

SHORELAND BEST MANAGEMENT PRACTICES

OVERVIEW

- Two different categories of Best Management Practices (BMPs)
 - Stormwater
 - Erosion/Runoff
- Explain the different types of practices for each category
- Want to install Stormwater BMPs in order to prevent installing Erosion/Runoff BMPs
- Not inclusive lists, but provides a variety of options for landowners to start with
- Most practices will require a contractor and some practices will require an engineer

STORMWATER BMPS

- Bioswales
- Infiltration Trenches
- Dry wells (infiltration tubes, french drains, soak holes)
- Rain gardens (bioretention basins)
- Infiltration Basins
- Riparian Buffers
- Rain Barrels/Cisterns
- Wet Pond
- Stormwater Reuse Systems
- Permeable Pavements/Pervious Pavers
- Reduce Impervious Surfaces

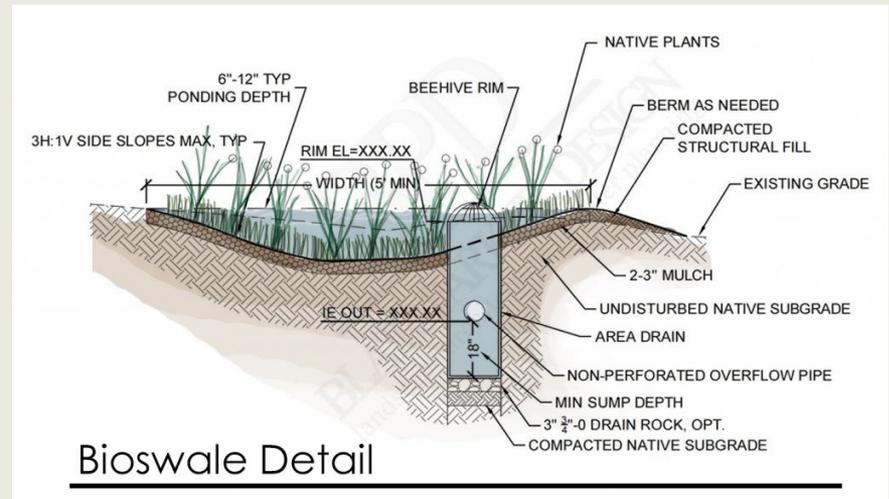
BIOSWALES

■ Bioswales

- A landscape feature appearing as a linear, shallow, open channel
- Vegetated with flood tolerant/erosion resistant plants
- Slows down and controls rate of stormwater while removing pollutants



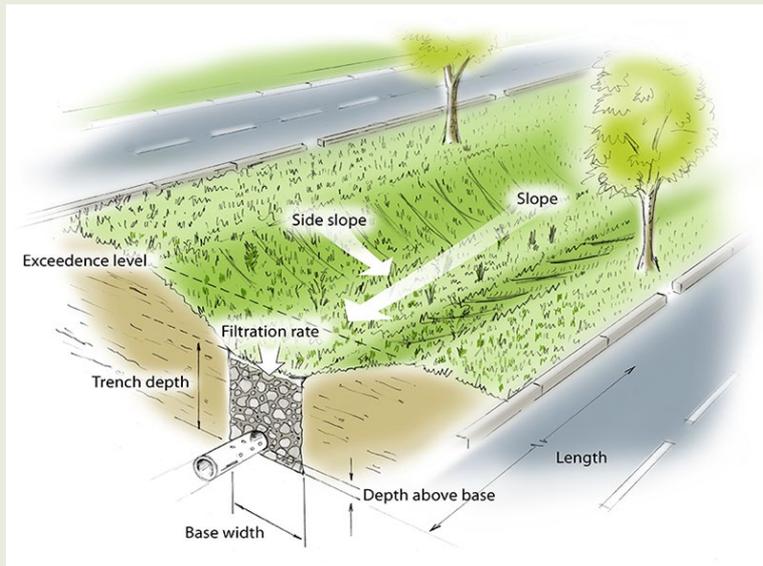
Minnehaha Creed Watershed District, 2023



Blair Parker Design, Bioswale Detail, 2023.

INFILTRATION TRENCH

- A shallow, excavated trench, 3-6ft, that is backfilled with a coarse stone aggregate allowing for the temporary storage of runoff in the void space of the material
- All water captured by the BMP is removed through infiltration and/or a drain
- Commonly used for drainage areas less than 5 acres in size



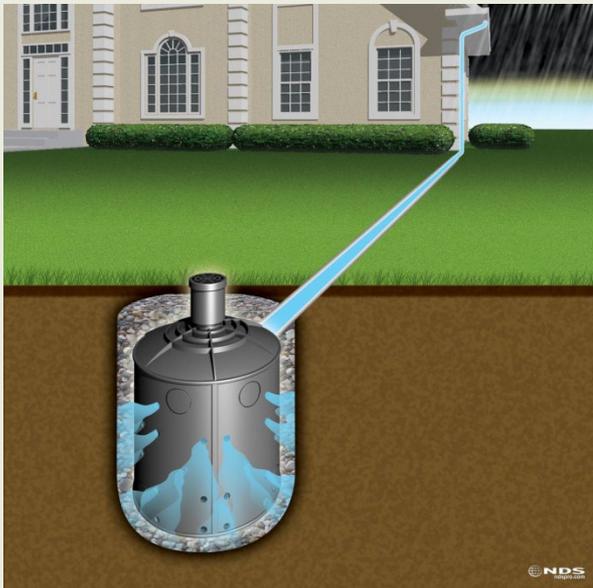
Innovyze Resource Center, 2023.



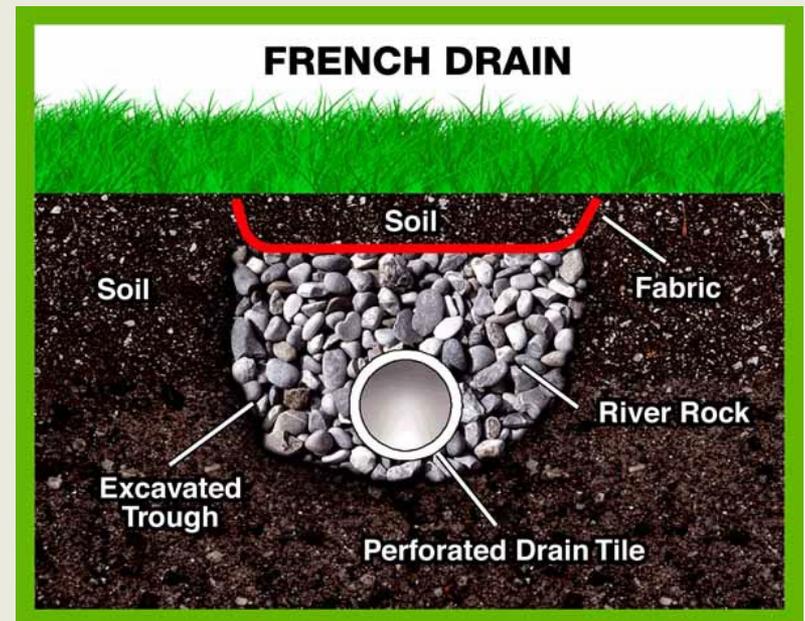
Sustainable
Stormwater
Management,
2023.

DRY WELLS

- Smaller version of an infiltration trench, has a subsurface storage facility (chamber or pit backfilled with a coarse stone aggregate) that receives and temporarily stores stormwater runoff
- Due to their size they are designed for smaller drainage areas, less than one acre in size



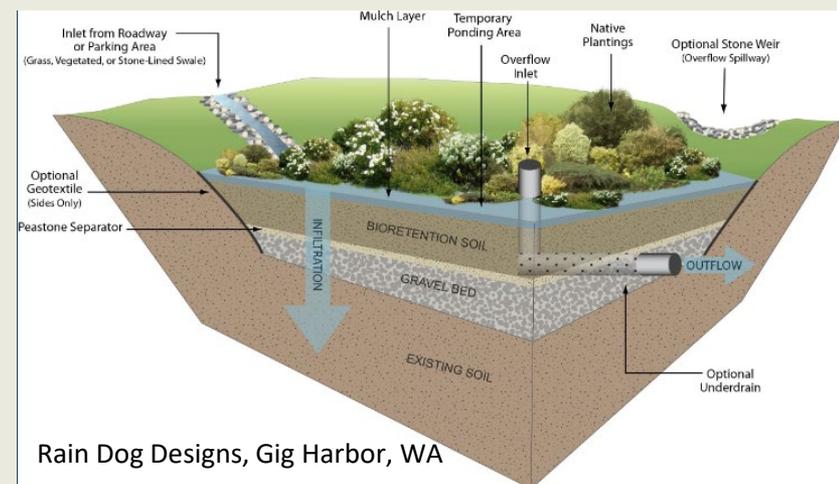
NDS Flo-Well Dry Well System, Lowes



F.A. Hobson Landscaping Inc, Queenstown, MD

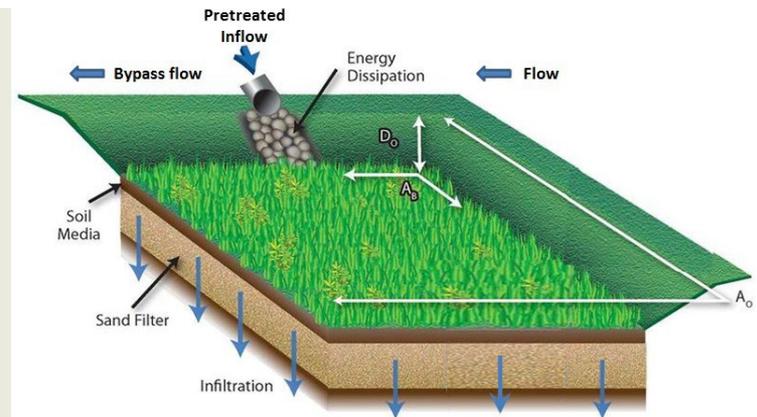
RAIN GARDENS

- Depressed area in the landscape that temporarily collects stormwater runoff and filter pollutants, usually planted with grasses, forbs, and shrubs
- More complex rain gardens have drainage systems and amended soils (media-sand, OM, clay) that helps filter/absorb nutrients, these are also called bioretention basins
- Typically 12-18 inches in depth
- Treat small storm/rain events



INFILTRATION BASINS

- Shallow artificial pond that is designed to infiltrate stormwater through permeable soils
 - They do not release water except by infiltration, evaporation, or emergency flood
 - No artificial drainage
- Reduces stormwater runoff/erosion and prevents flooding
- Needs to be designed appropriately according to volume of runoff



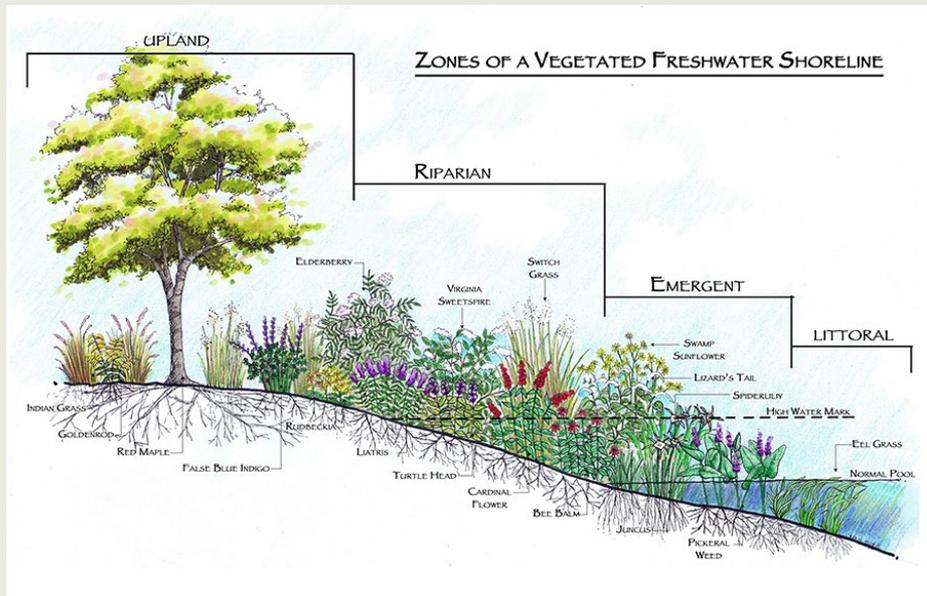
Minnesota Pollution Control Agency, Minnesota Stormwater Manual, 2023



Minnesota Pollution Control Agency, Minnesota Stormwater Manual, 2023

RIPARIAN BUFFERS

- Strips or multiple row plantings of trees, shrubs, grasses, and forbs along rivers, streams, lakes, and wetlands
- Prevent pollutants and nutrients from stormwater runoff entering the water and also enhances wildlife habitat



RAIN BARRELS/CISTERNS

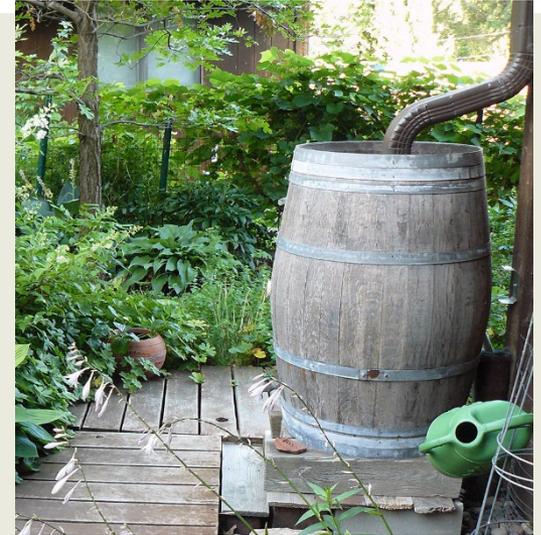
■ Rain barrels

- Captures water from a roof and holds it for later use such as on lawns, gardens, or indoor plants
- Reduces the amount of stormwater flow onto your property

■ Cisterns

- A large tank that collects rainwater from a roof and hold it for later use on lawns and gardens
- Appropriate if you have significant outdoor water needs
- Reduces the amount of stormwater flow onto your property

University of Minnesota Extension, Rain barrels in the home landscape, 2023.

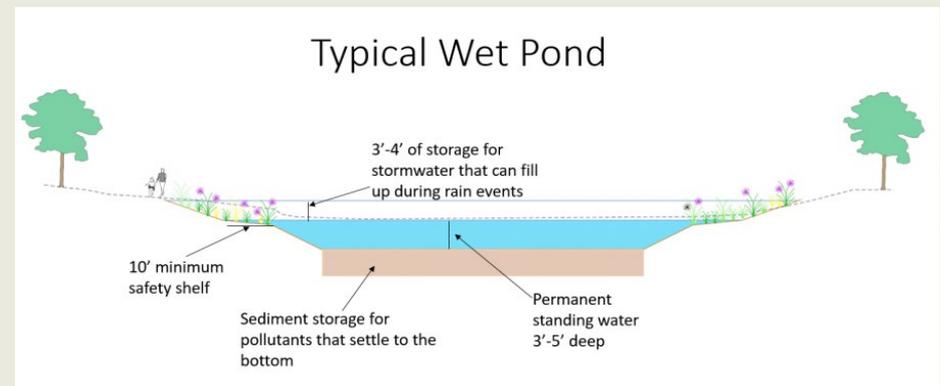


WET POND

- Stormwater drains to a pond
- Water is held in the pond for a period of time, allowing sediment to settle out and releasing the water over days instead of hours, to relieve flooding
- Has a permanent pool of water throughout the year
- Designed for large scale storage



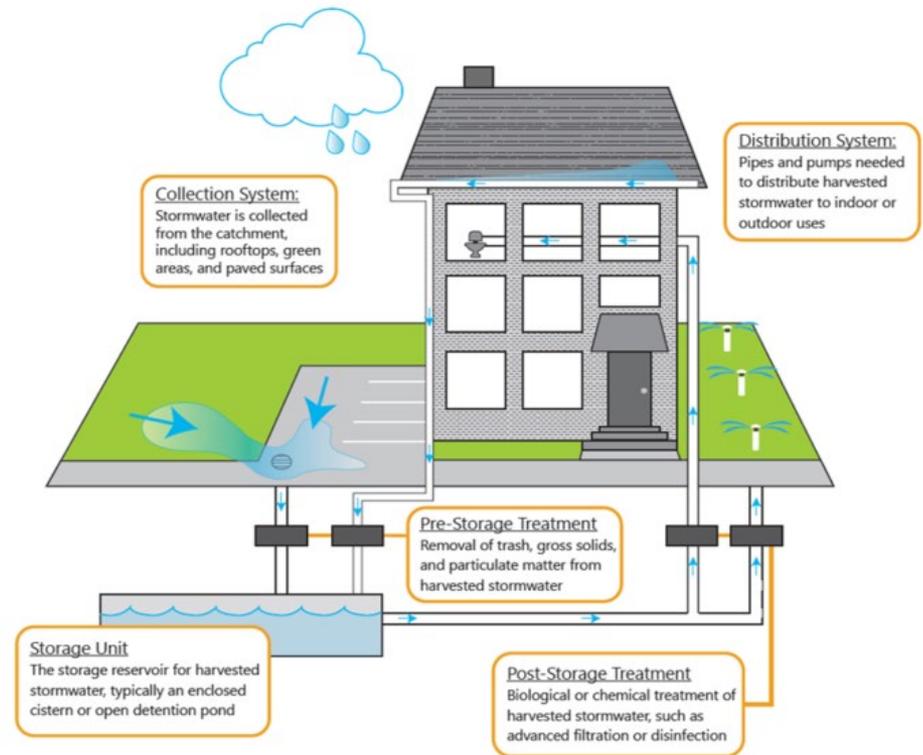
City of Madison, Wisconsin Ponds, 2023



City of Madison, Wisconsin Ponds, 2023

STORMWATER REUSE SYSTEMS

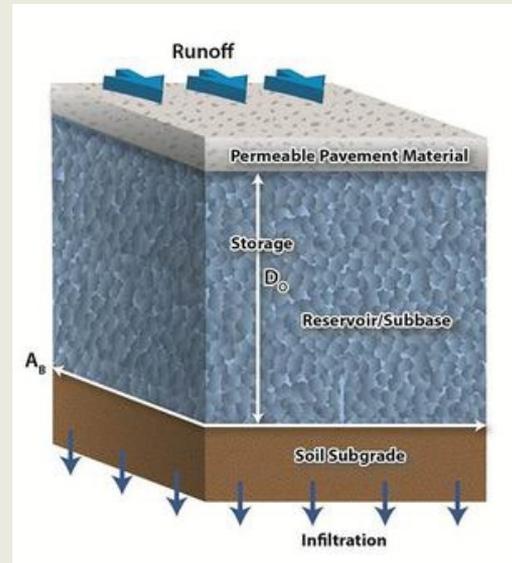
- Captures and retains stormwater for beneficial use at a different time or place than when stormwater was generated
- Large scale stormwater treatment system
- Maintenance is very important!
- 4 components
 - Collection system-collect the stormwater (rain barrels, drain tiles, filter basins, gutters, curb, storm sewers, etc.)
 - Treatment system-remove debris such as sediment, pollutants, solids (screening, skimmers, rock areas, grass swales)
 - Storage unit-stores water (rain barrels, cistern, pond, holding tank)
 - Distribution system-a way to utilize stored stormwater (dripline, garden hose, irrigation, infiltration, drainfield, pumps)



Minnesota Pollution Control Agency, Minnesota Stormwater Manual, 2023

PERMEABLE PAVEMENTS/PERVIOUS PAVERS

- Permeable pavements-Paving surfaces that allow stormwater runoff to filter through surface voids into an underlying stone reservoir for filtration and/or storage
- Pervious pavers-paving surfaces that are separated by joints and/or gaps that are filled with small stones/sand which are laid over a bed of aggregate stones. It allows stormwater runoff to infiltrate around the surfaces into the joints and/or gaps for filtration and/or storage.



Minnesota Soil
Bioengineering
Handbook,
MNDOT, 2015



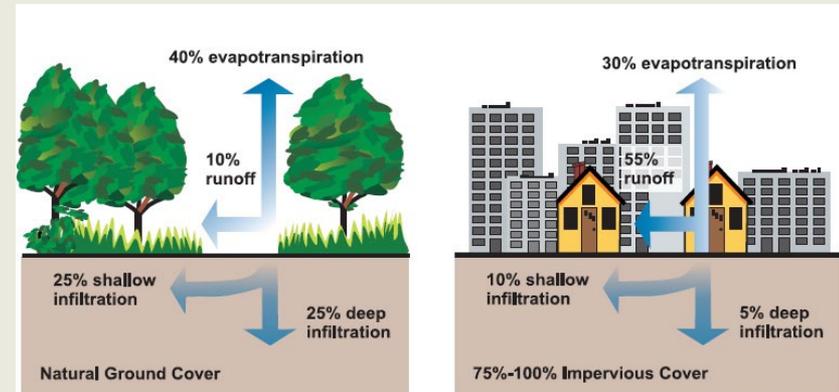
Mississippi Watershed Management Organization, 2023.

REDUCE IMPERVIOUS SURFACE

- Impervious surfaces-a constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development.

- Ex: driveways, sidewalks, decks, houses, patios, concrete, asphalt, gravel roads, compacted soils

- Reducing the amount of impervious surface on your property will help increase infiltration of water into the ground, reduce erosion/runoff, and help filter pollutants



University of Minnesota, Turfgrass Science, 2023.



EROSION/RUNOFF BMPS

- Native Vegetation Plantings
- Riparian Buffers
- Fascines(wattles)
- Live Stakes
- Brush Mattress
- Biorolls
- Vegetated Reinforced Soil Slope & Toe Stone
- Riprap
- Live Cribwalls
- Live Soft Gabion
- Soil Lifts

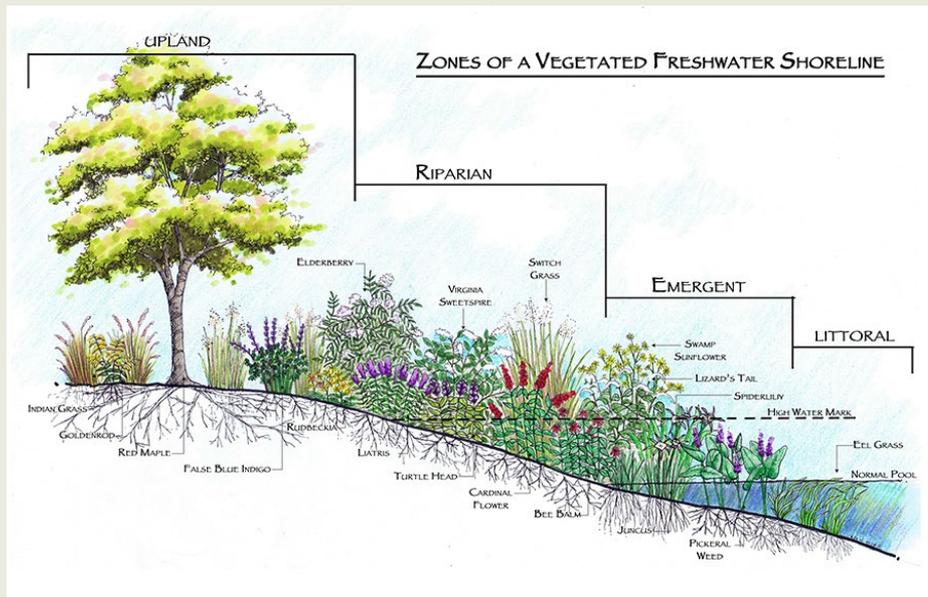
NATIVE VEGETATION PLANTINGS

- Native vegetation protects soil from erosion and reduces surface water runoff
 - Live foliage and litter reduces the impact of rainfall and increases water infiltration
 - Most native vegetation has deep roots which increases water infiltration and provides soil stability



RIPARIAN BUFFERS

- Strips or multiple row plantings of trees, shrubs, grasses, and forbs along rivers, streams, lakes, and wetlands
- Prevent pollutants and nutrients from stormwater runoff entering the water and also enhances wildlife habitat

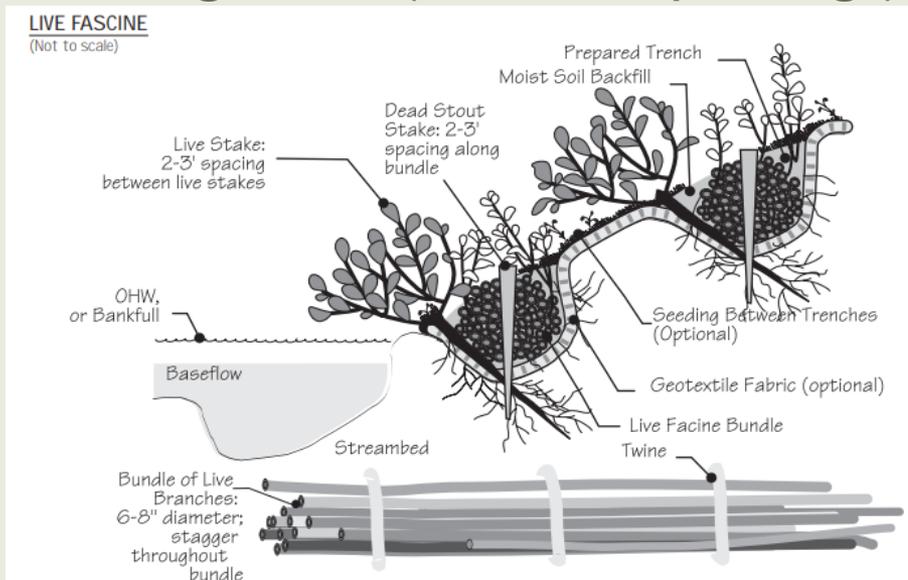


Piedmont Environmental Alliance, 2023.



FASCINES(WATTLES)

- Bundles of live woody stems, in their dormant state, that are used to protect banks and shorelines
- Help reduce erosion and provide bank protection by reducing runoff
 - Use for slopes that have light to moderate erosion where native vegetation (seeds and plantings) would wash away quickly



US Department of Agriculture Forest Service. A Soil Bioengineering Guide for Streambank and Lakeshore Stabilization, 2002.



Watershed Friendly Stream Maintenance, Cuyahoga SWCD, 2015

LIVE STAKES

- Stem cuttings taken from trees, in their dormant state, and are inserted directly into stream banks
- Eventually they will grow into new trees and help prevent erosion and runoff and create soil stability



Minnesota Soil Bioengineering Handbook, MNDOT, 2015

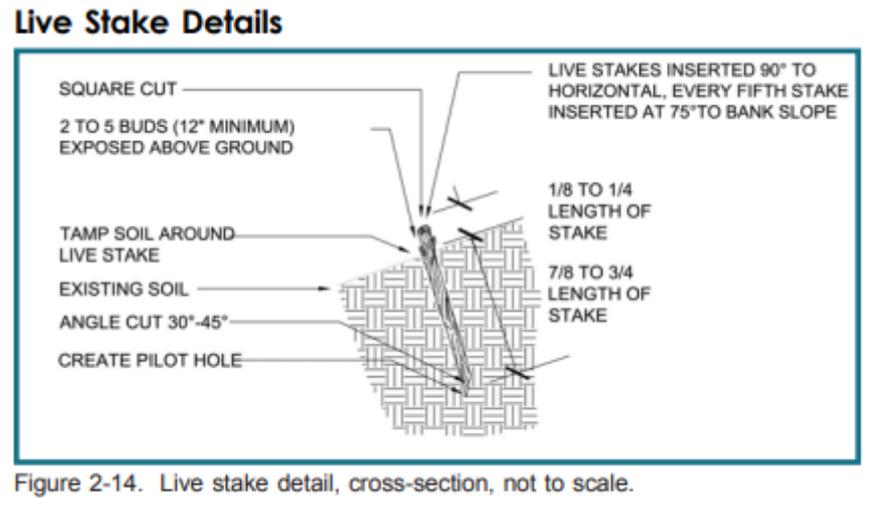


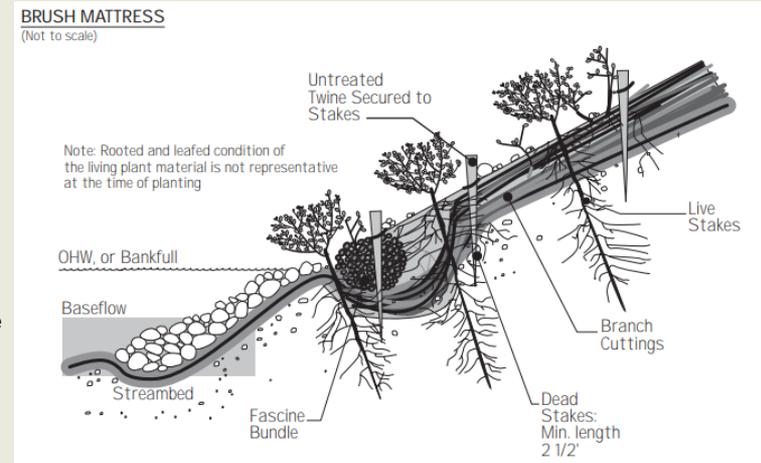
Figure 2-14. Live stake detail, cross-section, not to scale.

BRUSH MATTRESS

- Layer of interlaced live branches, in their dormant state, placed on a bank face, often with a live fascine and/or rock at the base (stone toe protection)
 - The live branches are cut from woody plants
- The mattress is held in place with wire or twine and stakes (live or dead)
- The brush mattress develops strong network of roots and helps reduce erosion and runoff
 - Creates soil stability



Salix, 2023.



US Department of Agriculture Forest Service. A Soil Bioengineering Guide for Streambank and Lakeshore Stabilization, 2002.

BIOROLLS/COIR LOGS/FIBER ROLL

- Natural and biodegradable logs used for soil stabilization and protection
 - Often have native vegetation planted on or around the logs to help with water infiltration and additional soil stabilization
 - Stack only 1-2 feet high, less stable when stacking

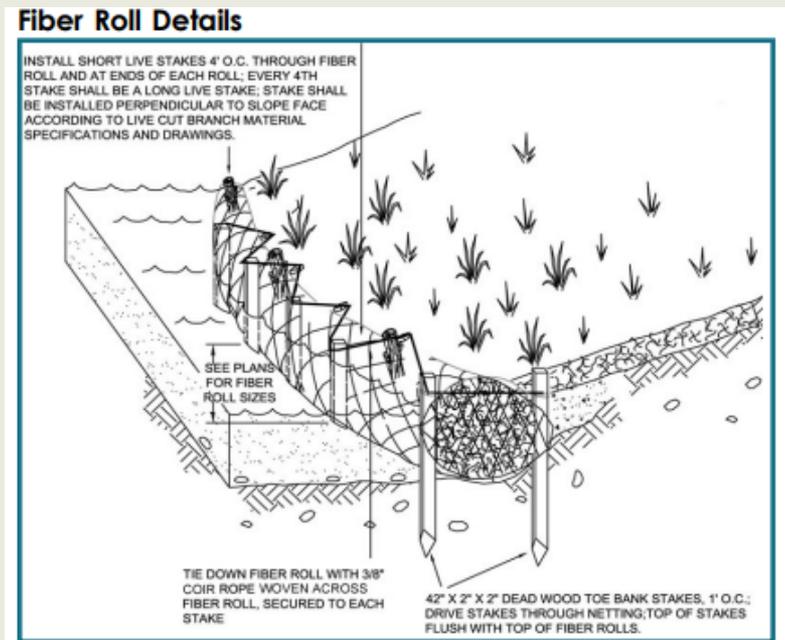


Figure 2-12. Fiber rolls detail, not to scale.

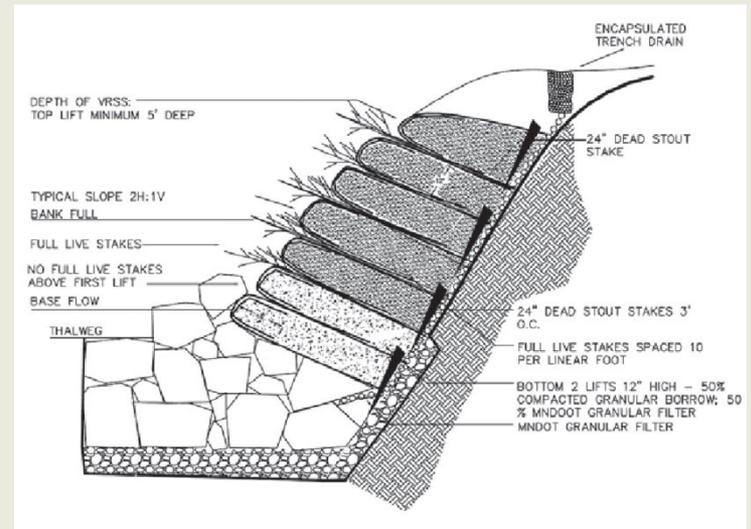
VEGETATED REINFORCED SOIL SLOPE & TOE STONE

- Fill embankments that incorporate the use of horizontal placement of living, woody plant material, tubing, branches, bare roots in conjunction with rock, geosynthetics, geogrids, and/or geocomposites for reinforcement to create stable, oversteepened slope structure
- Rock is used at below the depth of the scour (toe of bank) and helps with improving infiltration and protecting the riparian zone



Minnesota Soil Bioengineering Handbook, MNDOT, 2015

Figure 2-25. Vegetated reinforced soil stabilization planting. Minnehaha Creek, Minnesota



RIPRAP

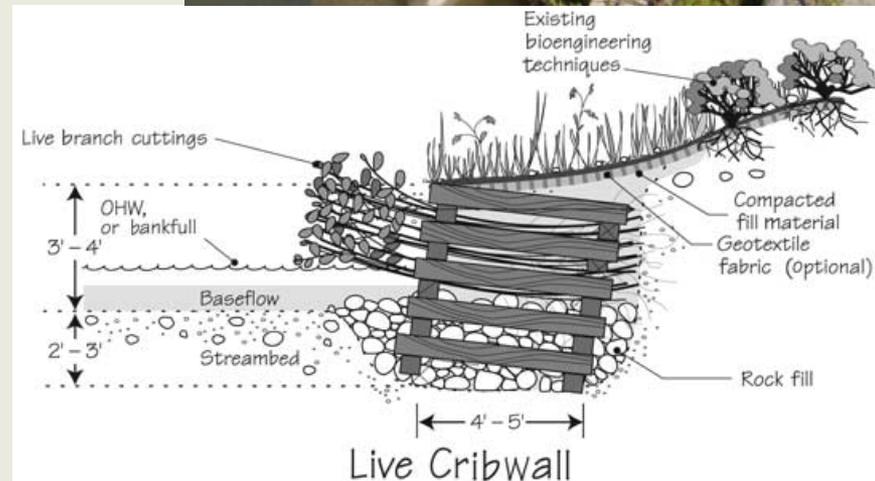
- Permanent layer of large stone used to armor, stabilize, and protect the soil surface against erosion and scour in areas of concentrated flow or wave action
 - Often used with native plantings to provide additional soil stability and filter out pollutants



LIVE CRIBWALLS

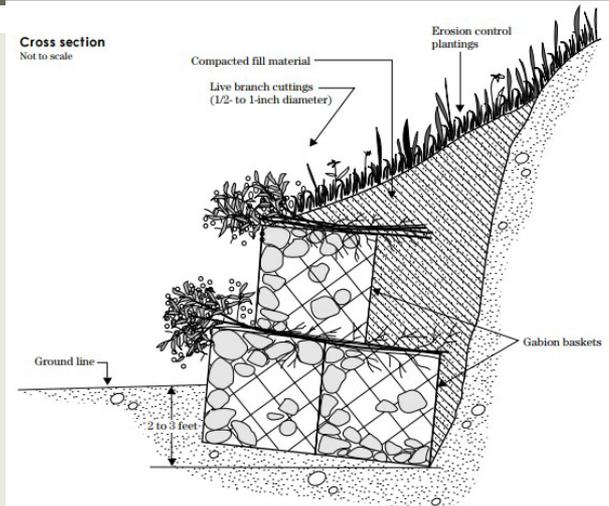
- Frame built with untreated timbers and filled with soil and live cuttings (at toe of slope)
 - The timbers provide immediate protection and stability
- Once completed the structure acts as a retaining wall
- Over time, the timbers importance gradually decreases as they decompose
 - Meanwhile the live cuttings grow, and the resulting root mass binds together the internal fill and the adjacent undisturbed soil

Watershed
Friendly
Stream
Maintenance,
Cuyahoga
SWCD, 2015



LIVE SOFT GABION

- Slope stabilization technique that incorporates significant quantities of nonliving materials into its construction
- Portion of the structure is geotextile which serves to hold soil and or rocky backfill in place until roots from the live cuttings grow enough to serve that purpose
- Involves major grading, excavating, and filling
 - Best for projects where valuable infrastructure (roads, buildings, bridges) is being protected



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

Larimit, Vegetated Gabions, 2023.



SOIL LIFTS

- Soil lifts lay on rock bases and are made with soil layers wrapped in biodegradable fabric. The wrapping makes the layers stackable, so that soil sections may be placed on top of others. Seeding and plantings of native vegetation is applied and the lift is left to settle.
- Over time, the seeds germinate and the soil slumps, creating a reinforced natural shoreline with native plants giving stability.

