

# Ecological Design Principles for Shorelands: Lessons Learned from the Minnesota Experience

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EXTENSION

# Itasca Co lake owners prefer which of these three shorelines?

Lawn



Replanted



Other

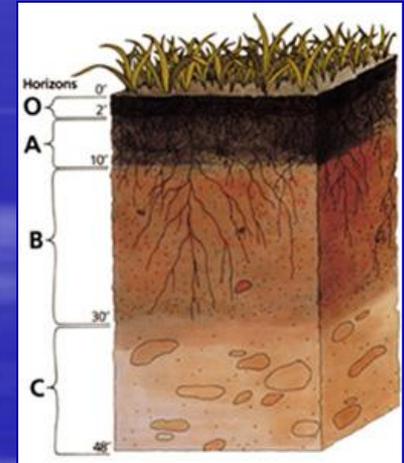
5%

Natural

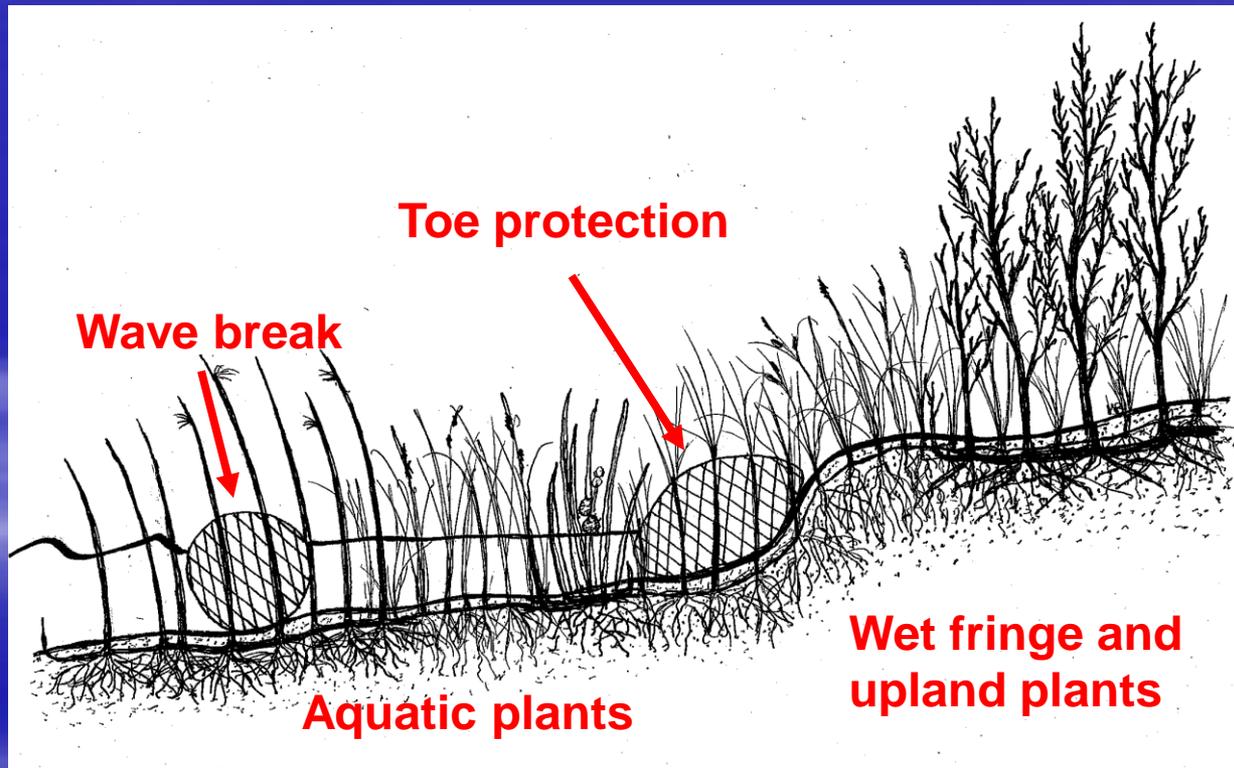


# Reading a shoreline

- Existence of native vegetation (mowed?)
- Soil composition (texture, pH, OM)
- Sun exposure
- Hydrology (bounce, water table, seeps?)
- Presence of erosion – cause(s)?
- Site history
  - Soil compaction, removal, topsoil added?
  - Invasive plants



# Treat the shoreland “SYSTEM” – holistic approach to addressing shoreland restoration



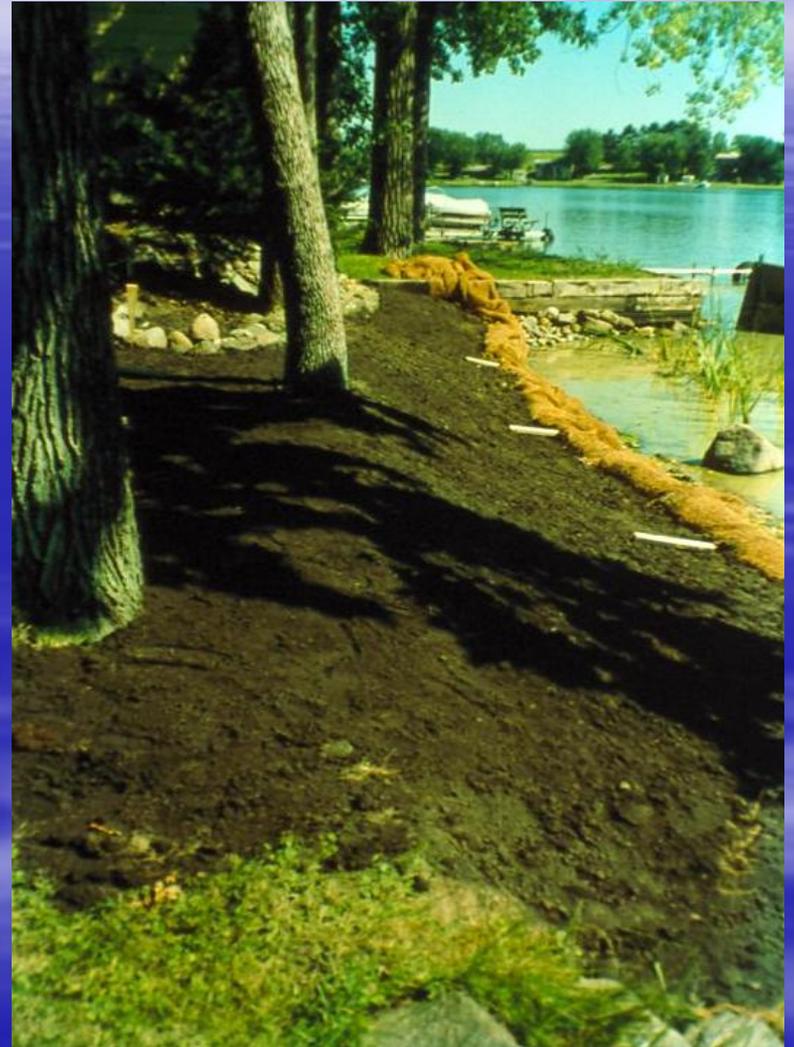
# North Center Lake



before



**Install coco log before work  
crew hauls dirt to shoreline**



Plant native flowers,  
grasses and sedges



Plant native aquatics  
and install wave break



**2 months after planting - cover crop established**



**2 years after planting – natives well established**

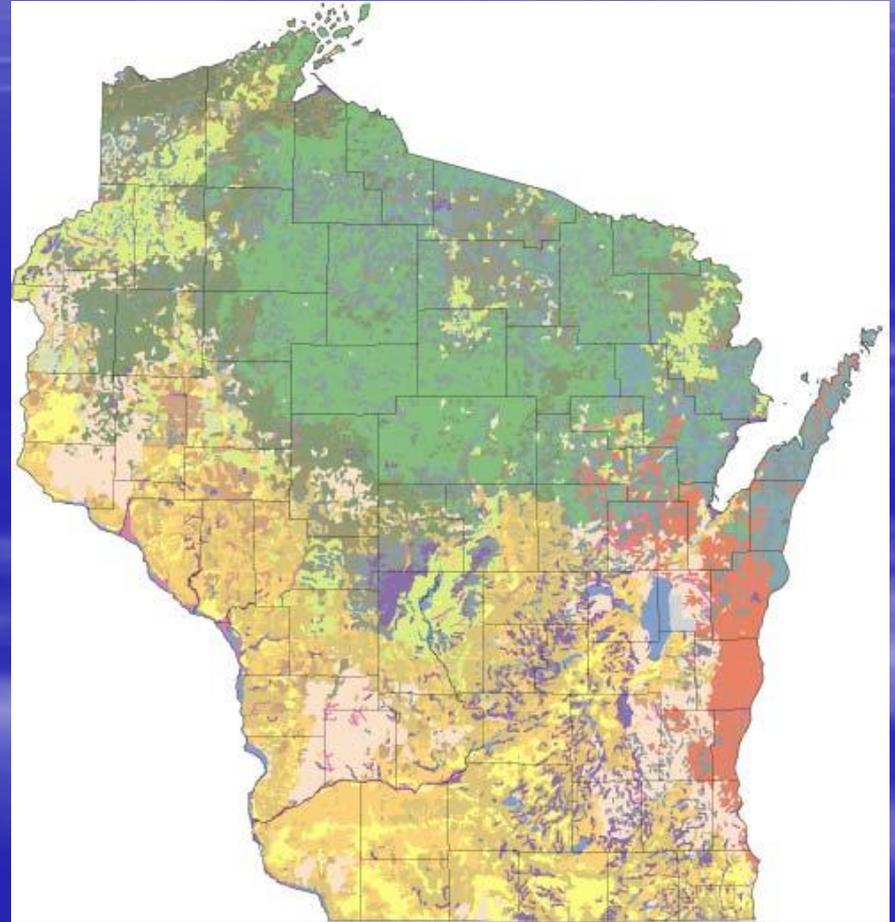


6 years after planting – restoration failed.  
Contractor hired to “fix” problem.

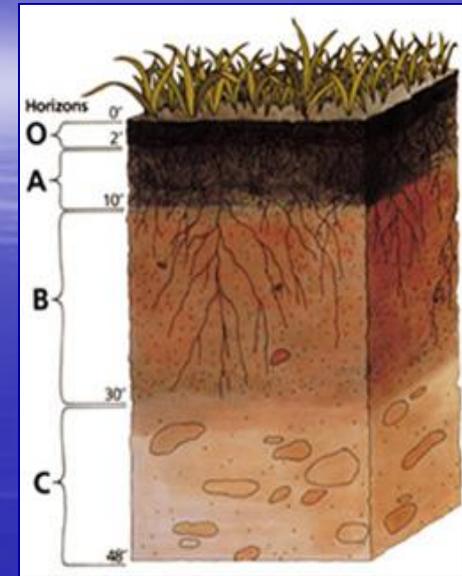
Lessons learned...

# Not all plants are created equal

- Plants are sensitive to ecological factors
- Use reference sites to help understand plant communities
- Soil preferences and tolerances (soil amendments?)



- Early to late successional species (sequence of plantings)
- Phasing – start small
- Annuals, biennials, short-lived perennials, perennials (plant selection, weed tolerance)
- Rooting strategies (get to know which plants to use for which situations)

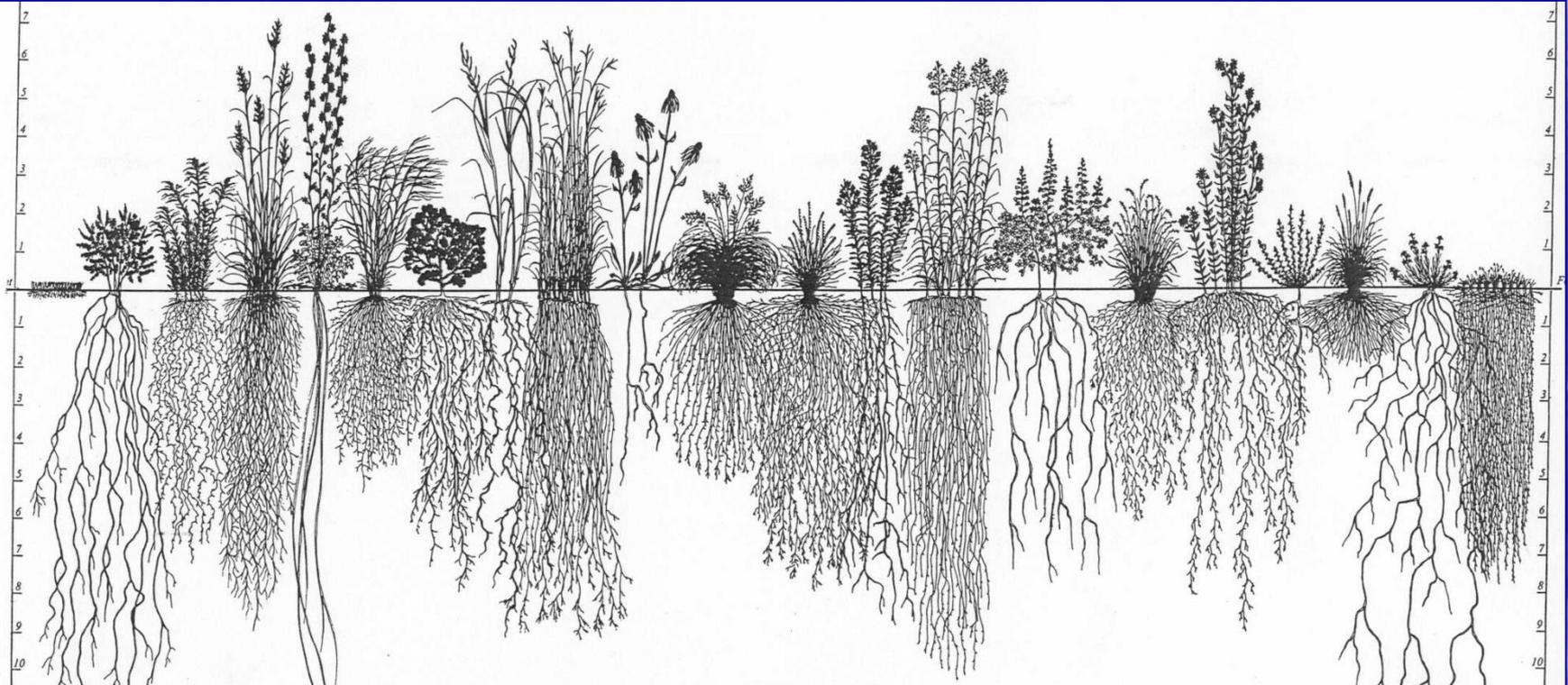


# Rooting strategies



sedge





## Root Systems of Prairie Plants

The fundamental basis for encouraging use of native plant species for improved soil erosion control in streams and stormwater facilities lies in the fact that native plants have extensive root systems which improve the ability of the soil to infiltrate water and withstand wet or erosive conditions. Native plant species, like those listed in this Guide, often have greater biomass below the surface. In this illustration, note the Kentucky Bluegrass shown on the far left, which, when compared to native grass and forb species, exhibits a shallow root system. *Illustration provided by Heidi Natura of the Conservation Research Institute.*

- |   |  |   |   |   |  |                                       |   |   |  |   |   |  |   |  |   |  |  |  |  |   |
|---|--|---|---|---|--|---------------------------------------|---|---|--|---|---|--|---|--|---|--|--|--|--|---|
| Kentucky Blue Grass<br><i>Poa pratensis</i> | Lead Plant<br><i>Amorpha canescens</i> | Missouri Goldenrod<br><i>Solidago missouriensis</i> | Indian Grass<br><i>Sorghastrum nutans</i> | Compass Plant<br><i>Silphium laciniatum</i> | Porcupine Grass<br><i>Stipa sparsa</i> | Heath Aster<br><i>Aster ericoides</i> | Prairie Cord Grass<br><i>Spartina pectinata</i> | Big Blue Stem<br><i>Andropogon gerardii</i> | Pale Purple Coneflower<br><i>Echinacea pallida</i> | Prairie Dropseed<br><i>Sporobolus heterolepis</i> | Side Oats Gramma<br><i>Bouteloua curtipendula</i> | False Boneset<br><i>Kuhnia eupatorioides</i> | Switch Grass<br><i>Panicum virgatum</i> | White Wild Indigo<br><i>Baptisia leucantha</i> | Little Blue Stem<br><i>Andropogon scoparius</i> | Rosa Weed<br><i>Silphium perfoliatum</i> | Purple Prairie Clover<br><i>Petalostemum purpureum</i> | Junc Grass<br><i>Koeleria cristata</i> | Cylindric Blazing Star<br><i>Liatris cylindracea</i> | Buffalo Grass<br><i>Buchloe doctyloides</i> |
|---|--|---|---|---|--|---------------------------------------|---|---|--|---|---|--|---|--|---|--|--|--|--|---|

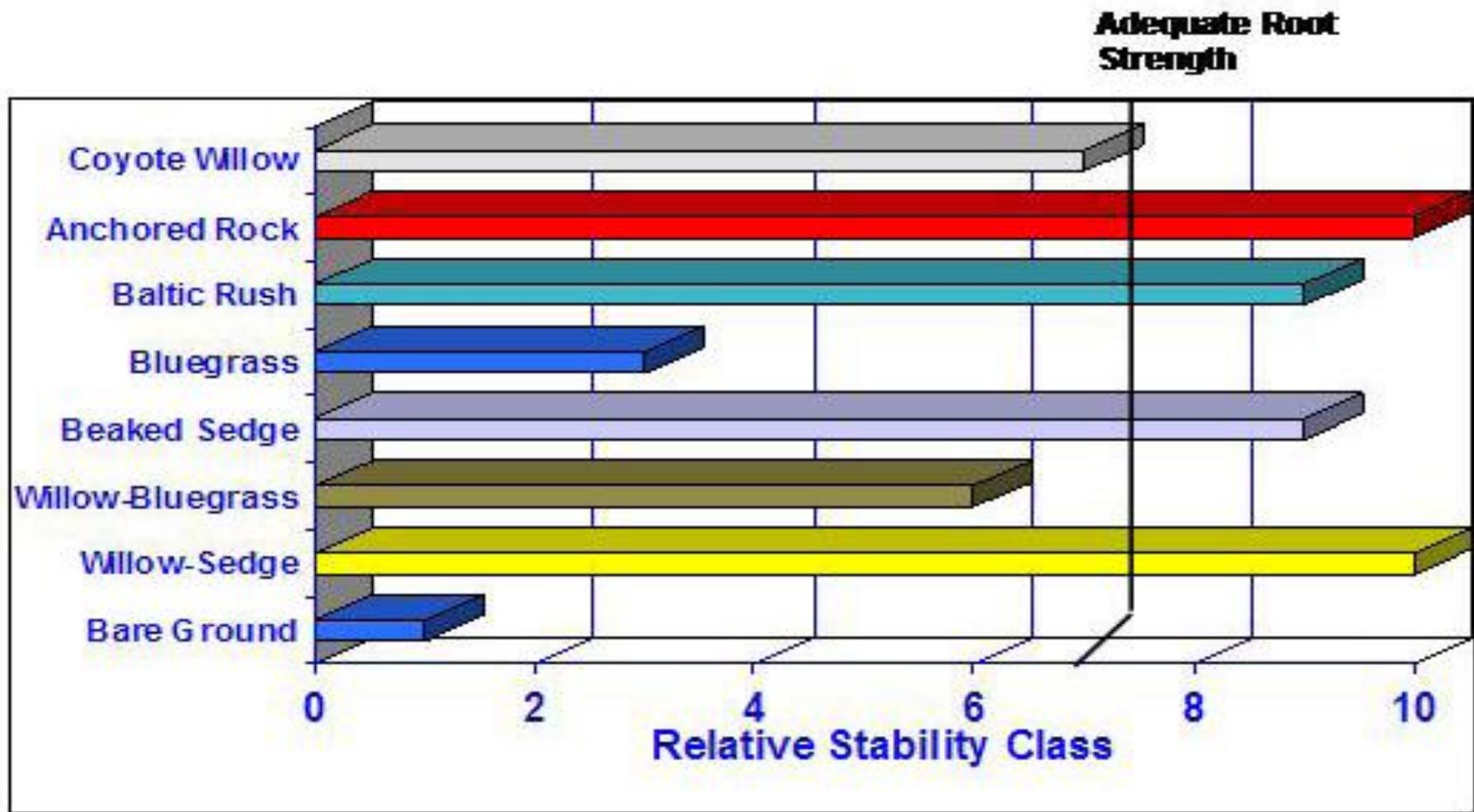
# Plant succession

- Colonize/stabilize first
- Add additional plants for diversity/longevity
- “Workhorse species” (mat, clump, seed)



# Erosion Control

## Channel Stability Rating (Vegetation)



# Can we “rebuild” the eroded shore?

- Moderate energy shoreline
- Add additional brush bundle next year?

Coco log  
(toe protection)

Brush bundle  
(wave break)

Rhizomatous  
emergents



# Plants that root from cuttings



Greg Berg – Stearns SWCD



Willow fascines 5 yrs after installation

# Live stakes/posts

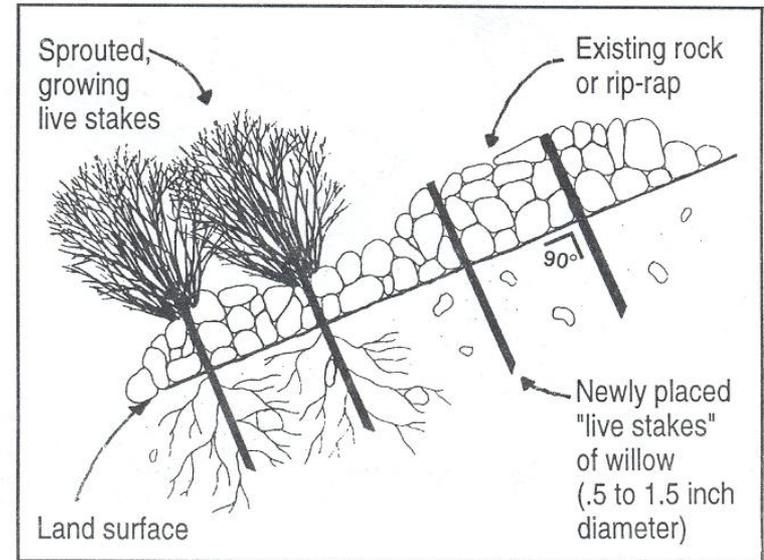


Figure 12: Live stakes installed through rip-rap.

# Vegetated geogrid



# Plant communities (“families”)

- Use reference sites to develop plant groupings that work well together and are effective for your site conditions

## Grassland/Meadow: “Matrix” vs. “Patch” species



## Forest layers: tree, shrub, ground story



## Aquatic layers – emergent, floating, submergent



# Protect your investment!



Gregg Thompson - AMSWCD

# Little Bass Lake

- Small lake
- Small resort
- Upland and aquatic vegetation removed on 400' of shoreline; turf seeded on upland
- Shore eroding 6"/year; 1-2' undercut toe
- Owner preference: "My customers come to the north woods - give them the north woods!"
- Total cost: \$800 (\$2.00/linear shoreland foot)

# Aerial view





Before planting



Install willow wattle  
along eroding shore

# Install aquatic and upland plants





In-lake sedge transplant after only one year



Shoreline after  
two years



Shoreline five years after planting