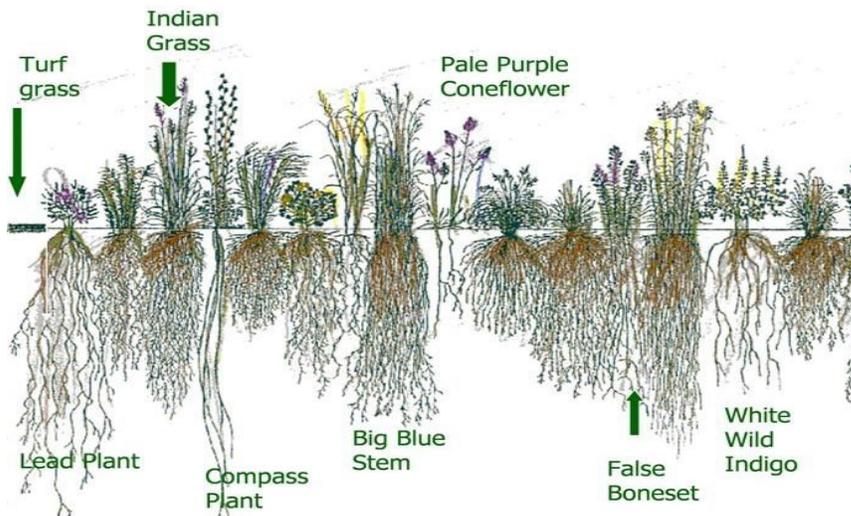


Lake Fitchtelberg

Example of Ohio deep rooted native species that are colorful and prevent erosion and loss of soil.



Purple Flag Iris



(naturenearby.org)

Shoreline Stabilization

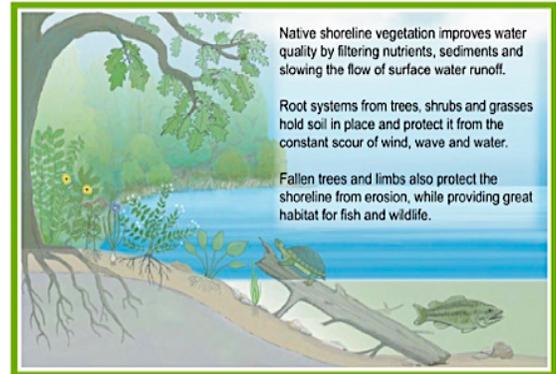
Minimizes Erosion, Protects Water Quality



EROSION :
It doesn't have to be a losing battle

Erosion is one of nature's most destructive forces. Through the actions of wind and water, valuable acres of crop land, beaches, streambanks and shoreline are worn away and lost each year.

The shorelines around Hoover Reservoir contain easily erodible soil types. Left unchecked, erosion reduces available parkland and generates silt and sediments which degrade water quality and harm aquatic life.



Native shoreline vegetation improves water quality by filtering nutrients, sediments and slowing the flow of surface water runoff.

Root systems from trees, shrubs and grasses hold soil in place and protect it from the constant scour of wind, wave and water.

Fallen trees and limbs also protect the shoreline from erosion, while providing great habitat for fish and wildlife.

Land can be protected from erosion through the use of natural and engineered solutions.



A healthy stand of natural vegetation will provide strong root systems, shade and habitat.



Live willow stakes will establish a fast growing deep-rooted buffer at the water's edge.



Armor—flex holds soil and provides a hard, porous surface which can support grasses and foot traffic.



A-jacks stabilizes severe bank erosion and allows interspersed plant growth for added protection.



Rip-rap is a durable solution for protecting large areas of shoreline, preventing further erosion.

How Can You Help Minimize Erosion?

- Landscape with deep-rooted native plants
- Prevent boat wakes which damage shorelines
- Avoid creating areas of bare soil, including paths
- Instead of turfgrass, plant a buffer of trees or shrubs along the water's edge

Did You Know?

Water Fact:

Sedimentation and habitat loss are Ohio's leading causes of water quality degradation.

(Columbus.gov)



Switchgrass, Purple Cone Flower, Sneezeweed, Spiked Blazing Star



The Beauty of Alternative Riprap Methods

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