



Natural Shoreline Protection in the Great Lakes

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Overview

- What are natural shorelines?
- Design considerations
- Project examples from low, moderate, and high energy sites



What is a natural shoreline?

- Terminology may change, “natural”, “living”, “nature-based” shorelines
- “A living shoreline is a protected, stabilized coastal edge made of natural materials such as plants, sand, or rock. Unlike a concrete seawall or other hard structure, which impede the growth of plants and animals, living shorelines grow over time. “

-NOAA



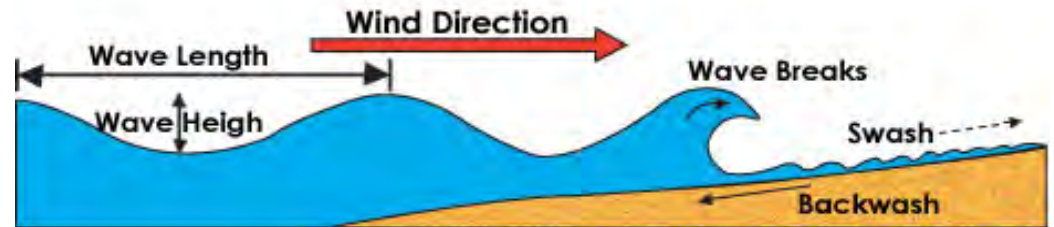
How does wave energy affect vegetative growth?

- Soil erosion
- Physical displacement of plants
- Turbidity



What do we mean by low/moderate/high energy sites?

- Energy is primarily driven by wave height
 - Wind driven waves
 - Boats
- Wisconsin DNR
 - Low energy=less than 1 foot
 - Moderate Energy=1-2.3'
 - High Energy=greater than 2.3'



Bioengineering

- Bioengineering is “The use of plants, plant products, and special techniques to create structure within the soil to withstand erosive forces. It involves the reintroduction of deep-rooted native plants, creating a system that mimics naturally stable shorelines.” - *MNSP*

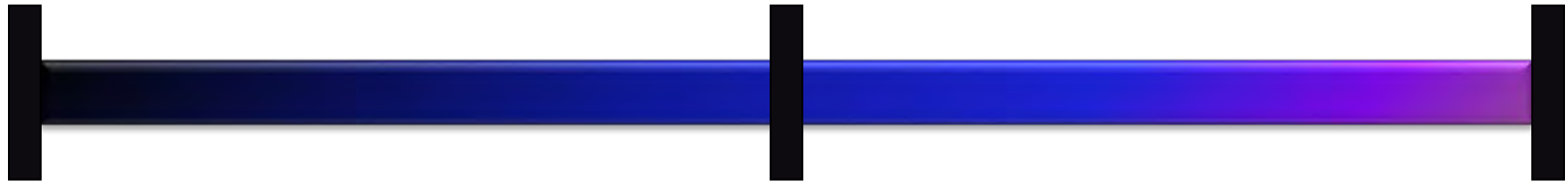


Stabilization Techniques: A Continuum of Choices

Bioengineering

**Biotechnical
Engineering**

Structural Engineering



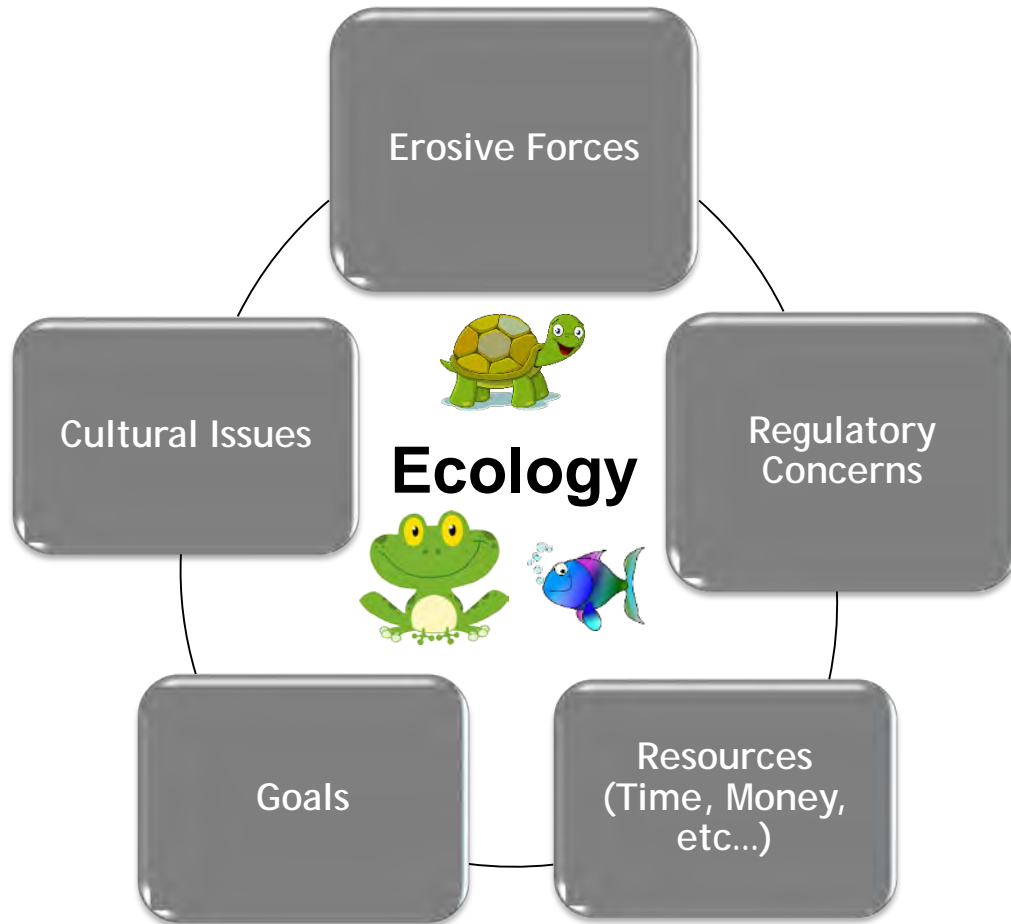
Native plants and
natural materials

Native plants, rock, and
erosion control materials

Rock, gabions,
sheetpile, and concrete



Design Considerations



- Form MUST follow function
- Cost vs. risk
- Aesthetics
- Vegetation type
- Sunlight
- Habitat considerations (ie, threatened, endangered or rare species)
- Access to site
- Soils/moisture
- Waves/shear stress/erosive forces



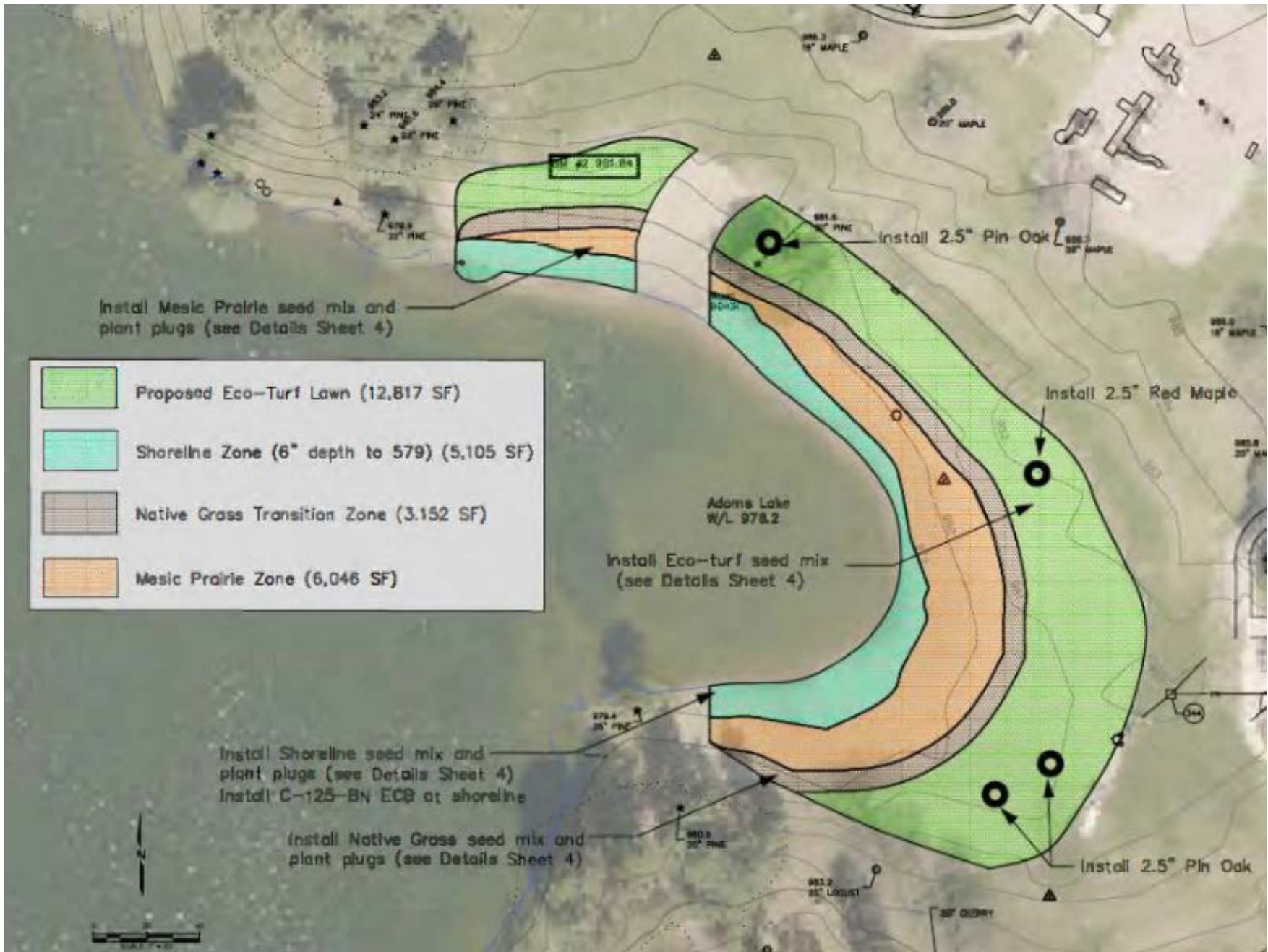


Addison Oaks County Park



- Oakland County Park
- Conversion of beach into natural shoreline
- Low energy





Install Mesic Prairie seed mix and plant plugs (see Details Sheet 4)

- Proposed Eco-Turf Lawn (12,817 SF)
- Shoreline Zone (6" depth to 579) (5,105 SF)
- Native Grass Transition Zone (3,152 SF)
- Mesic Prairie Zone (6,046 SF)

Install Eco-turf seed mix (see Details Sheet 4)

Install Shoreline seed mix and plant plugs (see Details Sheet 4)
Install C-125-BN ECB at shoreline

Install Native Grass seed mix and plant plugs (see Details Sheet 4)



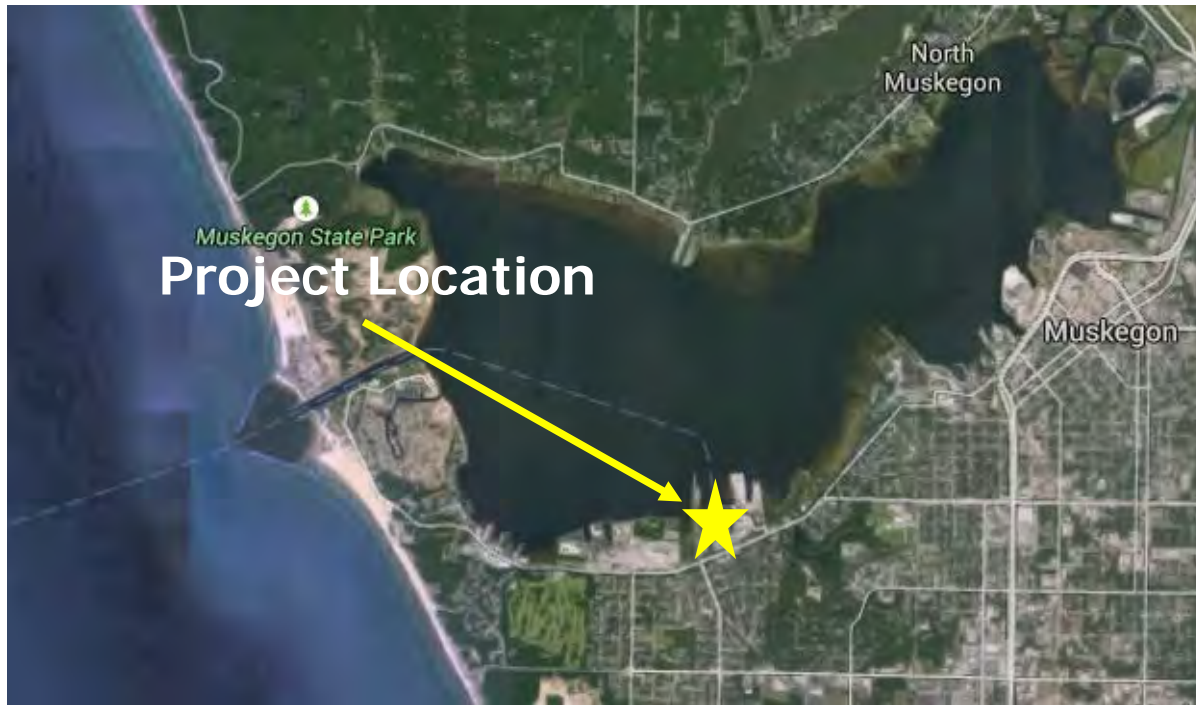








Grand Trunk Public Boat Launch



- Owned by MDNR, maintained by City of Muskegon
- Low energy
- Rock/debris on shoreline
- Project funded by NOAA through the Great Lakes Commission and West Michigan Shoreline Regional Development Commission



Before Restoration



Simple re-grading and debris removal





Heritage Landing County Park



- Muskegon County park
- Moderate to low energy
- Rock/debris on shoreline
- Project funded by NOAA through the Great Lakes Commission and West Michigan Shoreline Regional Development Commission



Project Location



e Earth

300 ft



Pre-Restoration







Post-Restoration



Pre-Restoration



Construction

Post-Restoration



Post-Restoration



Post-Restoration



Center Point Bay Marina



- Funded by NOAA through the Great Lakes Commission and WMSRDC
- Private landowner
- 2 mile fetch
- Up to ~3' ice sheets
- ~3' waves recorded at site
- Ice push from multiple directions

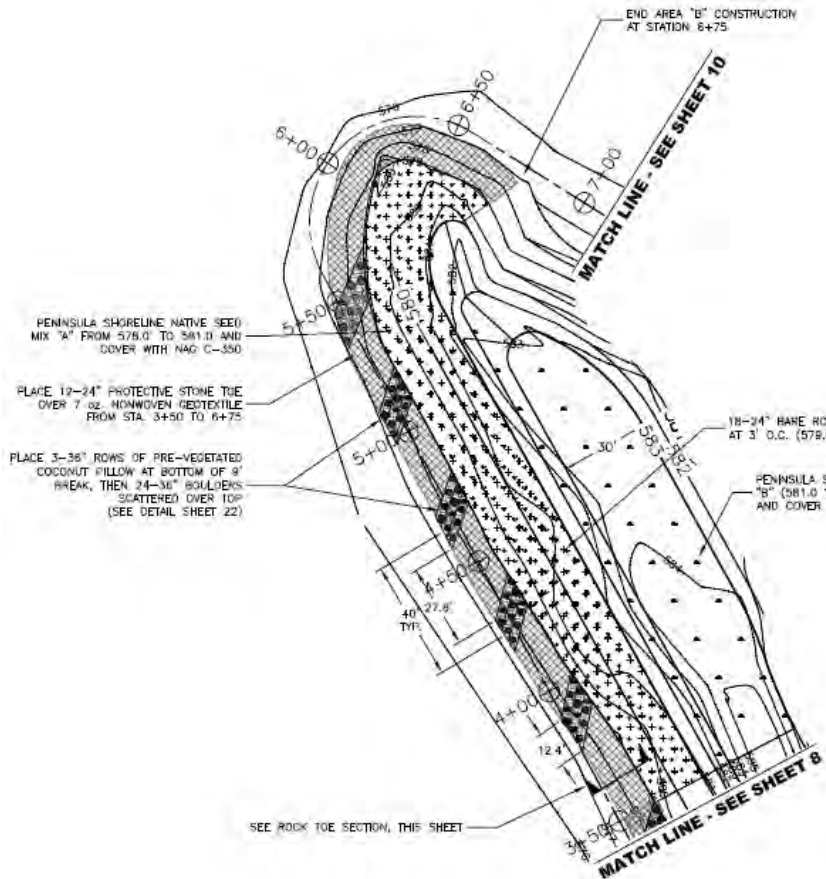


2009



2009



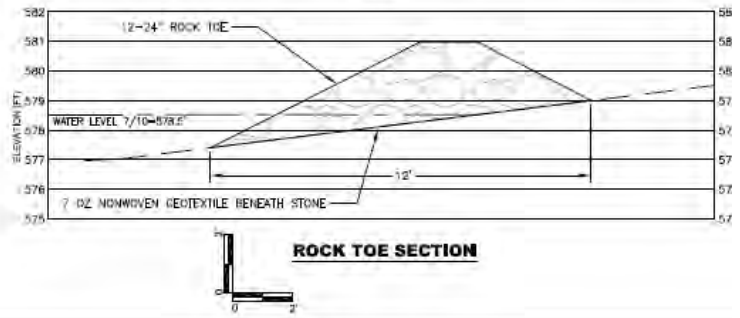
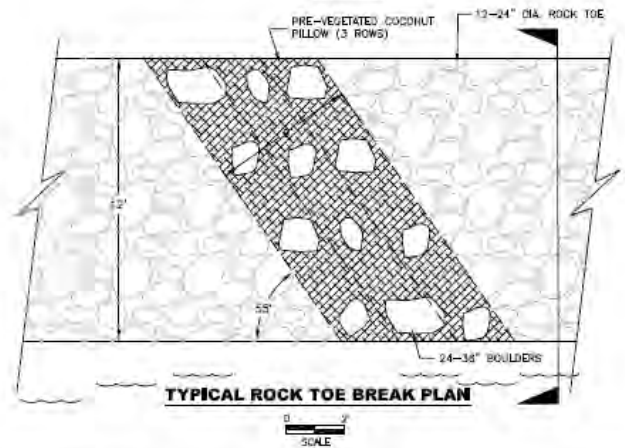


NOTES:

1. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRING DAMAGE TO EXISTING STRUCTURES, ASPHALT PATH OR TURF GRASS.
2. ALL DAMAGED TURF GRASS SHALL BE REPAIRED BY RE-SEEDING
3. CONTRACTOR SHALL AVOID ALL EXISTING CONDUIT, PIPING, AND STRUCTURES WITHIN PROJECT AREA. CONTRACTOR SHALL BE RESPONSIBLE FOR REPAIRS TO ANY STRUCTURES DAMAGED DURING CONSTRUCTION.

LEGEND

- (—) EXISTING CONTOUR
- (—) PROPOSED CONTOUR
- ⊕ STATIONING MARKER
- [Pattern: Dotted] PENINSULA SHORELINE NATIVE SEED MIX "A"
- [Pattern: Dotted with small squares] PENINSULA SHORELINE NATIVE SEED MIX "B"
- [Pattern: Dotted with larger squares] 18-24" BARE ROOT SHRUBS 3' O.C.
- [Pattern: Horizontal lines] PRE-VEGETATED COCONUT PILLOW
- [Pattern: Diagonal lines] ROCK TOE



2010



Designed gaps for wildlife passage across the land/water interface

2015

Bulrush climbing onto
lake bed



2015



2016



2016



2019



In summary:



- Need to balance functional, aesthetic and ecological goals
- Plants alone may not cut it
- Keep the big picture in mind
- Consider historic and future, not just current conditions
- Remember that a failed project benefits no one
- Don't let the perfect be the enemy of the good



Thank you!

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