

Green “Retaining Walls”

A Sustainable
Approach to
Shoreline
Stabilization



Envirolok®



Dixon
Shoreline / Landscaping LLC

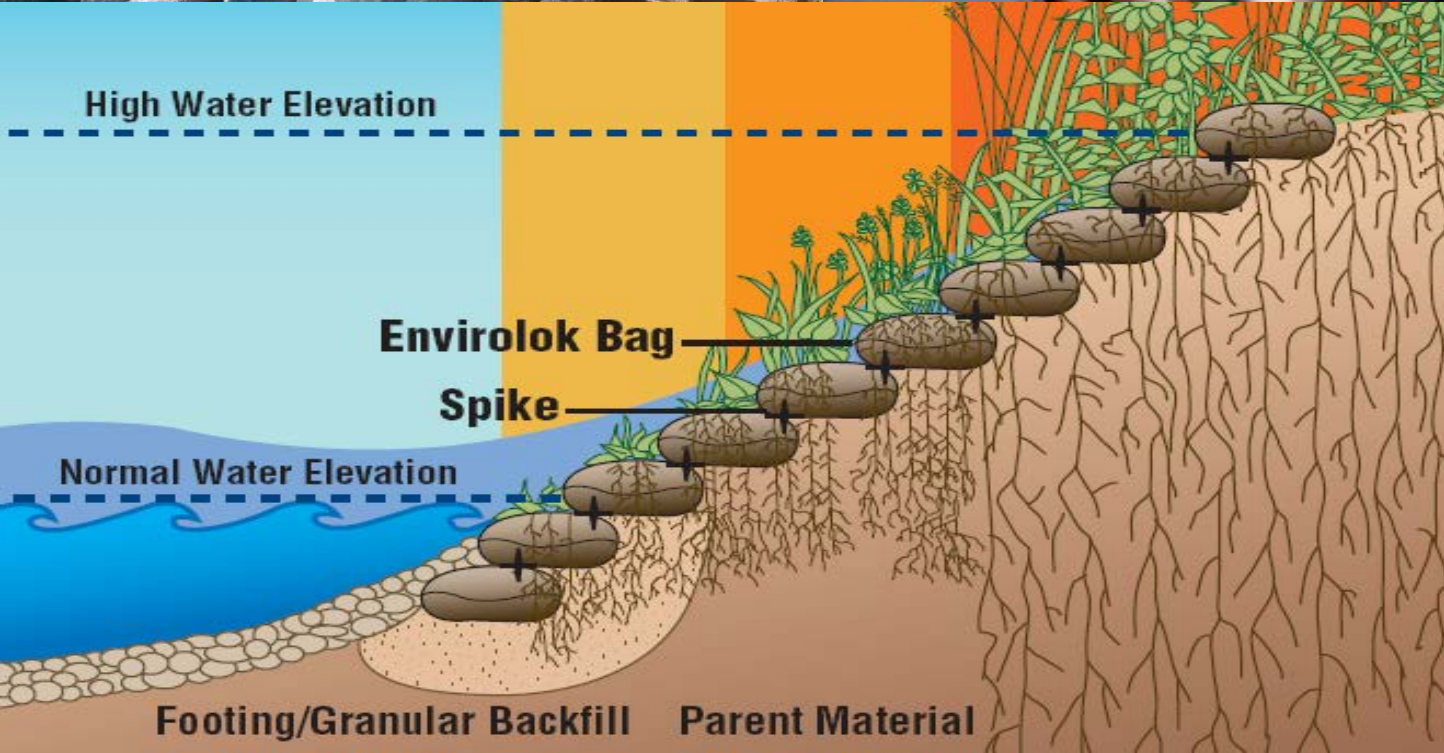


For Today

Welcome & Introductions
Why Healthy Shorelines?
History of Shoreline Zoning
Design/ Approval Process

- Collaboration
- Site Assessment
- Working with Soil Bags

Applying the Knowledge





Introductions

Eric P. Seidl, LEED-AP

Sales Manager- Envirolok, LLC

- 20 yrs experience in Landscape Architecture
- Parks, Open Space, Land Development & Waterfront Restoration
- Stormwater Management

Pat Dixon

Owner Dixon Shoreline Landscaping

- Shoreline & Wetland Expertise
- Passion-driven
- Provides instrumental guidance for homeowners, contractors, DNR & Regulatory Agencies
- Nationally recognized in multiple publications



What's the point of living on the lake...



Water Quality

- Habitat-
 - Amphibians, Fish, Waterfowl, Animals & Humans
- Recreation- Water Sports
 - Passive & Active Use

Why Healthy Shorelines are Critical





Before 1960



History of Shoreland Zoning

After 1960

**Increase in Development
& Accessibility Along w/
Manicuring the Shore –
Leads to decline in
Recreational Tourism**

Preventing & Controlling Pollution –
Needed for Boating & Swimming
Protecting Spawning Grounds – Good
Fishing
Maintaining Shore Cover – Good
Fishing & Hunting
And Today- We Add Property Values

History of Shoreland Zoning

1966

**Where it all
Began**



Full Circle?

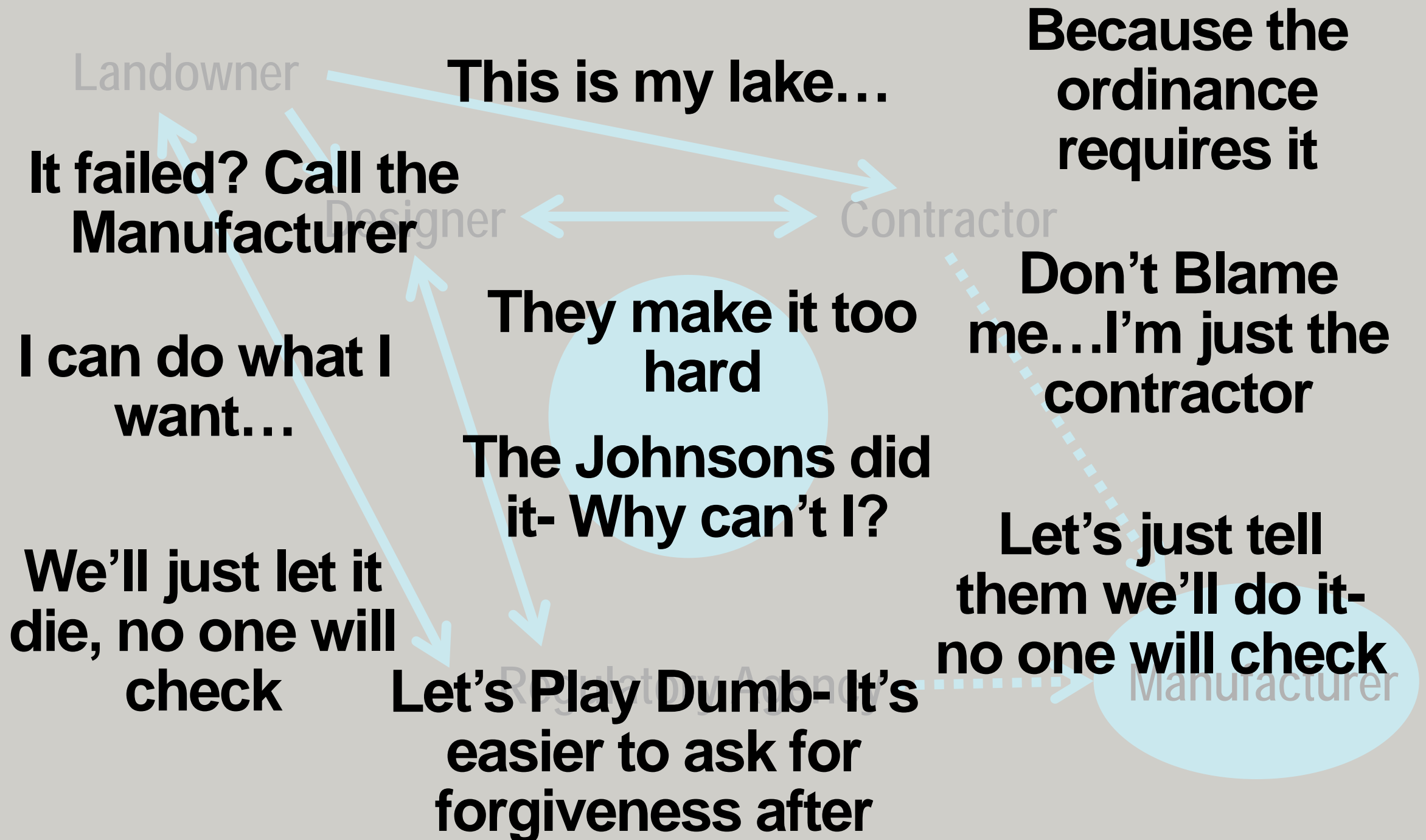
The Current Process





rocess

**Desirable
Outcome**



Collaborative Model

Regulatory Agency

Designer

Contractor

Manufacturer

Landowner

Desired
Outcome

1x solution

Cost-effective

Maximize Use

Water Quality

Recreational Tourism

Desired Outcome = Sustainability

Landowner

Be Present & Be Active

Project Roles -Know the Audience-

Designer/ Contractor

- Empower/ Educate the Landowner
- Drive the Process
- Embrace the Regulation- Why are they good? How do they benefit the homeowner?
- Speak the Language
- Listen
- Get Involved

The Manufacturer

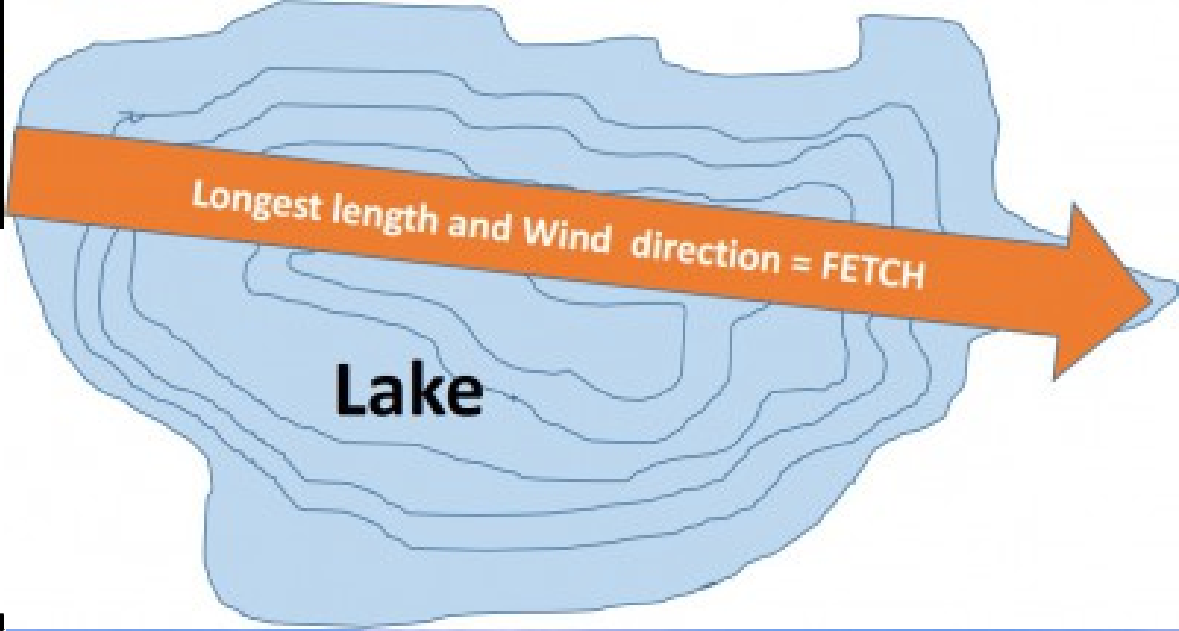
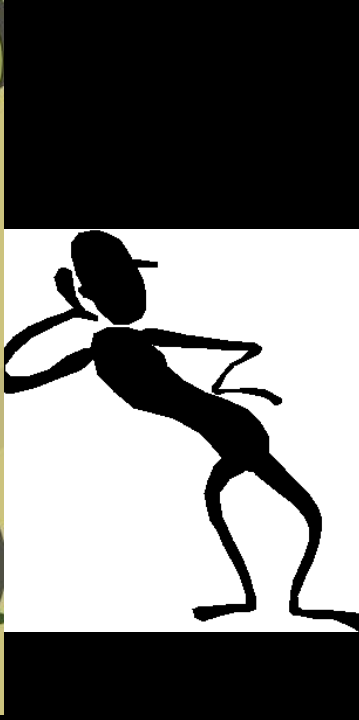
- Product Support
- Quality Control – Create a process
- Provide the Tools- Education/ Training
- Follow Up w/ the RA
- Empower the Process
- Get Involved
- Make it Easy for Everyone – Take out the Unknowns

Regulatory Agency

Speak the Language
Empower the Experts...

Be Consistent-

- What are other departments doing?
- What are Other Counties doing?
- Educate



Starts With Listening

- To the Land
- Site Investigation
- Sun, Water, Wind (Fetch)
- Soils

Understand the User- desired outcome
Investigate the Adjacencies



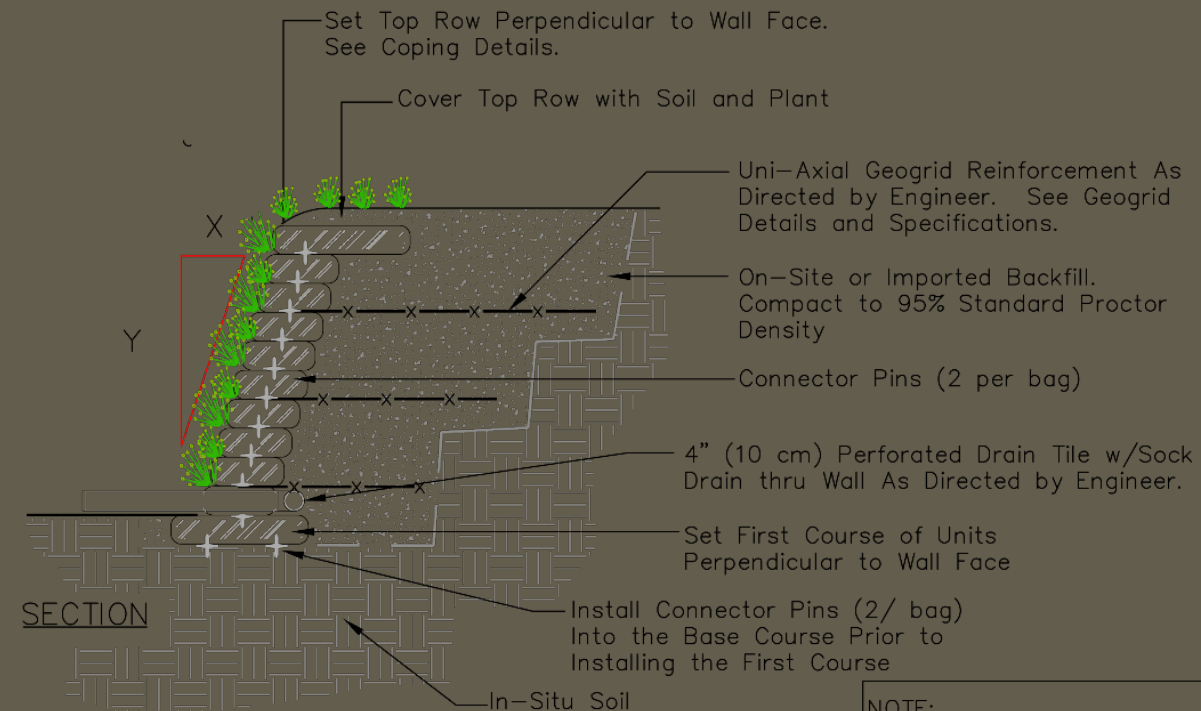
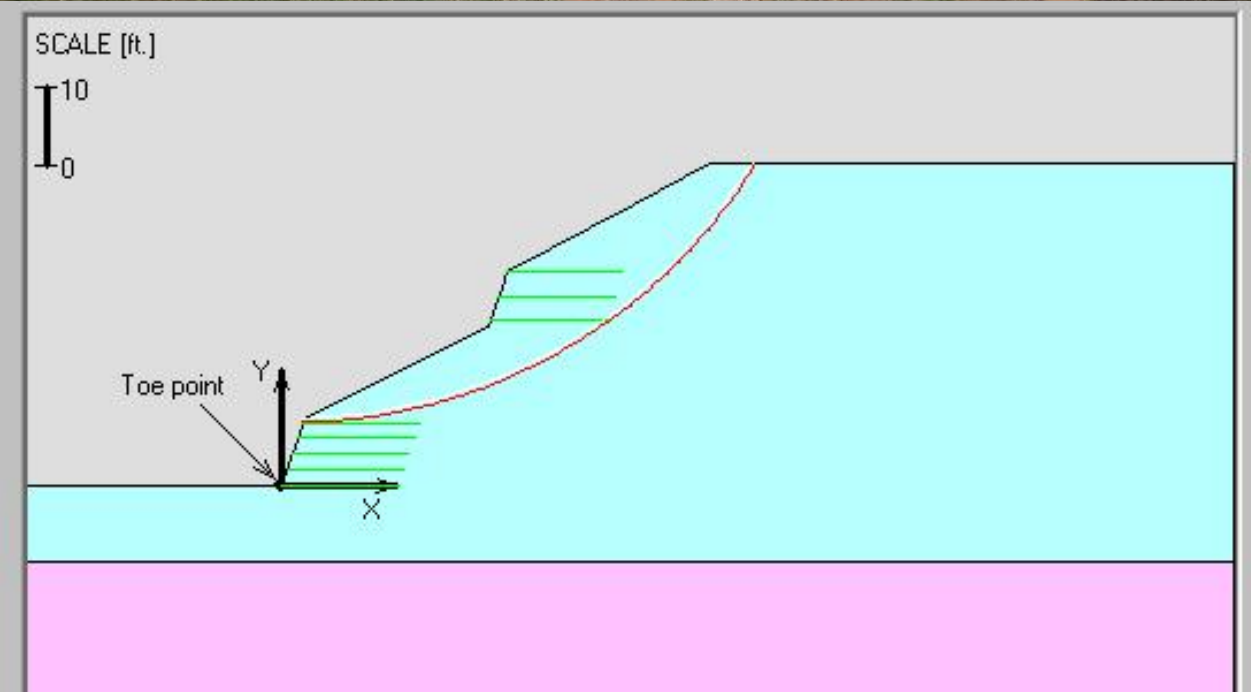
How can we COLLABORATE to create Healthy Shorelines



Partnering with the experts

When do we need?

- Engineering
- Soil Samples



NOTE:

- See Specifications for full Installation Instructions

Slope Stabilization Solutions

Wood \$

Least Longevity of all options
Chemical Infused
Not Engineered- deadmen rot
High Maintenance
High Rate of Disturbance



Erosion Blanket & Seeding \$

Limited by slope
Establishment Maintenance- Cost in long run
Less control of a Manicured Look
Perceived as high maintenance- Education



Concrete/ Block - \$\$\$-\$\$\$\$

Still not permanent
Extensive Base Course
Little forgiveness w/ freeze / thaw
Expensive to replace and repair





Slope Stabilization Solutions

Slope Stabilization Solutions

Compost Sock Systems - \$\$

Less Slope Limitations

Root Matrix holds slope

Need stable soils

Compost decompose quickly,

- Result - Slumping





Envirolok

- Combines Engineering, Soils & Native Plants
- Permanent, Proven
- Moves w/ freeze / thaw
- Low Impact
- Engineered Reinforcement-
- Geogrid, Earth Anchors
- Support
- Vegetation Options
- Use as RSS or MSE type system



Slope Stabilization Solutions



BAGS



SPIKES

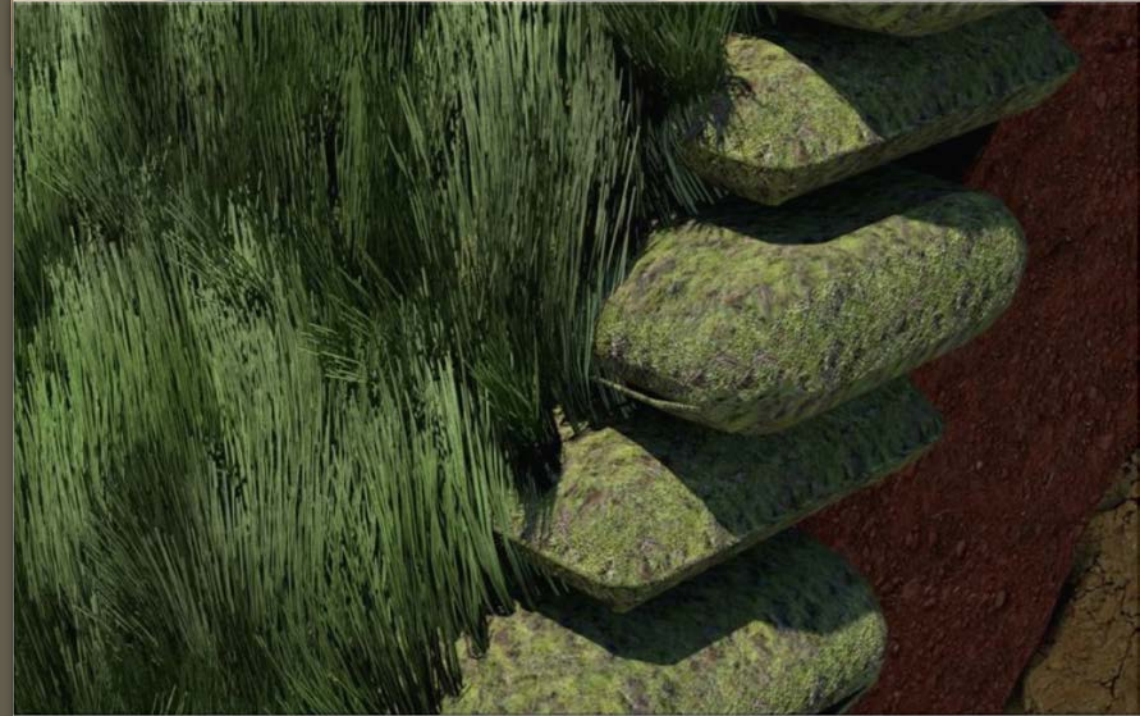
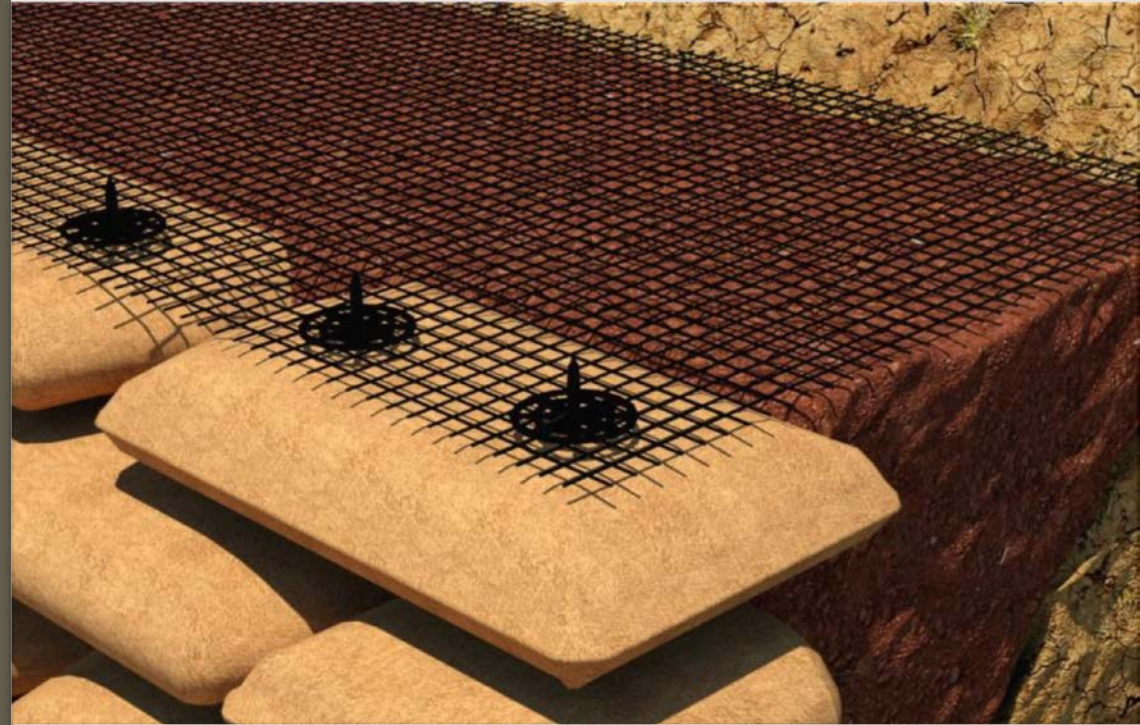


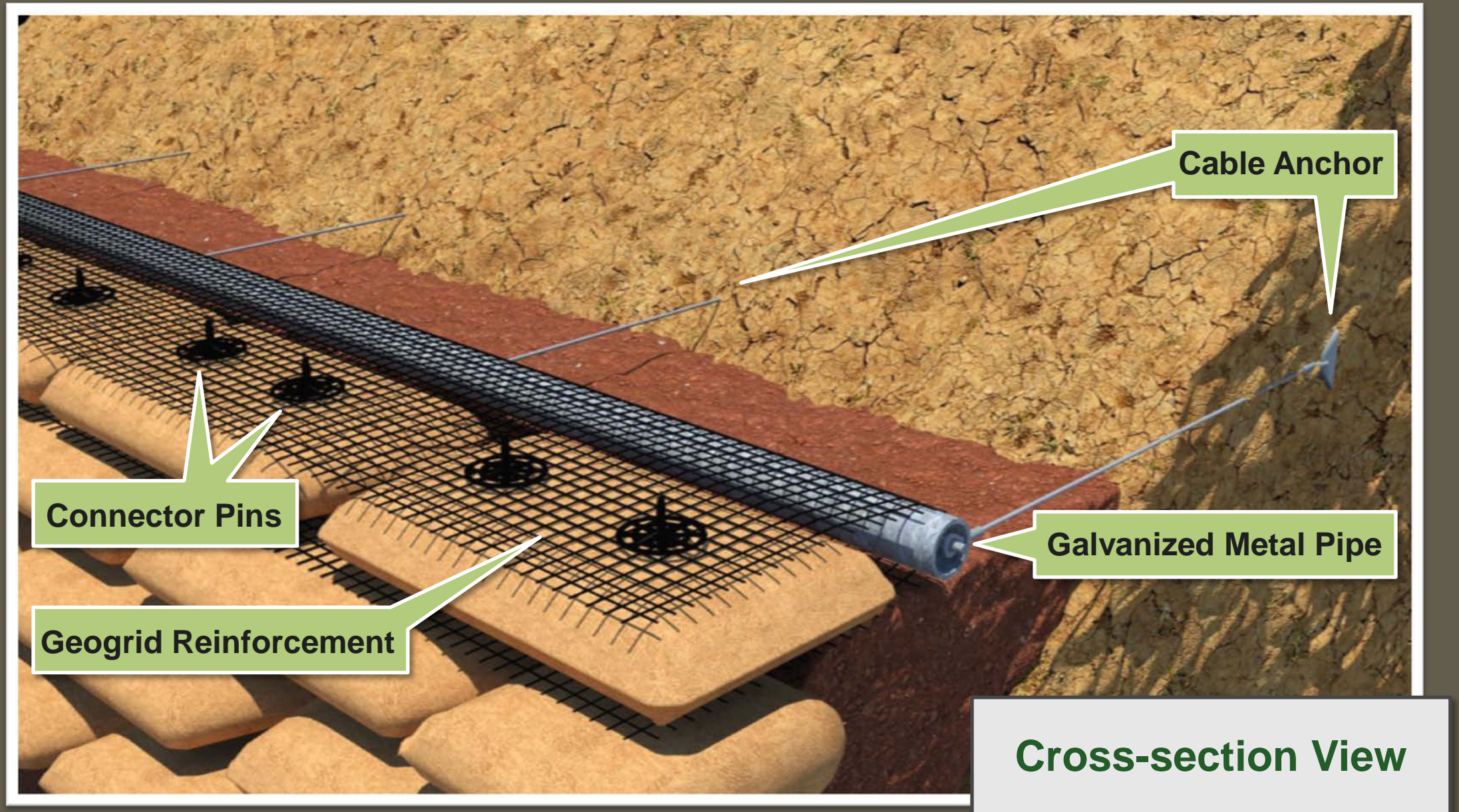
**SUPPORT &
ENGINEERING**



VEGETATION

Slope Stabilization Solutions





Applications





Applications



Applications



Applications



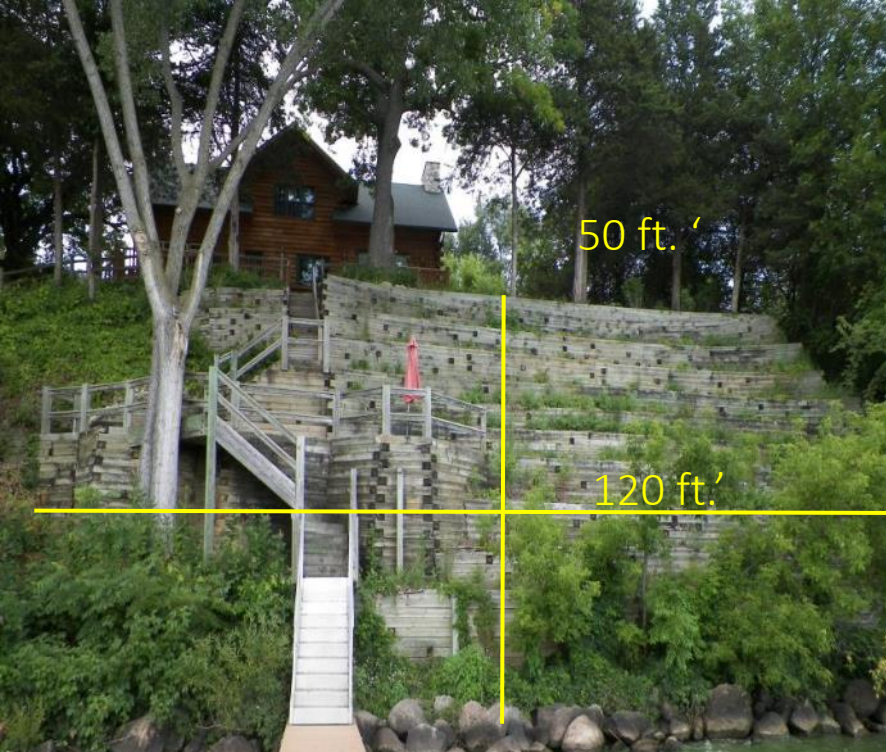
Why Would You Want This?



When You Can Have This?

**WORKING WITH MOTHER
NATURE,
NOT AGAINST HER!**





Mid-Level Lake Access



Recessed Stair Case

2014/07/18



Dead Man Anchors

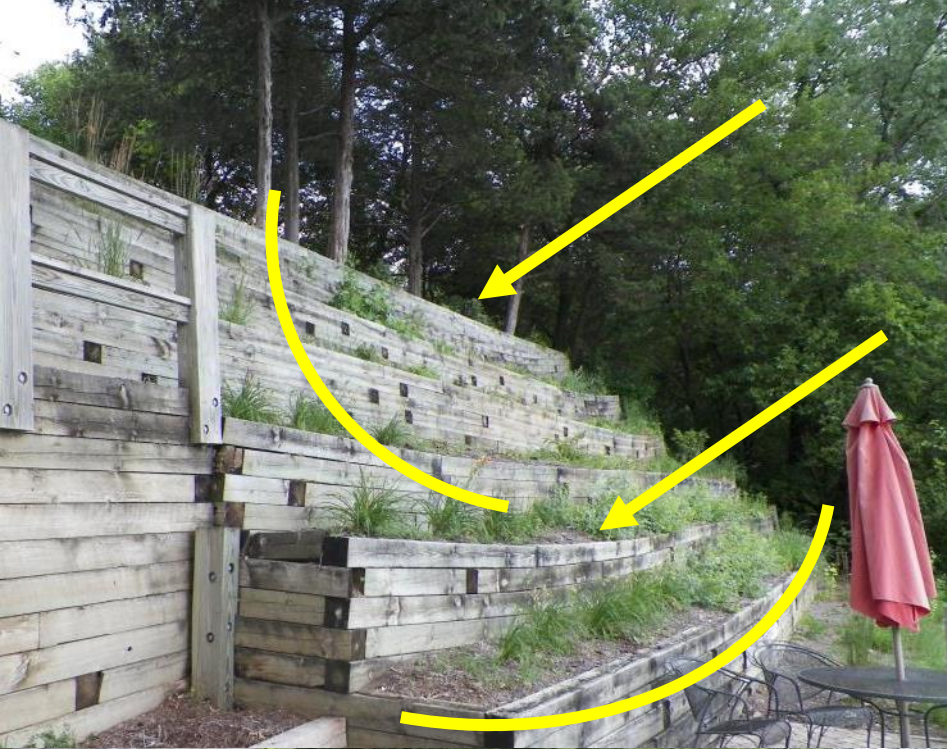
2014/07/18

Step 1: Site Inspection

Figuring it all out- wow, this is a big job!

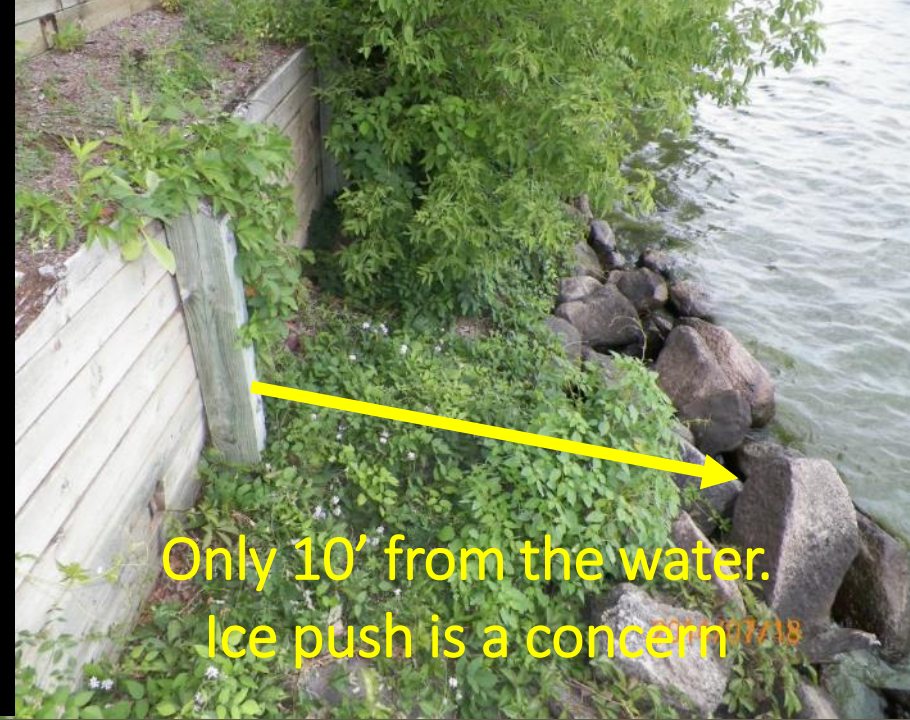
This job is 120' across and 50' high.
Pitch 1.2 to 1



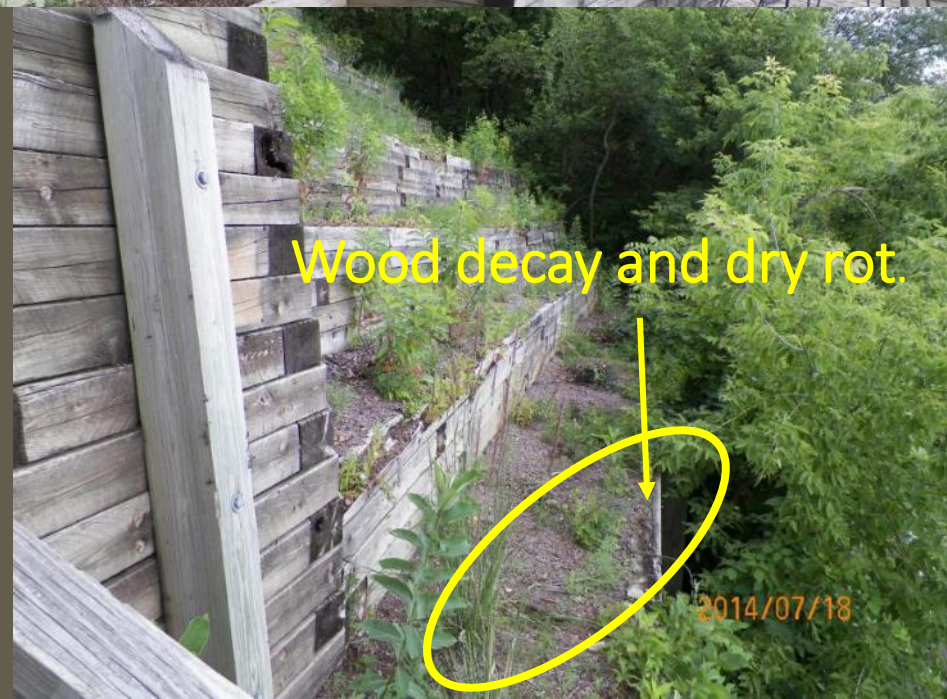


Wall is only 17 years old!

- Bowing & Settling
 - What does this tell us?
- Dry Rot
- Mulch+Wood=Rot



Only 10' from the water.
Ice push is a concern



Wood decay and dry rot.

Step 1: Site Inspection

How can we
access the site?
What about the
existing trees



Step 1: Site Inspection

Vegetation

- Can tell a story about the soil, sun & water



Into the unknown of rotted wood and poison ivy.

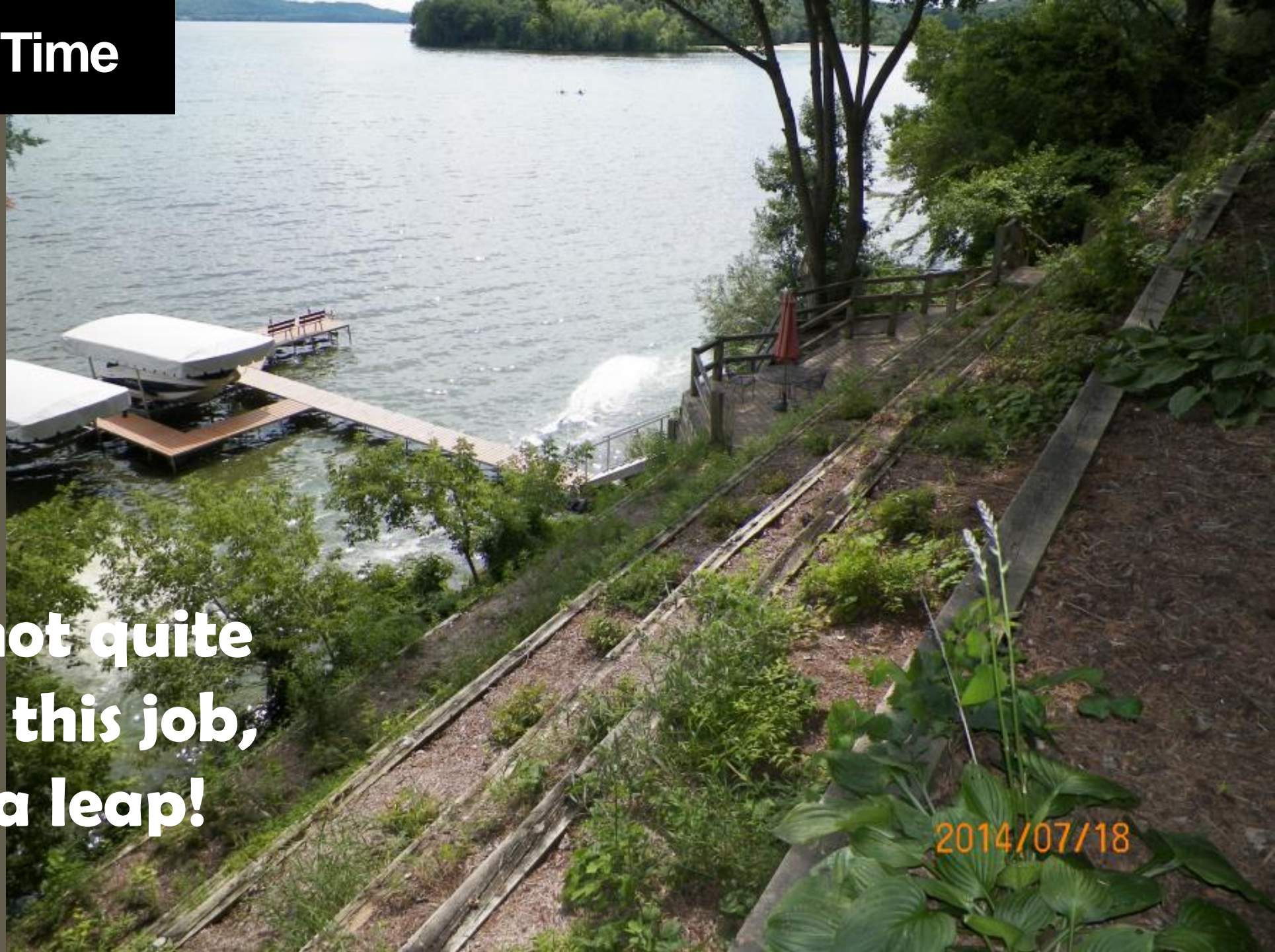


Invasive Plants have taken over and will need to be removed.

Step 2: Decision Time

- Access
- Approach
- Budget
- Next Steps

**Wow, I'm not quite
sure I want this job,
it's quite a leap!**



2014/07/18

Step 3: Design & Engineering

Establish collaboration

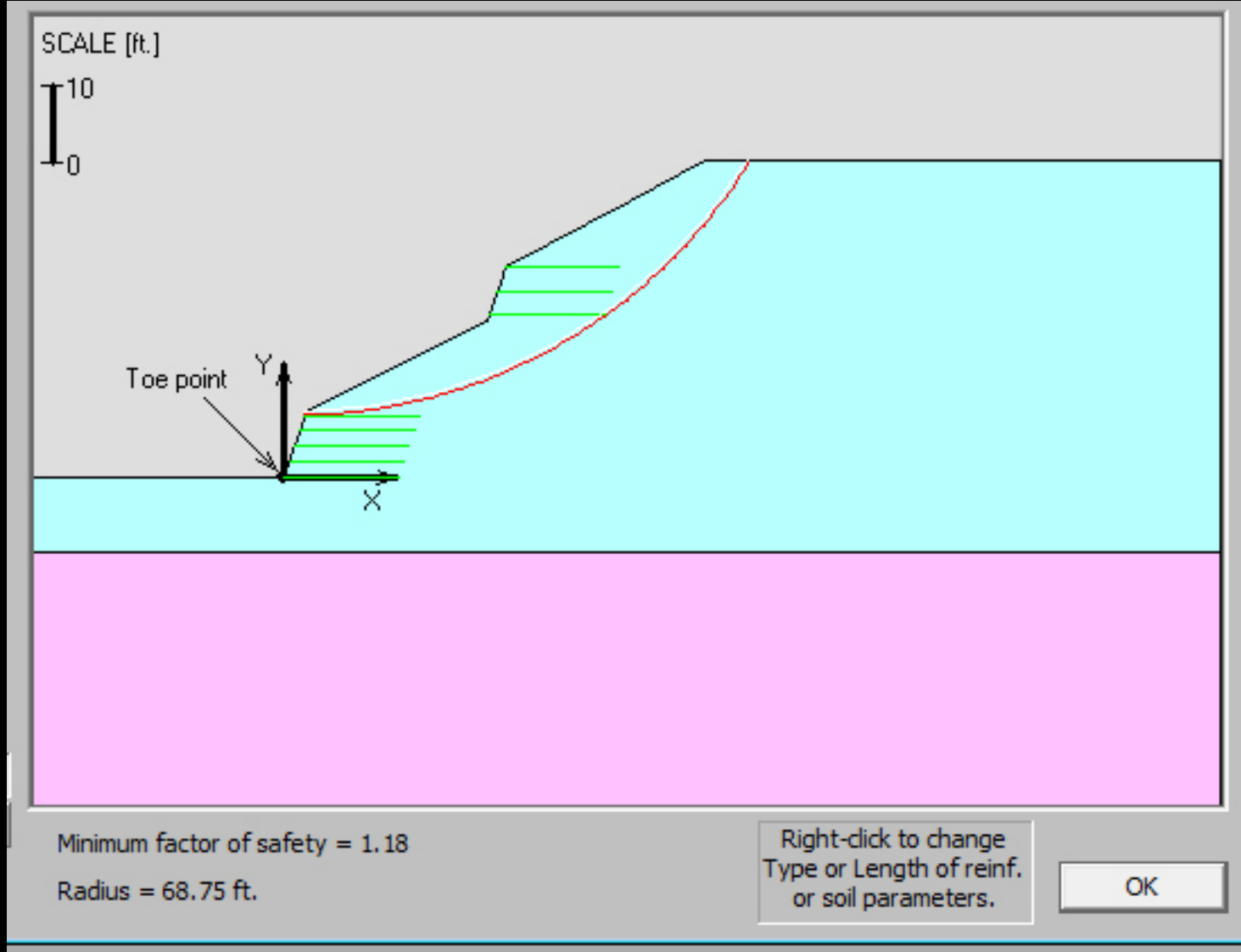
w/ the Client &

Regulators

- Present the Evidence
- Consult the Experts
- When is Engineering Necessary?

- Sandy Soil
 - ϕ 28°, no cohesion
 - 1H:1V existing slope
 - No room to flatten the slope
 - No room for excavation for soil reinforcement.
 - Typical depth for reinforcing on a 1:1 slope is "H", 30-40 ft.

Step 3: Design & Engineering



Slope Stability

Step 3: Design & Engineering



Soil samples taken to a depth of 50', for the purpose of engineering



Drill rig, positioned as close to the edge of the hill as possible for accurate soil samples.

Step 3: Design & Engineering

COLLABORATION

- Let the fun begin!

Collaboration with all entities needed to happen within 30 days, including approved permits from WI DNR, Columbia County Planning and Zoning, and Race Engineering.

Everything hinged on soil test samples, as well as a soil erosion & sediment control plan.

This information is needed to present a rough estimate of the cost for this project to the homeowner.

Step 4: Site Prep

Project Work Begins
8/21/14!



Remove invasive plant species from the shoreline in front of lower wall.



$\frac{1}{4}$ " steel plate backboard stopper!



Step 4: Site Prep

After two weeks of prep



Pictures don't do
justice to the size of
this project



Every rock is hand placed and
numbered!

2014/08/26

Step 4: Site Prep - Access



Prepping the access cut thru the existing wooden walls



Step 4: Site Prep - Access



**Access to the lower
level walls finally
complete**



Step 5: Phase 1 Demolition & Construction



With rip rap complete and access in place, we can now begin the demolition and installation of soil bags!





Installing Block and Tackle Rigging



Using the tree for leverage

Step 5: Phase 1 Demolition & Construction



Step 5: Phase 1 Demolition & Construction

- Soil bags being sent down the chute for installation
- 1st 30' Section
- Timbers removed





Step 5: Phase 1 Demolition & Construction

Dense vegetation was here, it was all invasive species and has now been removed, and is readied and prepped for soil bags.



Earth Anchors and GEO Grid being installed, every 2' high and 6' laterally.



Step 5: Phase 1 Demolition & Construction



Step 5: Phase 1 Demolition & Construction



**All Hands on Deck,
Digging our for
The Next Section**



**Using the
barrel
method to
remove soil,
up and out
of the work
area.**

Step 5: Phase 1 Demolition & Construction



**Wood Pole Grab, for
Timber Removal**



**Soil Bags
Positioned and
Ready to be
installed**

Step 5: Phase 1 Construction

Earth Anchor and GEO Grid Installation



Driving in 3/16" Galvanized Cable Earth Anchor, connected to #880 better built anchor head.



Step 5: Phase 1 Construction



White sand, was discovered in soil test. White Sand is like silica sand it has no ability to bind and tends to roll creating problems for stability.



Step 5: Phase 1 Construction

**The magnitude
and depth of
this project is
awe inspiring.**



Step 5: Phase 1 Construction



West End



**New Discoveries
Every Day!**

Step 5: Phase 1 Construction

It Takes A Team



**This was
the most
grueling
part of the
hand work
for our
team.**

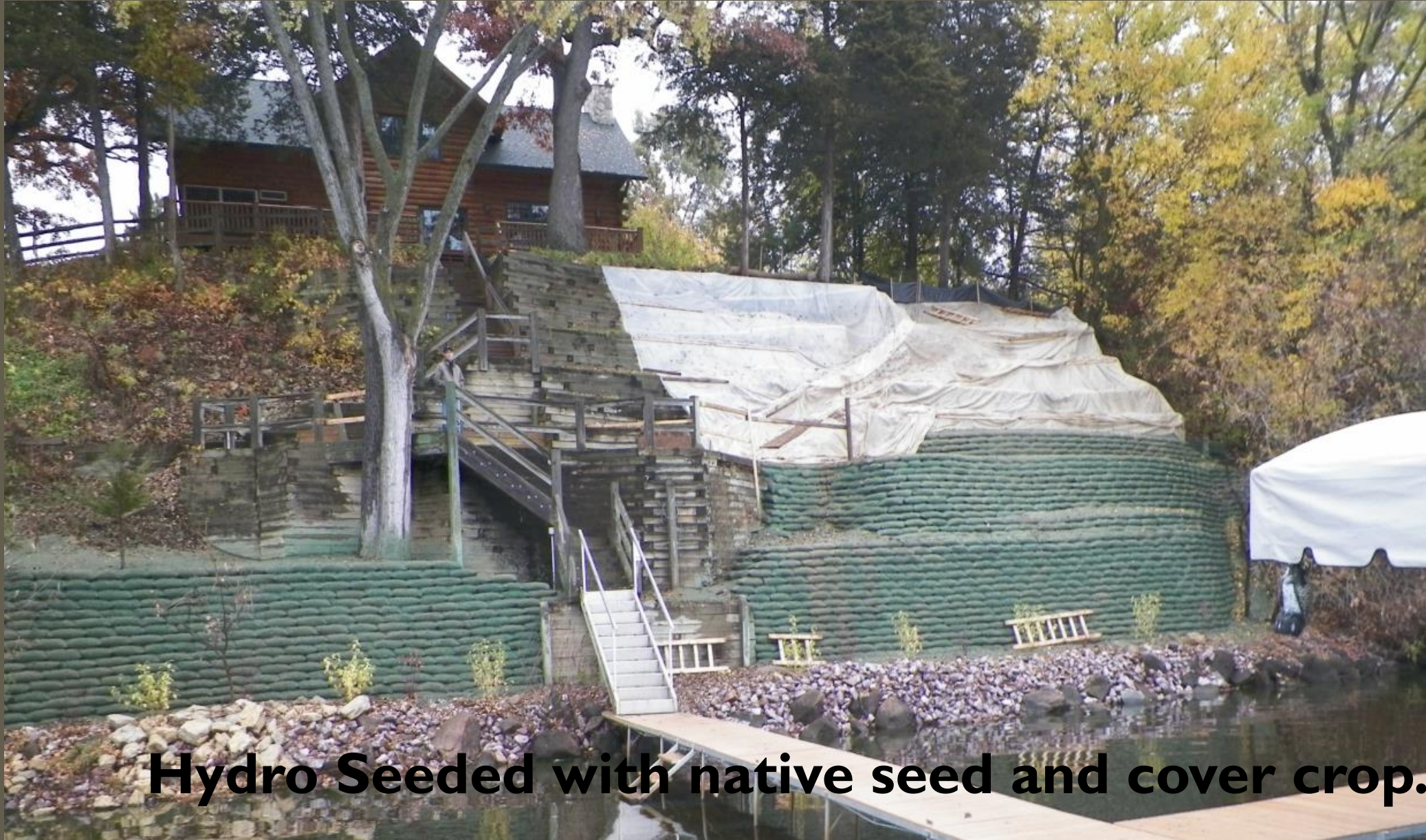
Step 5: Phase 1 Construction



Lower 8' Almost Done

Step 5: Phase 1 Construction – Late Fall 2014

**¼ of the
way there!**



Hydro Seeded with native seed and cover crop.

Step 5: Phase 2 Construction

**Closing The Gap
Spring 2015**



Step 5: Phase 2 Construction



June 2015

Old landing and lake access removed,
as well as recessed stairs removed.
The hillside is starting to take shape
the way we envisioned



Step 5: Phase 2 Construction

Replacing old wooden stair case with stone stairs for lake access, following the original stair layout as close as possible



Using slides and chute to get materials down to the work area

Step 5: Phase 2 Construction



Soil bags provide sediment and erosion control along the sides of in-ground stone staircases. In-ground stairs constructed properly provide a natural low profile look along the water way.

Working below old wooden walls are always a concern for soil cave in



Step 5: Phase 2 Construction



Replacing the stairs between a 4' dia Oak & 2' dia Cedar, left little to no room to expand the footprint of the stair access for the homeowner.

In-ground stairs were the only option on this project due to the rise and run of the hill.

Rise & Run need to be within 1/2 "

Step 5: Phase 2 Construction



**Access to the pier had to
run along the hillside**



**Stairs are finally
in after 3 weeks**

**Installing soil bags along in
ground stairs prevents soil loss**

Step 5: Phase 2 Construction



Step 5: Phase 2 Construction

Using soil bags to stabilize the slope allows us to follow the natural contour of hillside



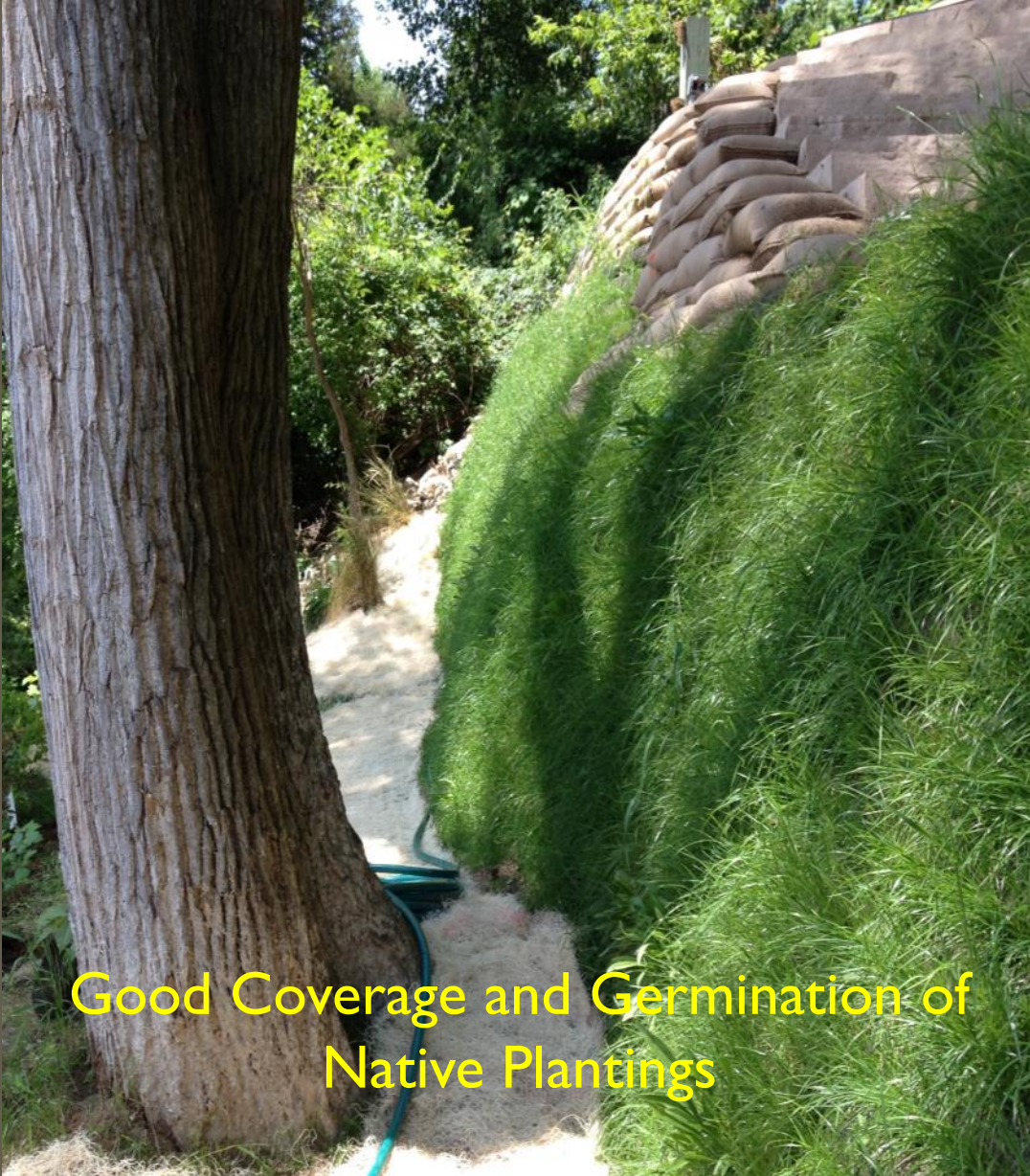
Step 5: Phase 2 Construction

Weather has been great
1 ½ months until the
season is done



Vegetation
growth is
good

Step 5: Phase 2 Construction



Step 5: Phase 2 Construction

**Late summer
2015**



Step 5: Phase 2 Construction

Fall 2015

- Railings are in
- Access to the lake is complete.
- ALL approved by the local building inspector



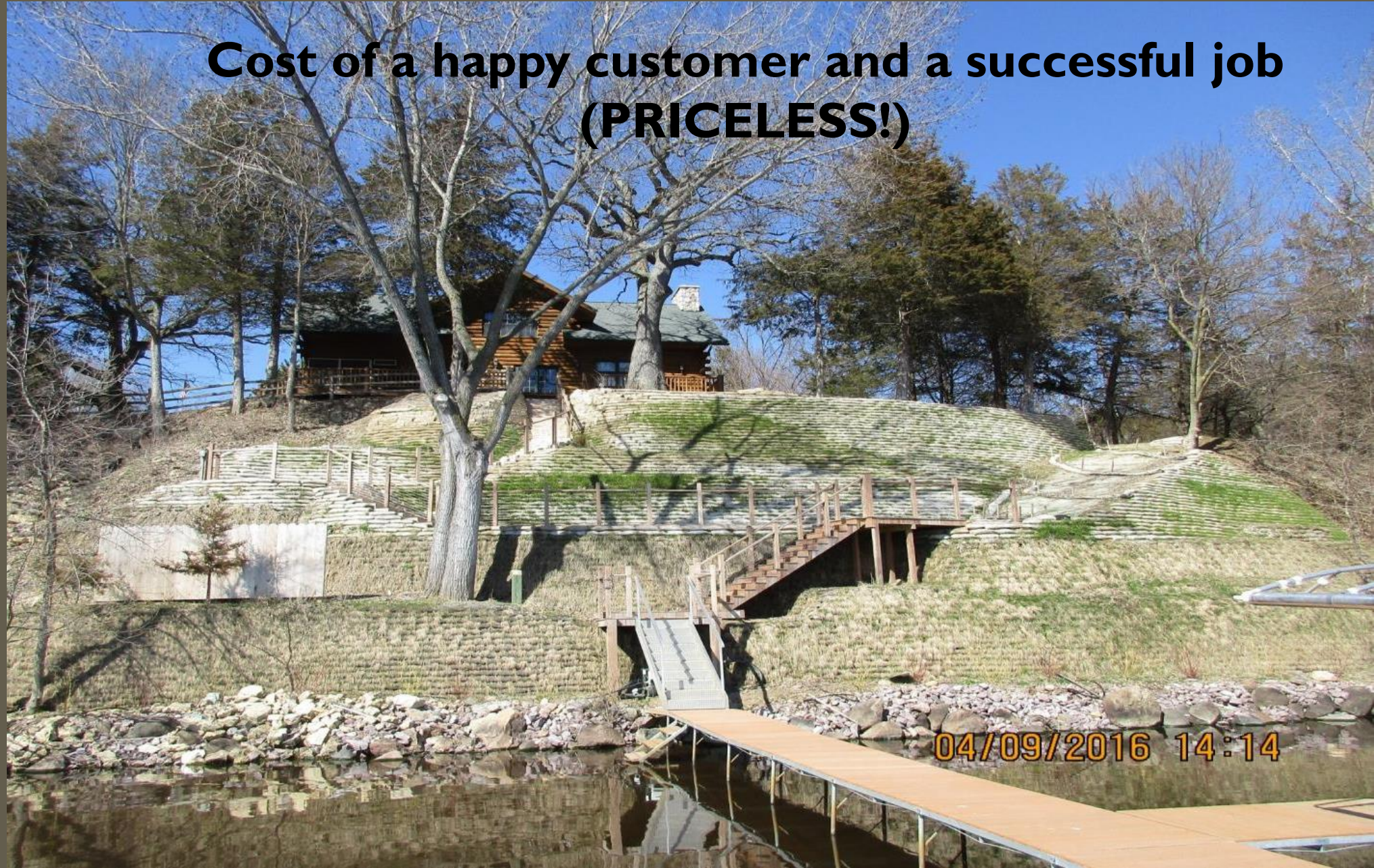
Step 5: Phase 2 Construction

**Spring of
2016**

**All soil bags
held up
fantastic!**

**All we need
to do now is
install
10,000 plant
plugs and
hook up the
irrigation
system**

**Cost of a happy customer and a successful job
(PRICELESS!)**



Vegetation





Green “Retaining Walls”

Thank You!!!



 **Envirolok®**

 ***Dixon***
Shoreline / Landscaping LLC