

LIVING SHORELINES MARSH SILL DESIGN

Spencer Rogers

North Carolina Sea Grant
UNC-Wilmington Center for Marine Science
NCSU Dept. of Civil, Environmental & Construction
Engineering



CLASSES OF EROSION MANAGEMENT OPTIONS

- 1. Avoid the problem**
- 2. Plant it**
- 3. Harden the shoreline**
- 4. Trap sand**
- 5. Add sand**

CLASSES OF EROSION MANAGEMENT OPTIONS

1. Avoid the problem
2. Plant it

Living Shorelines

3. Harden the shoreline
4. Trap sand
5. Add sand

DCM BIOLOGICAL IMPACT OF EROSION CONTROL OPTIONS

The North Carolina Estuarine Biological and
Physical Processes Work Group's



Recommendations for Appropriate Shoreline
Stabilization Methods for the Different
North Carolina Estuarine Shorelines Types



North Carolina Division of Coastal Management
August 2006

“My bug is best.
Don’t mess with it.”



210

July 2006



1 Miles

MARSH

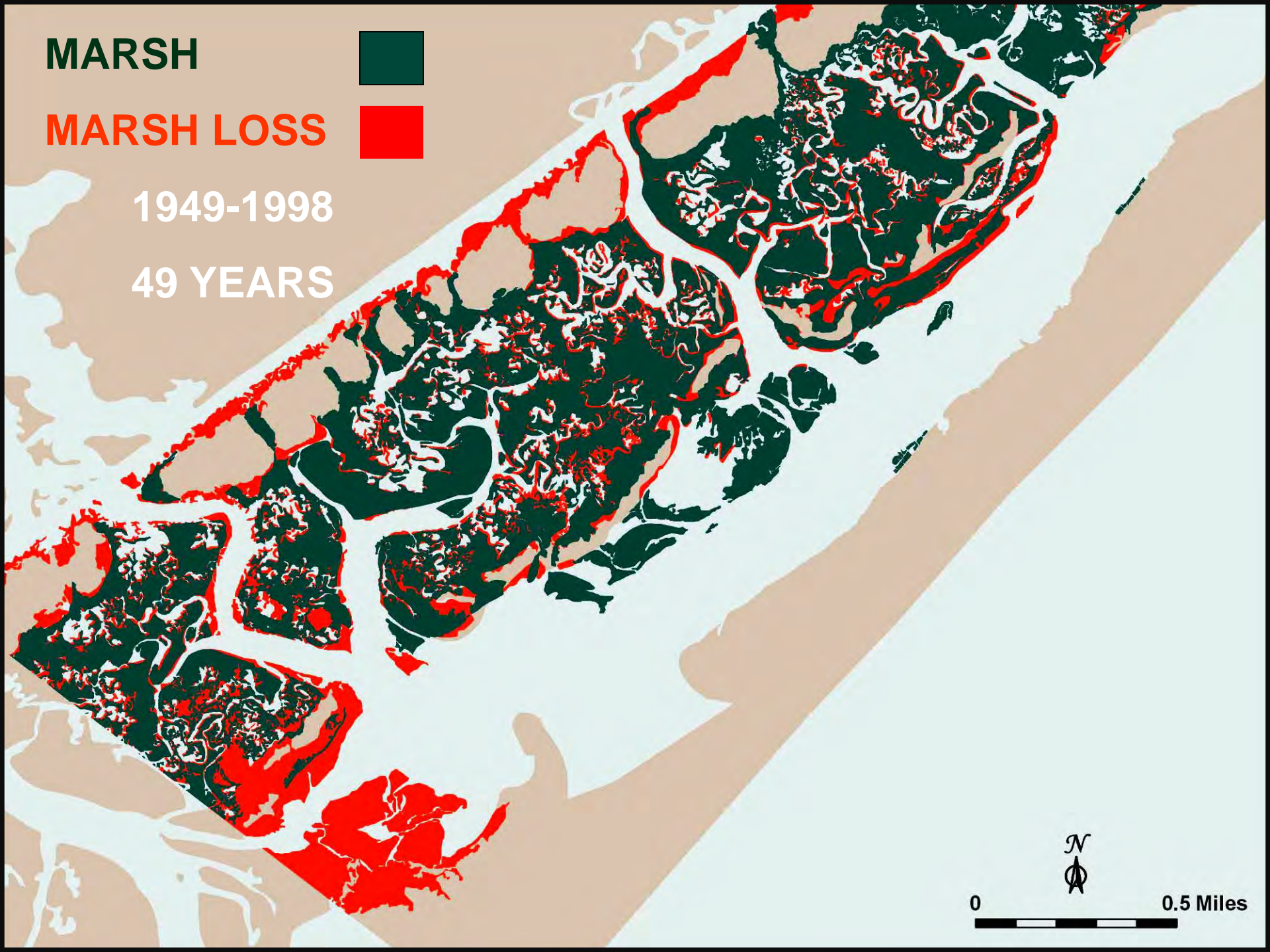


MARSH LOSS



1949-1998

49 YEARS



MARSH

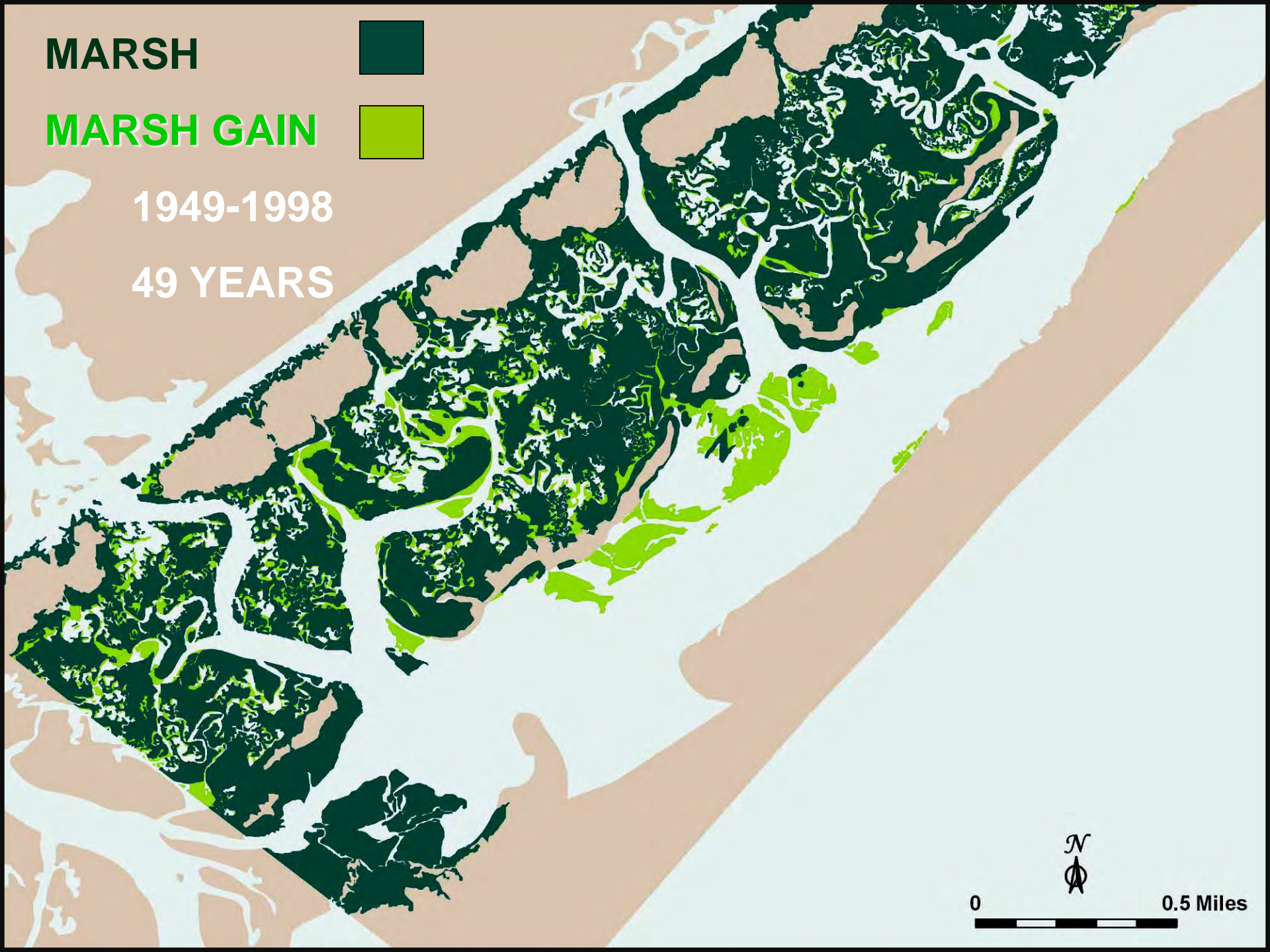


MARSH GAIN



1949-1998

49 YEARS

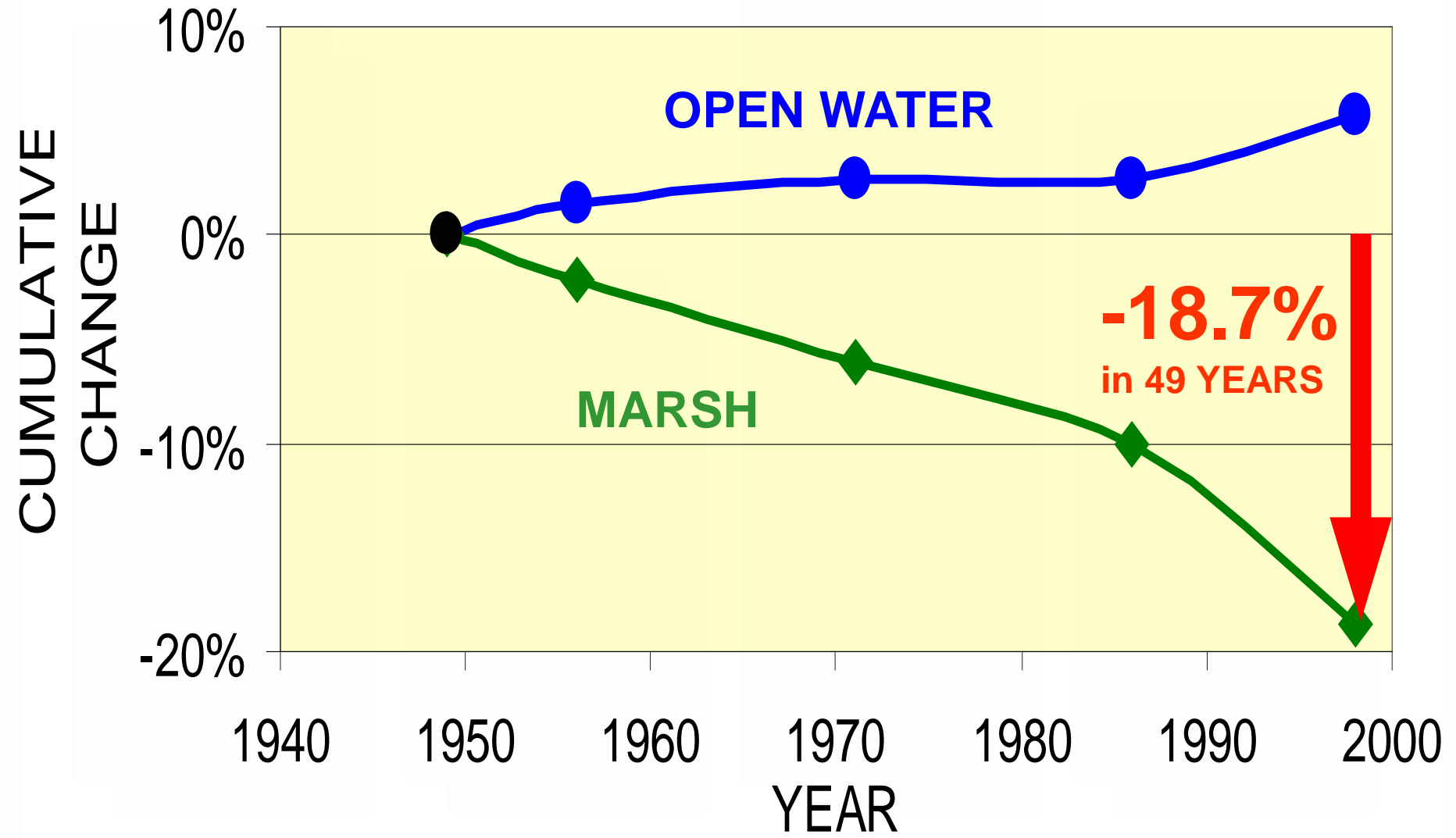


0



0.5 Miles

CHANGES IN TOPSAIL SOUND MARSH & OPEN WATER ACERAGE



LIVING SHORELINES: UNAVOIDABLE BENEFITS?

- **Habitat creation**
- **Stormwater runoff management**
- **Maintains vegetation buffer**





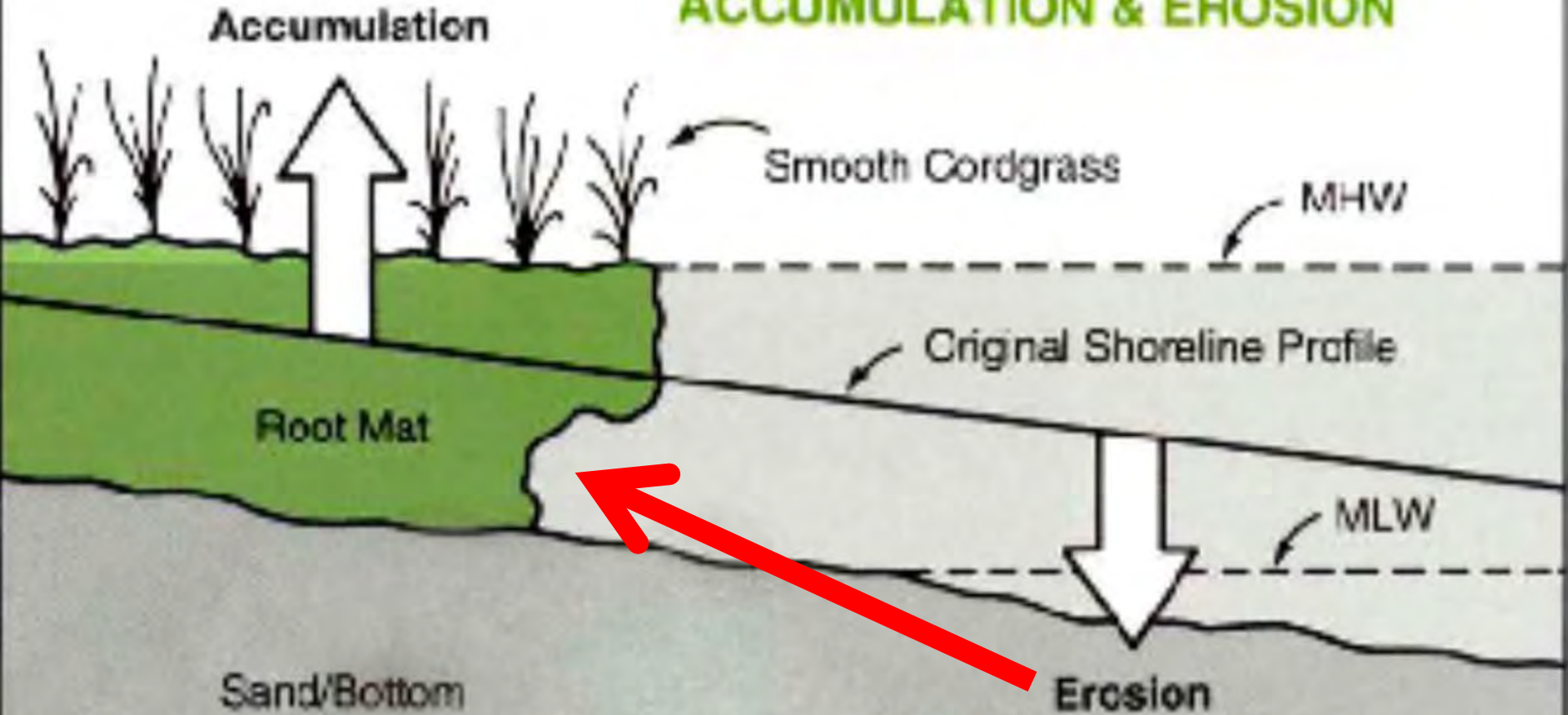


HOW DO LIVING SHORELINES WORK

Root mat building marsh grasses



PEAT ROOT MAT ACCUMULATION & EROSION



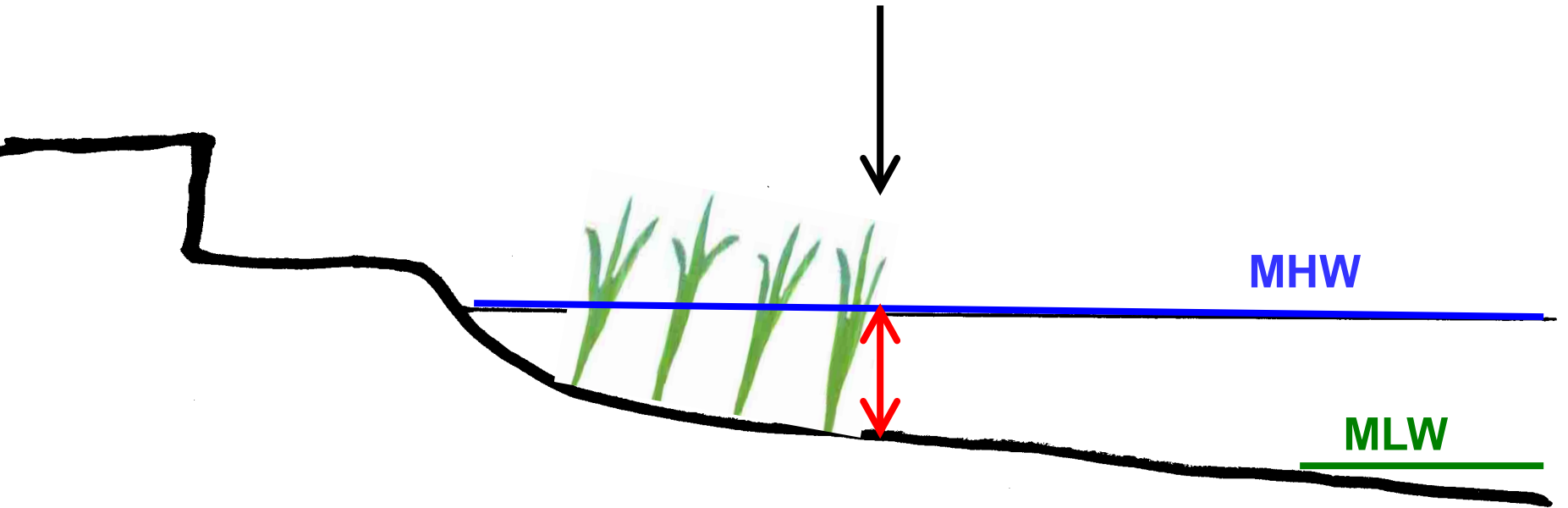


WHAT DO THEY NEED TO GROW?

Root mat building marsh grasses

- Daily wet and dry
- High salinity to brackish water
- Sunlight
- Limited wave shelter

**Waterward depth contour of
locally growing marsh or mid-tide**





SUCCESS FACTORS FOR PLANTING

1. Mid- to high tide depths, wider than 20 feet
2. High salinity to brackish water
 - Match species to the salinity
3. Near full sunlight
4. Fetch
 - Less than 1 mile of open water
 - No boat wakes

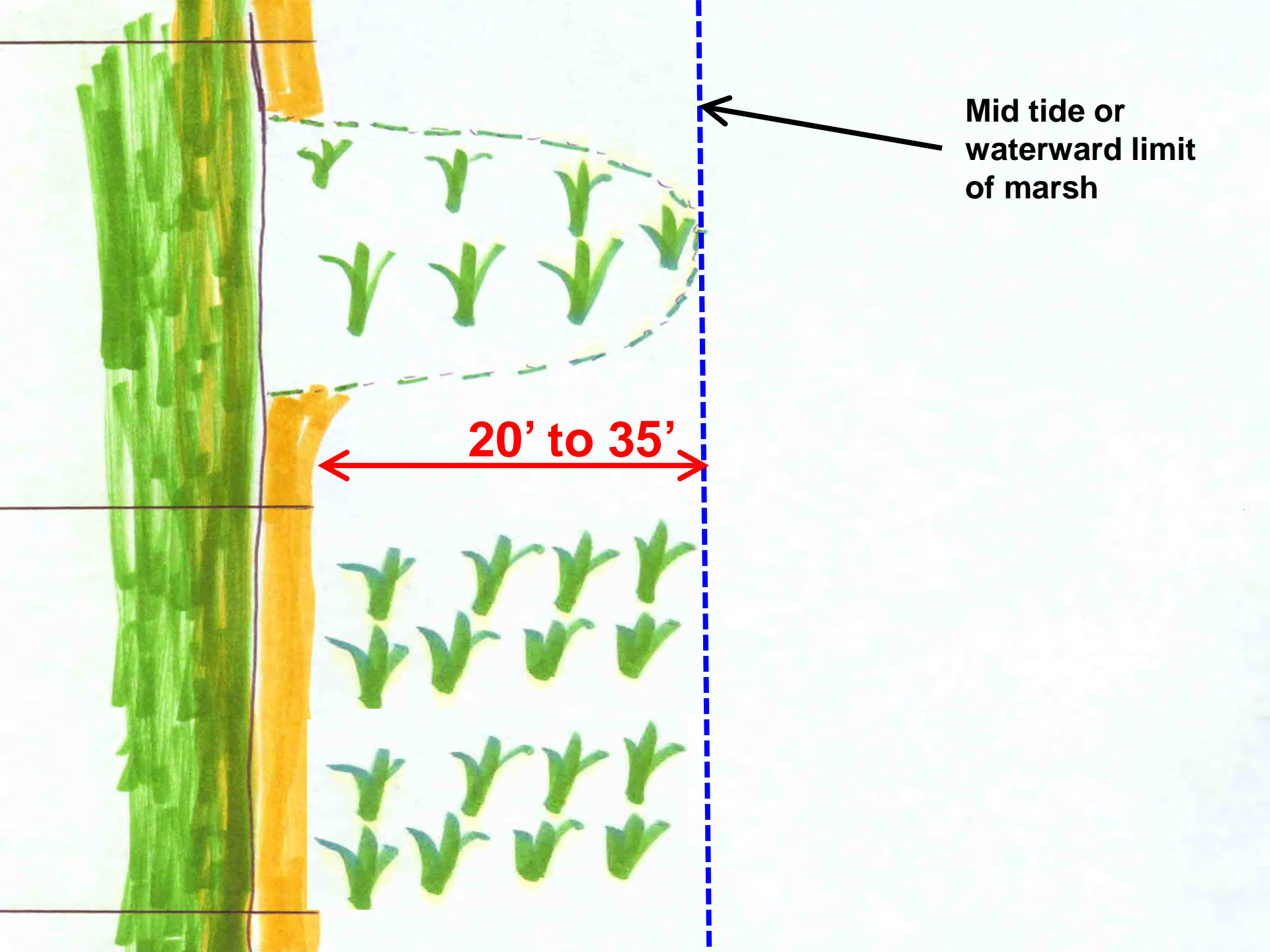
SUCCESS FACTORS FOR PLANTING

5. Aggressive Agriculture

- Fertilize when planting
- Replanting as needed

More severe exposure?

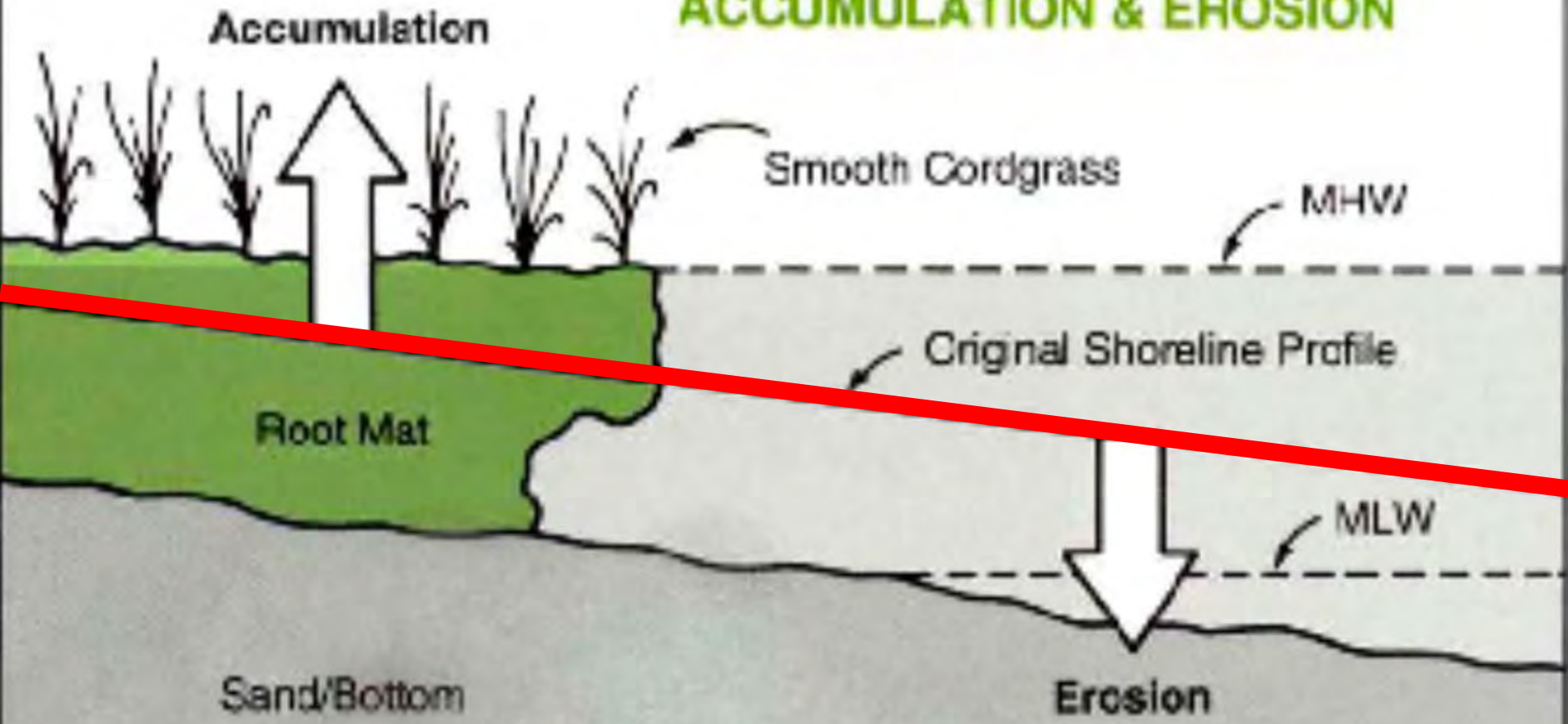
- Wave protection structures required



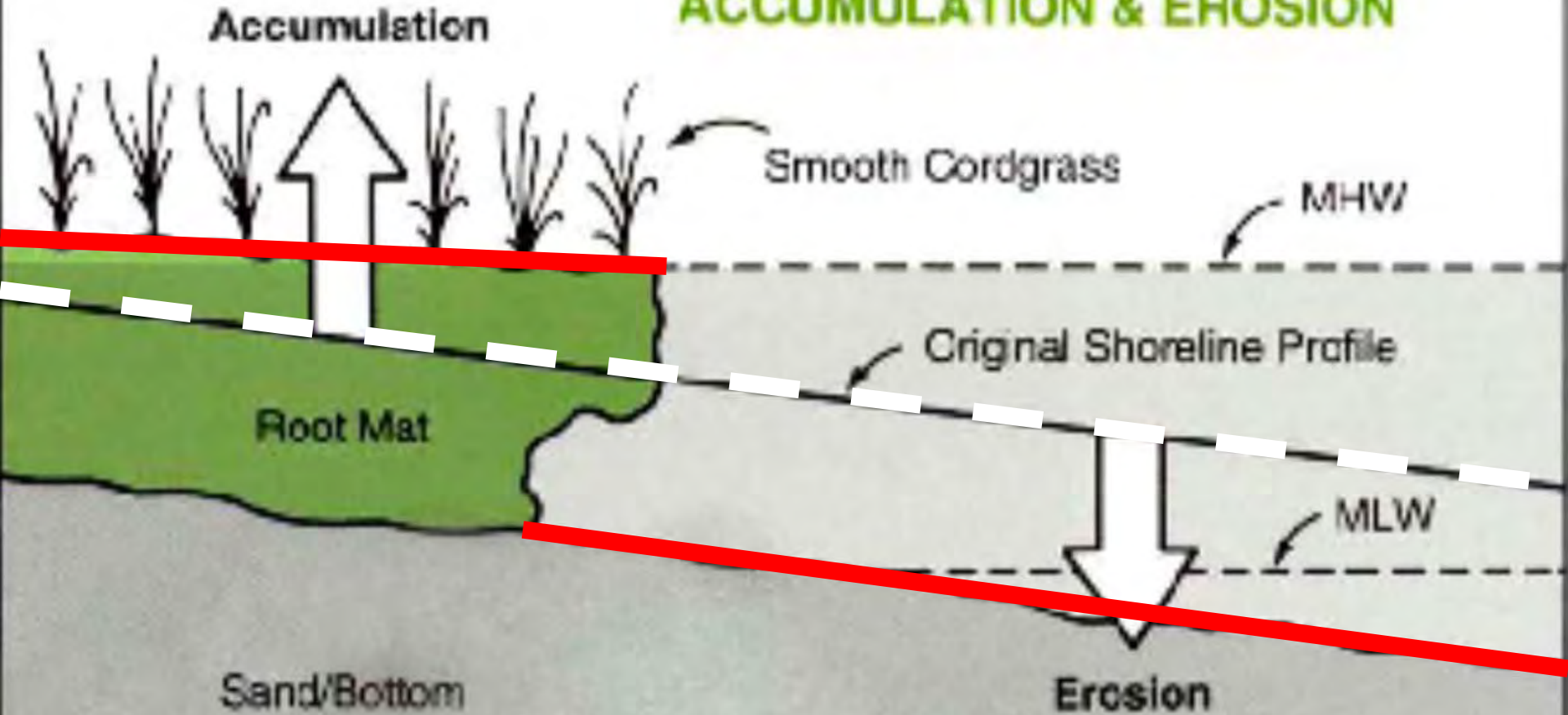
Mid tide or
waterward limit
of marsh

20' to 35'

PEAT ROOT MAT ACCUMULATION & EROSION



PEAT ROOT MAT ACCUMULATION & EROSION





SILL DESIGN ISSUES

What is the minimum wave protection necessary to prevent the marsh root mat from undermining?

SILL DESIGN ISSUES

or

How cheap can you make it?

&

How long will it last?



COASTAL RESEARCH SANCTUARY

COASTAL RESEARCH SANCTUARY







SILL DESIGN ISSUES

Permanent or temporary
protection?



**CAMP LEACH
2 YEARS
AFTER CONSTRUCTION**



**CAMP LEACH
5 TO 9 YEARS
AFTER CONSTRUCTION**



**CAMP LEACH
9 YEARS INSTALLED
9 MONTHS AFTER REMOVAL**



**CAMP LEACH
9 YEARS INSTALLED
2 YEARS AFTER REMOVAL**



Ruler [X]

Line Path Polygon Circle 3D path 3D polygon

Measure the distance between two points on the ground

Map Length: 50.03 Miles

Ground Length: 50.03

Heading: 24.50 degrees

Mouse Navigation [Save] [Clear]

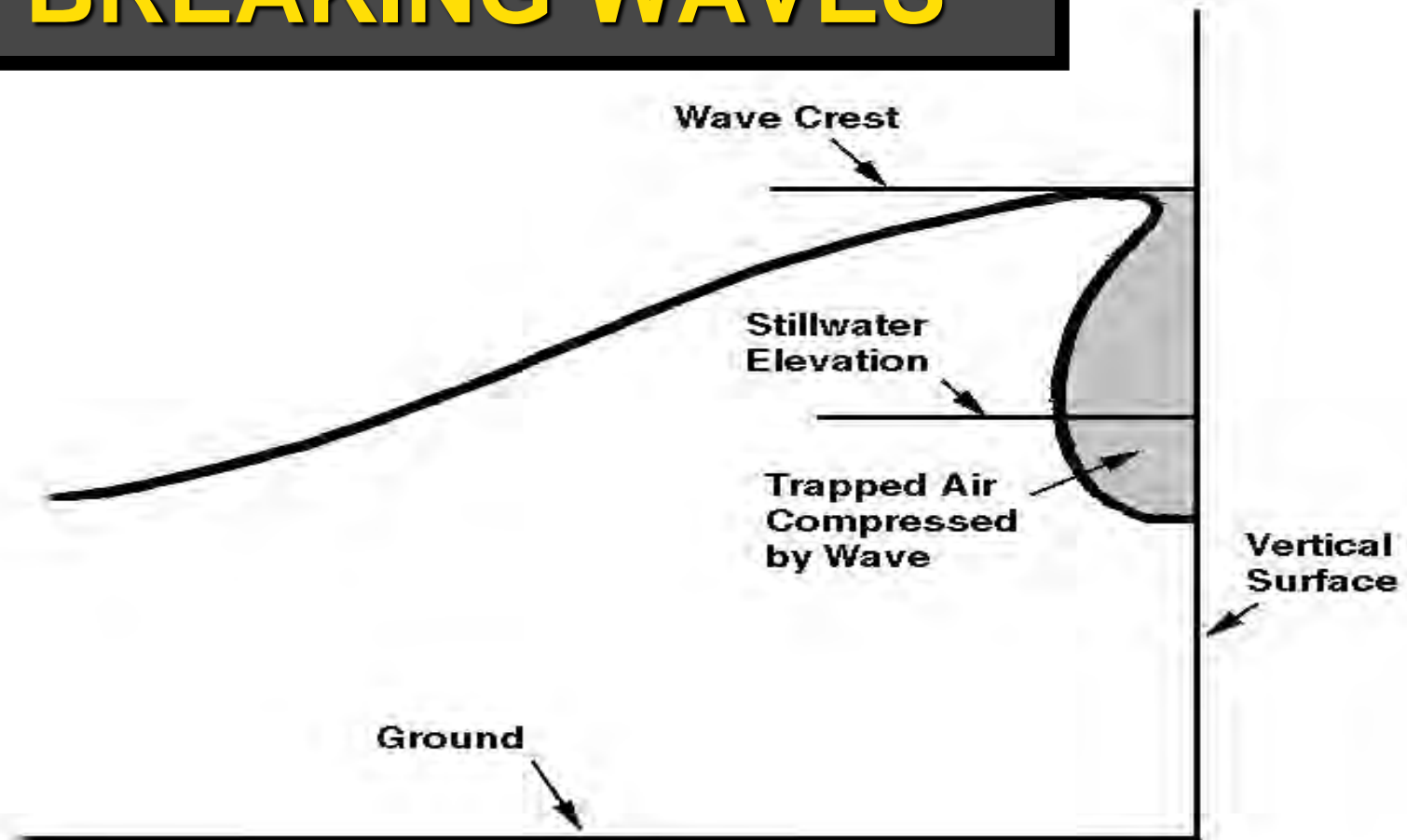
50 miles



SILL DESIGN ISSUES

- Fetch
- Water Depth
- Material
 - Vertical
 - Stone
 - Granite, Concrete, Limestone
 - Size & Weight
 - Slopes

BREAKING WAVES



SILL DESIGN ISSUES

How low can you go?



SILL DESIGN ISSUES

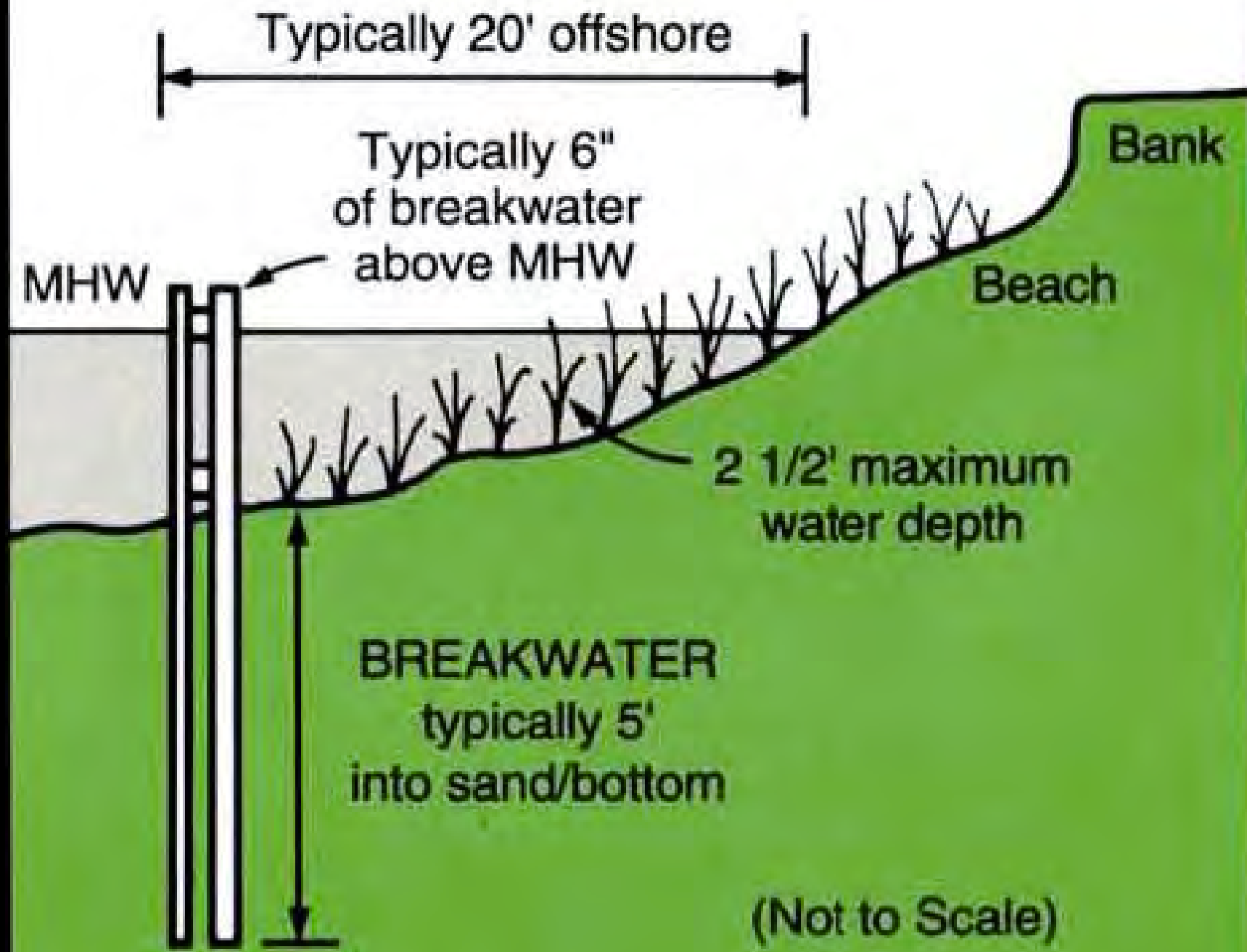
How porous can you
make it?



**CAMP LEACH
5 TO 9 YEARS
AFTER CONSTRUCTION**

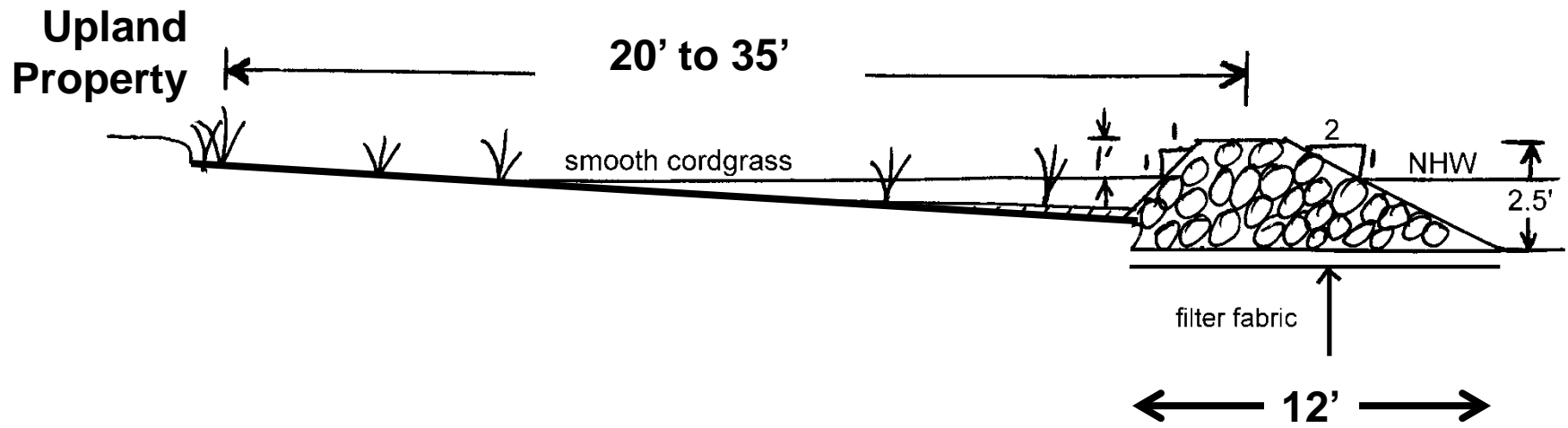


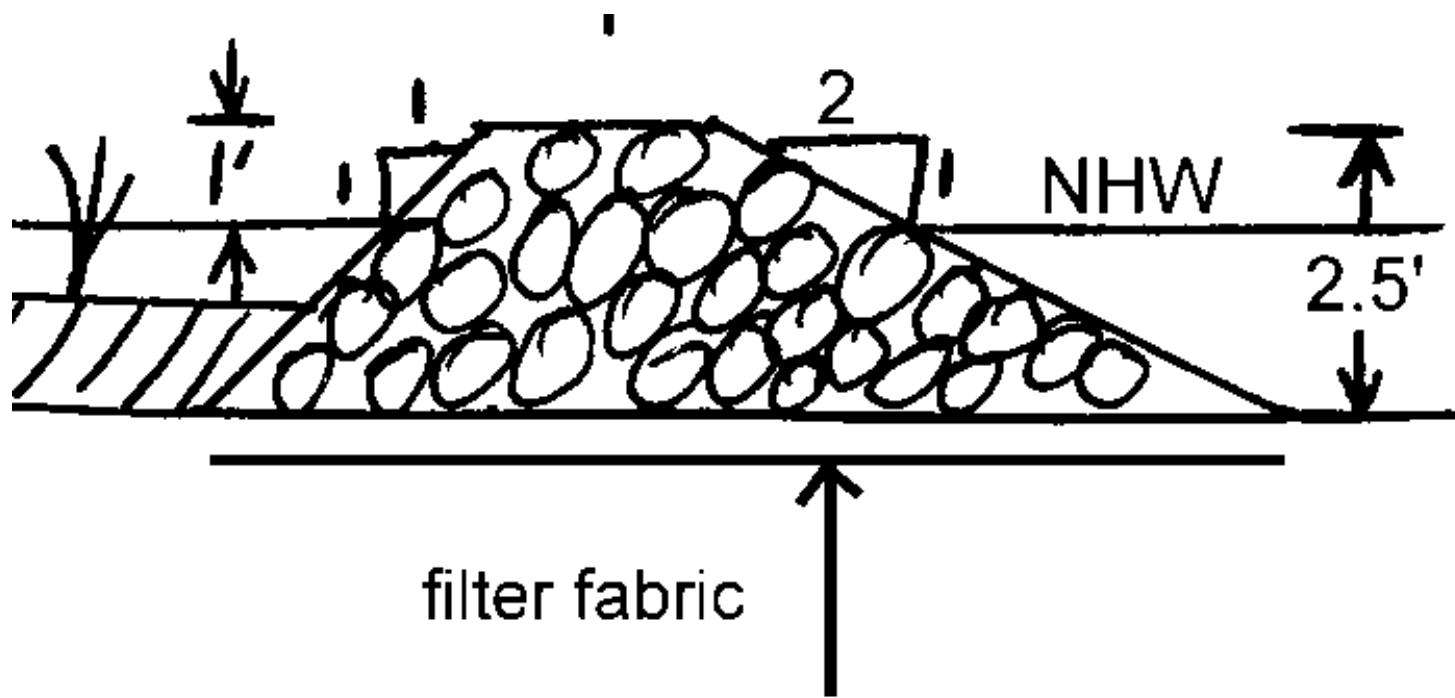




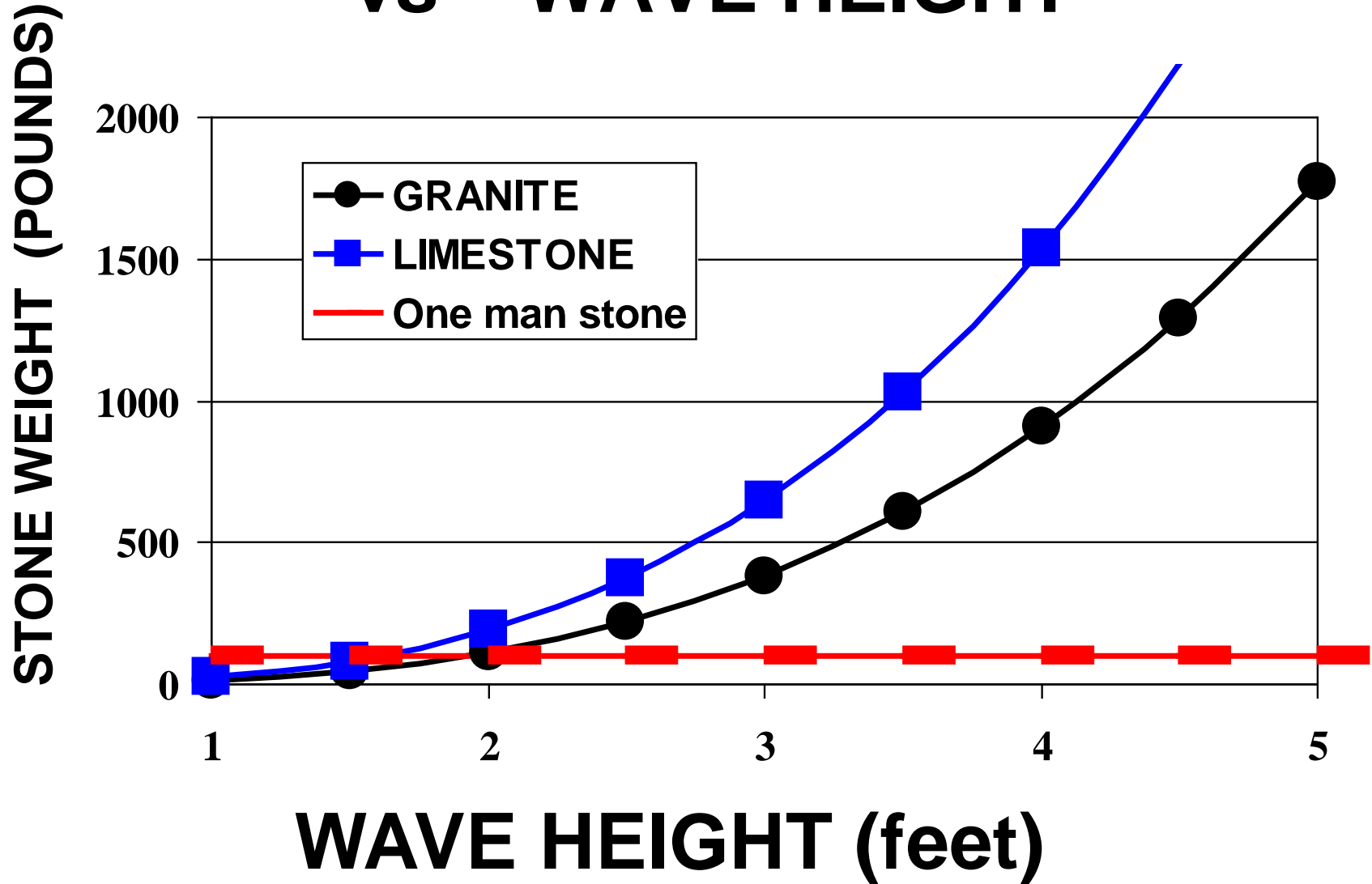






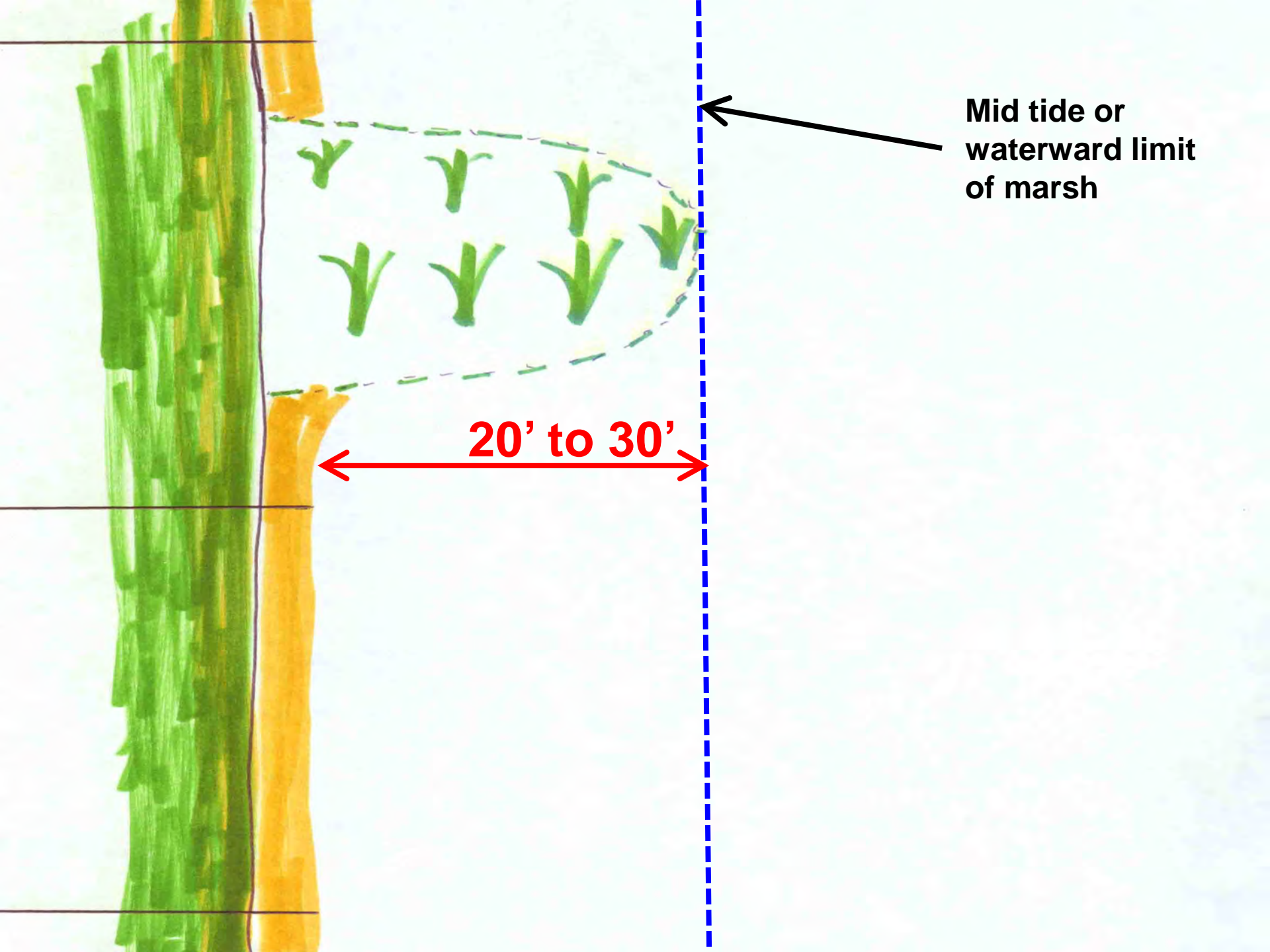


REVTMENT STONE WEIGHT vs WAVE HEIGHT



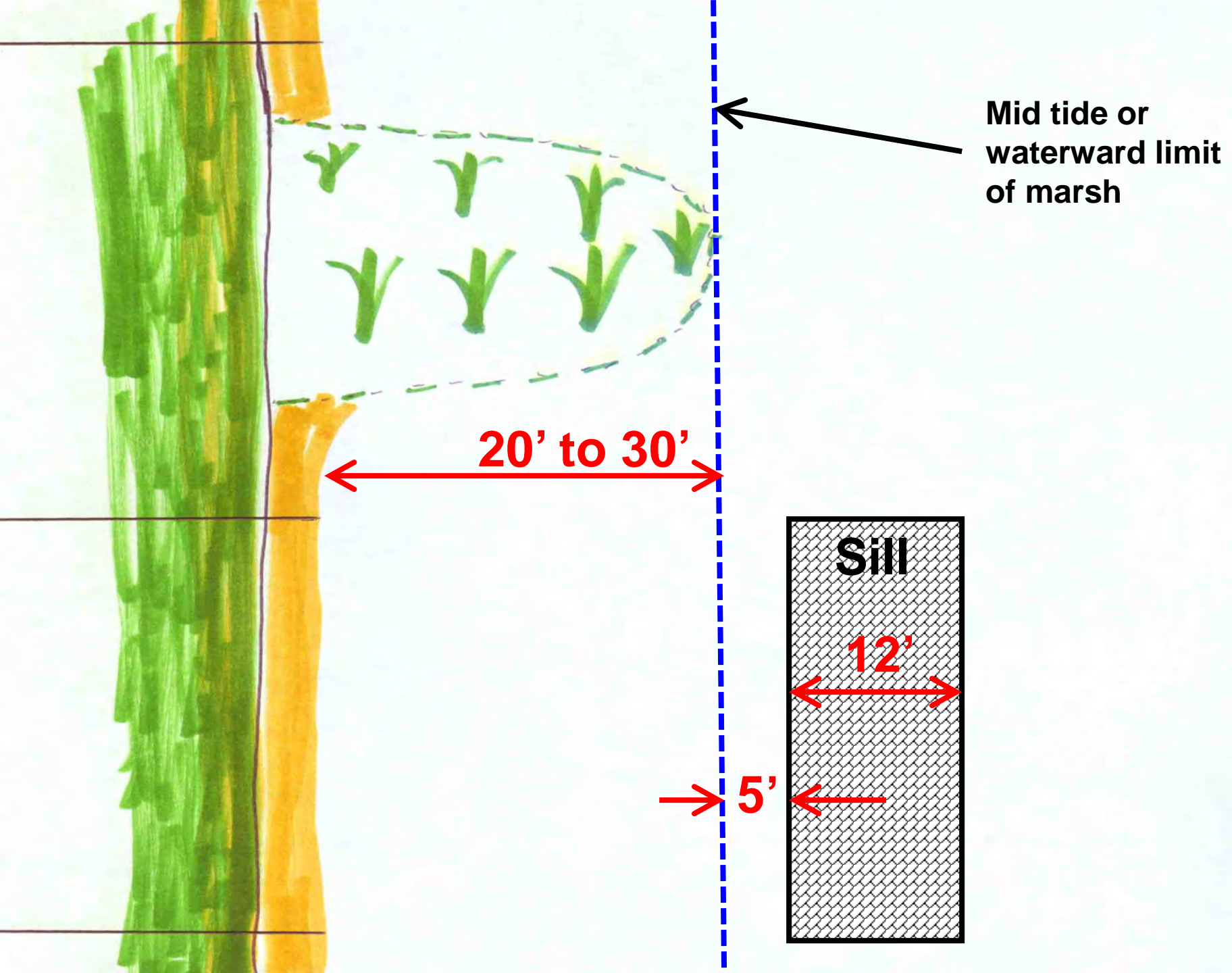
SILL DESIGN ISSUES

Where do you build a sill?



Mid tide or
waterward limit
of marsh

20' to 30'



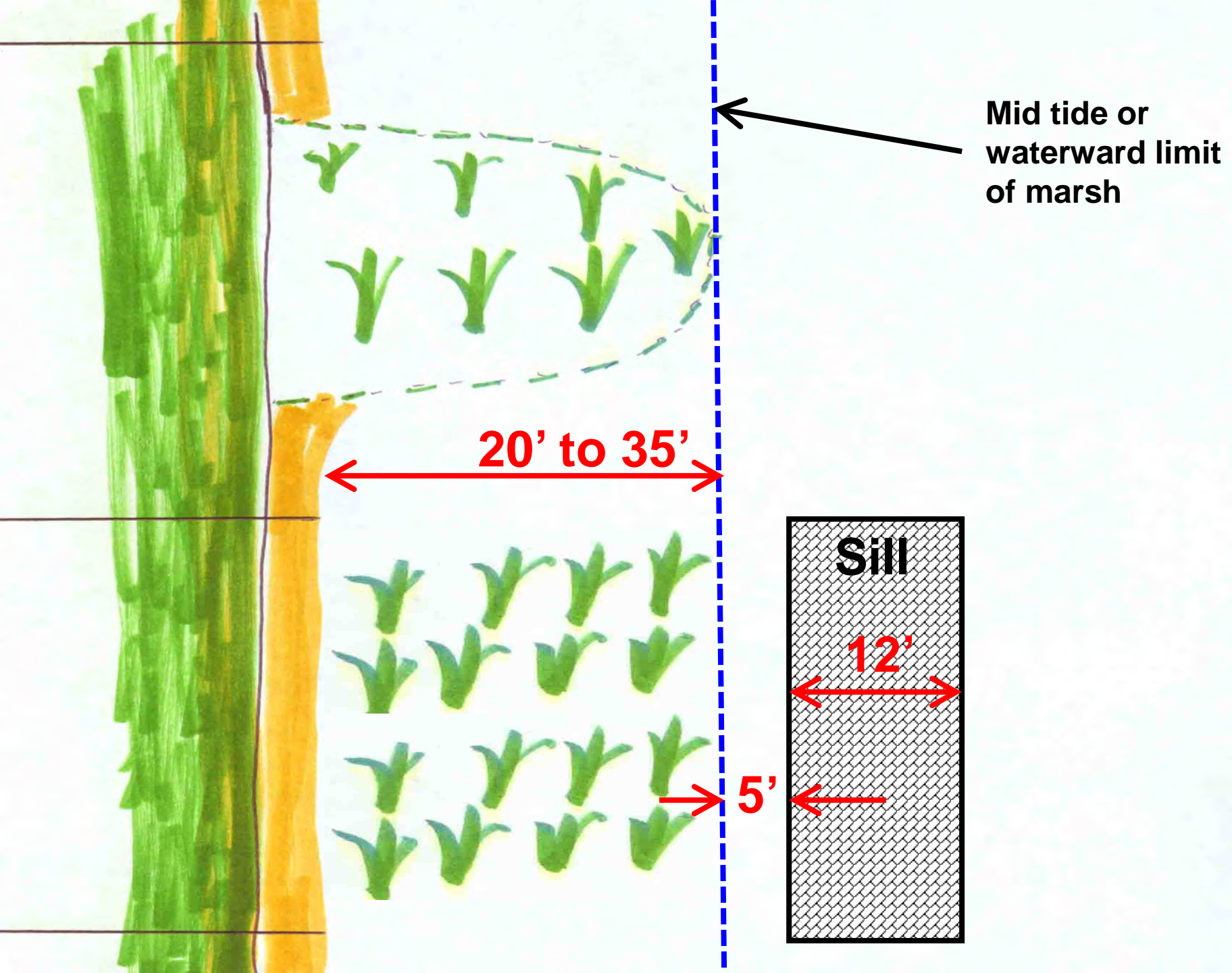
Mid tide or
waterward limit
of marsh

20' to 30'

Sill

12'

5'



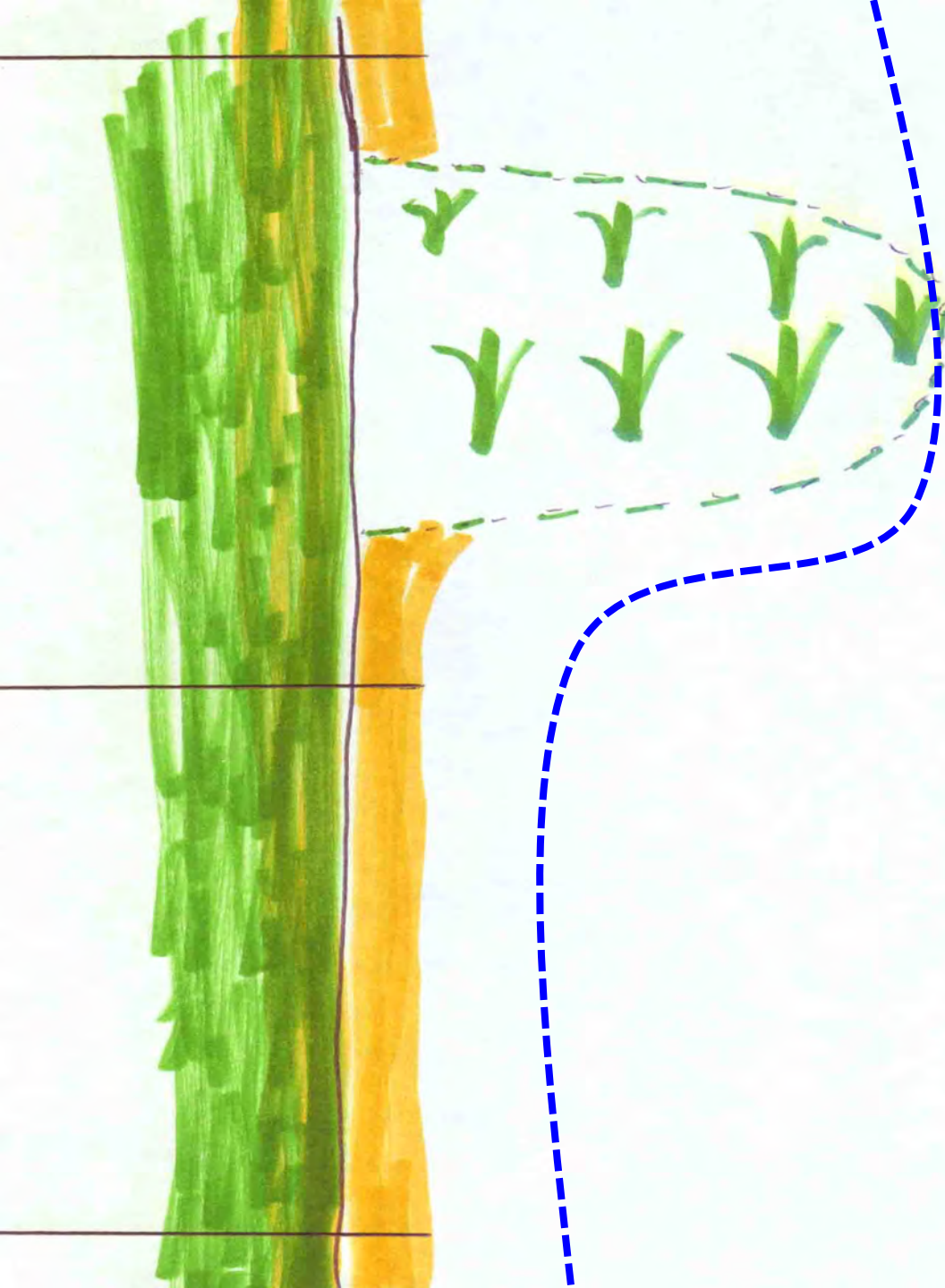
Mid tide or waterward limit of marsh

20' to 35'

Sill

12'

5'



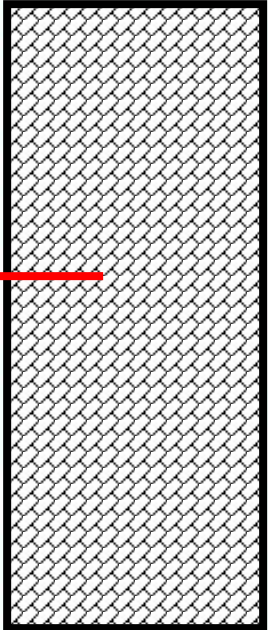
**Mid tide or
waterward limit
of marsh**



Mid tide or
waterward limit
of marsh

No Fill

~20'



Mid tide or waterward limit of marsh

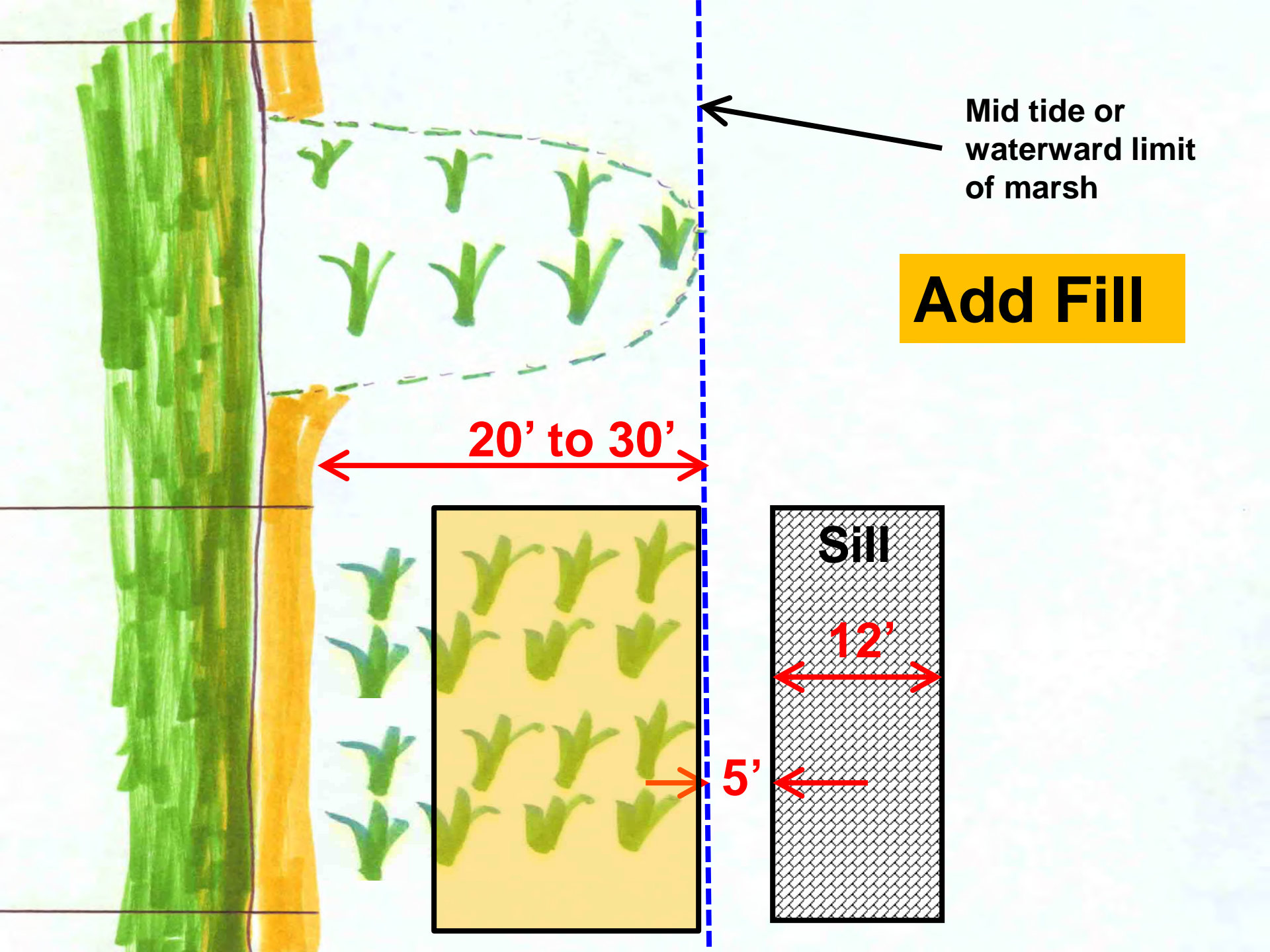
Add Fill

20' to 30'

Sill

12'

5'



SILL DESIGN ISSUES

- Elevation
 - Keep it low!
- Openings and gaps
 - Length of structure
 - 5' every 100'
- Lifetime
- Cost

























MARSH SILLS

QUESTIONS?