MAXIMIZING SHORELINE PROTECTION USING VEGETATION AND ARTIFICIAL OYSTER REEF STRUCTURES: LESSONS LEARNED

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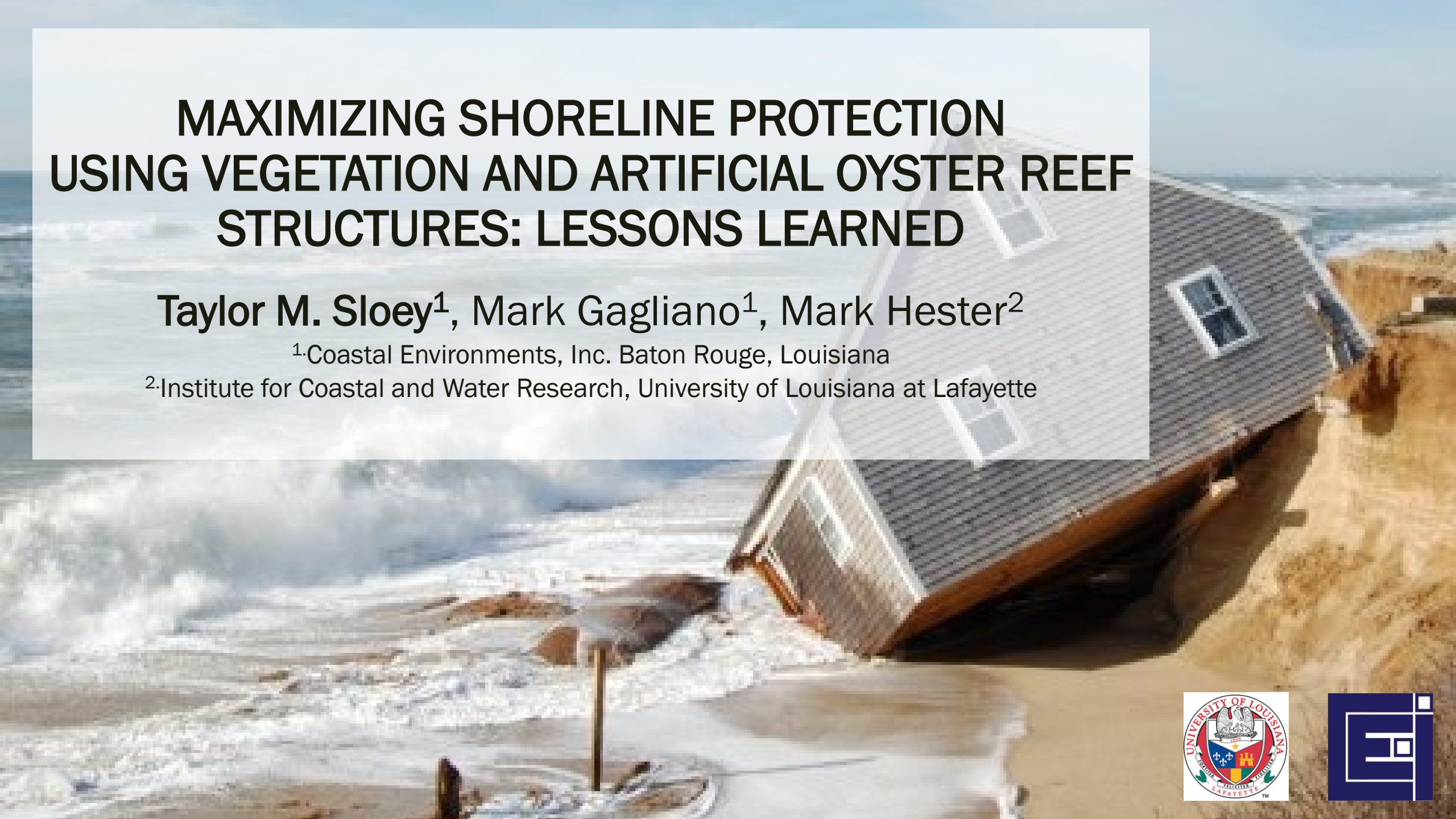
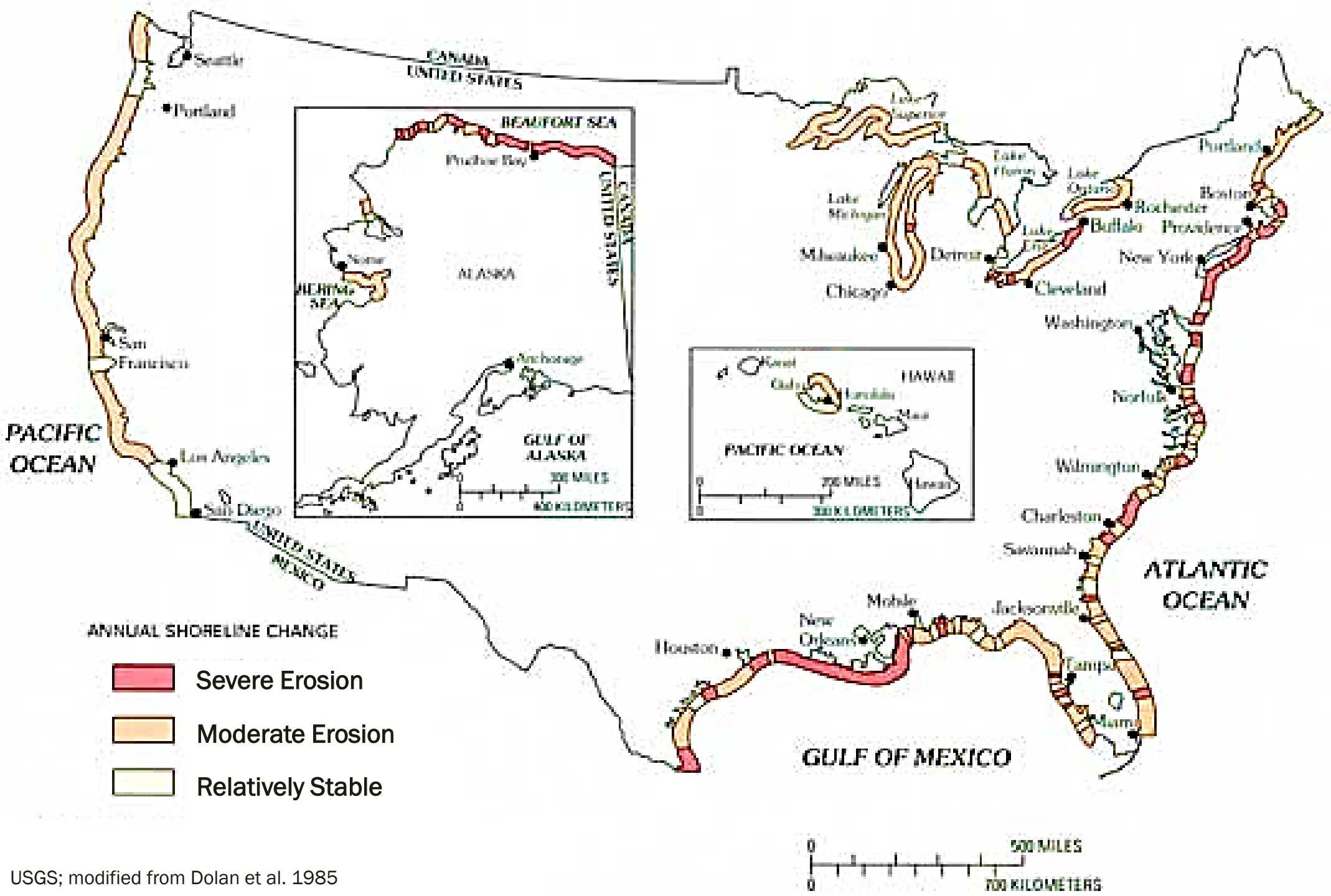
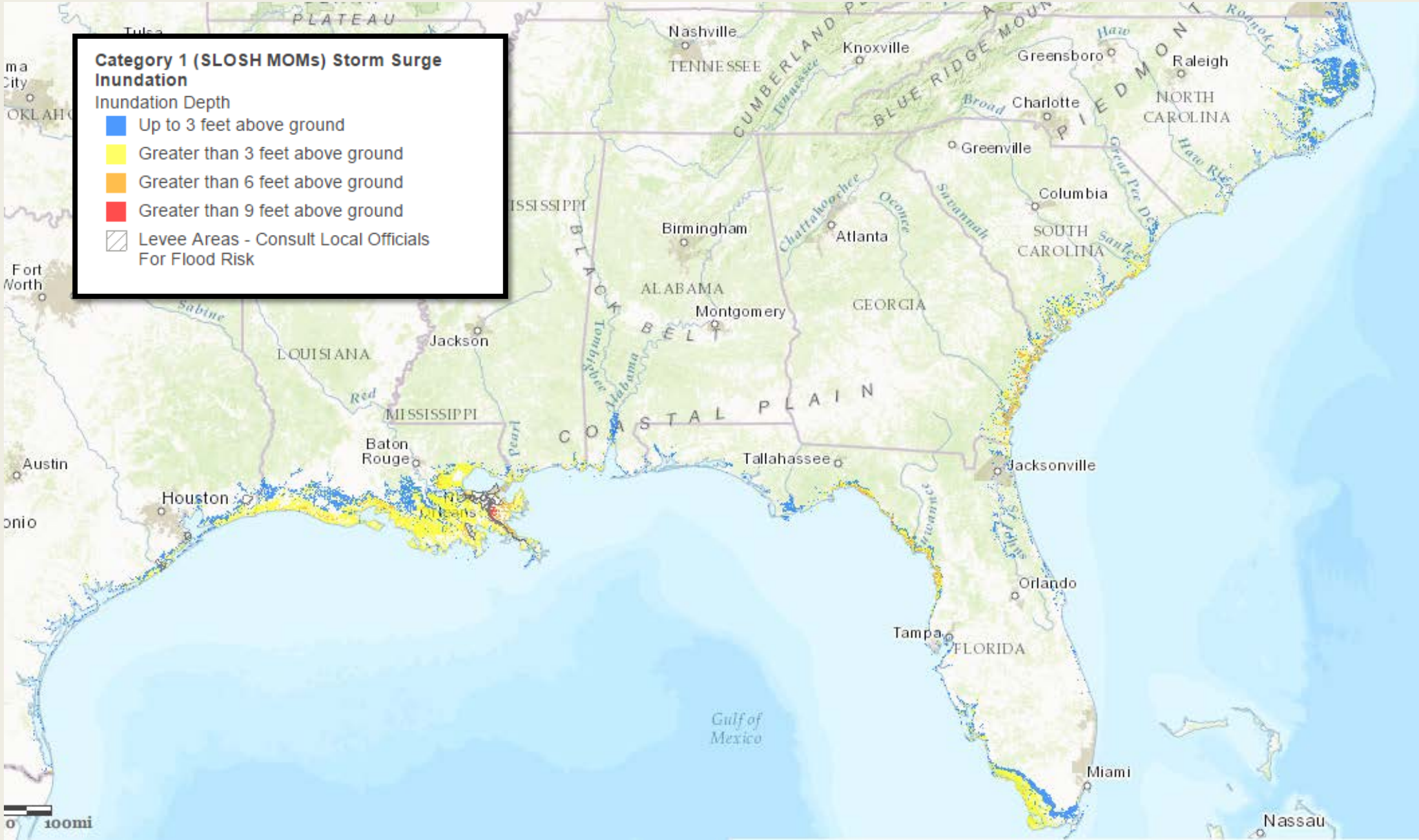


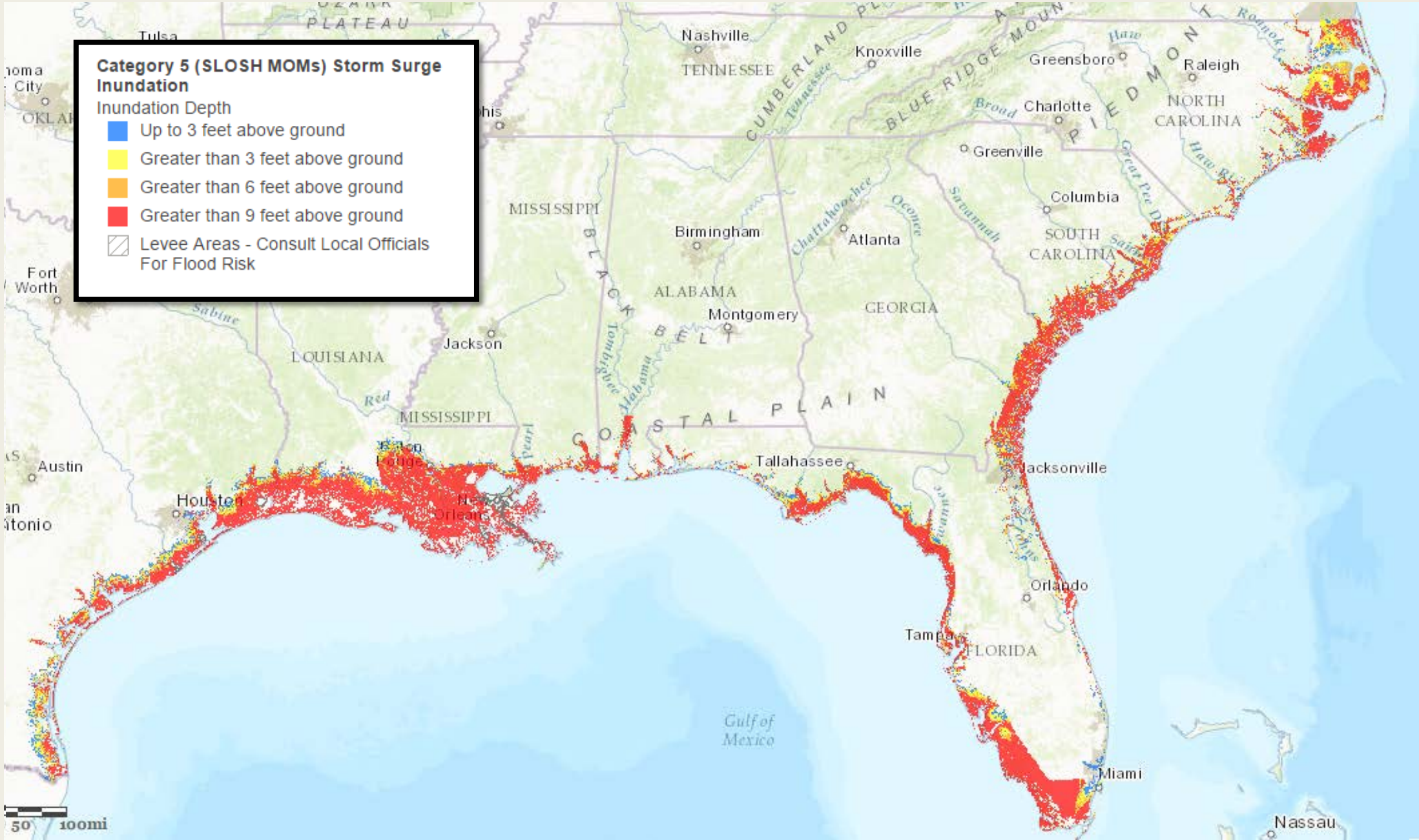


USGS; modified from Dolan et al. 1985

NOAA Storm Surge Inundation Model: Category 1



NOAA Storm Surge Inundation Model: Category 5



ving 500 homes. Zoom in, or use filters to narrow your search.

Custer State Park
Badlands N.P.
Buffalo Gap National Grassland
Oglala National Grassland
Nebraska National Forest
Sand Hills
Nebraska
Omaha
Topeka
Olathe
Zillow

Nebraska Real Estate

7,071 homes for sale. 307 unmapped.

Homes for You | Newest | Cheapest | M

10419 Hillcrest Dr, La Vista, N
HOUSE FOR SALE
$305,000
6 bds • 4 ba • 3,314 sqft • 10,54
Less than 1 day on Zillow • Col

5610 Hickory St, Omaha, NE
HOUSE FOR SALE
$155,000
3 bds • 2 ba • 1,503 sqft • 7,287
Less than 1 day on Zillow • CBS

251 E Cherrywood Dr, Lincol
COMING SOON
$120,000
3 bds • 2 ba • 1,025 sqft • 8,076
On market Apr 11th

1213 Willow Ave, Bellevue, N
CONDO FOR SALE
$109,500
3 bds • 3 ba • 1,786 sqft • Built
Less than 1 day on Zillow • Mic

DAMAGE PREVENTION

HARD STRUCTURES

LIVING SHORELINES

HARD STRUCTURES

HARD STRUCTURES

Coastal Squeeze

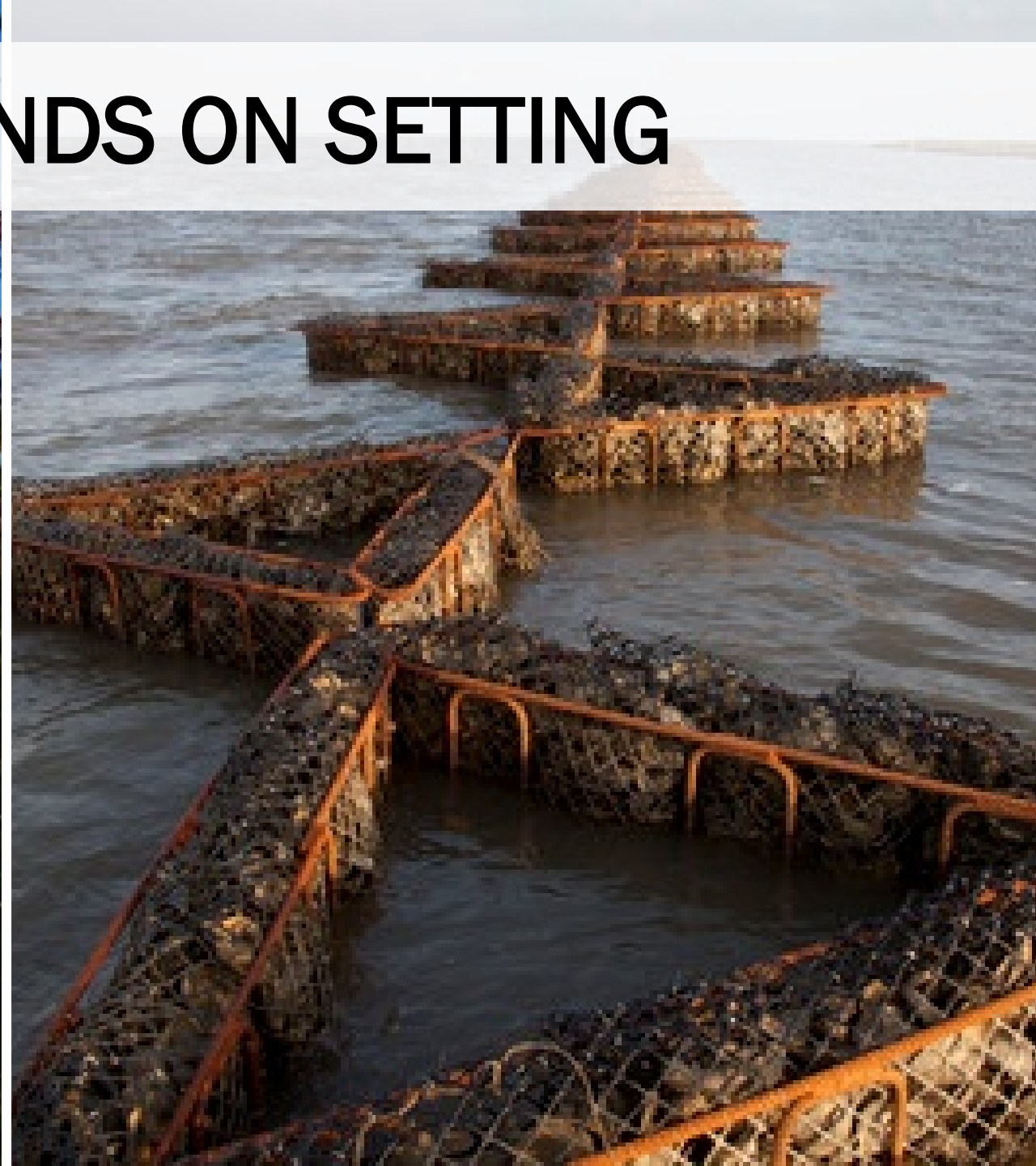
Intertidal habitat loss which arises due to the high water mark being fixed by a defence and the low water mark migrating landwards in response to sea level rise. (Pontee 2013)

LIVING SHORELINES

Photo:southernenvironment.org

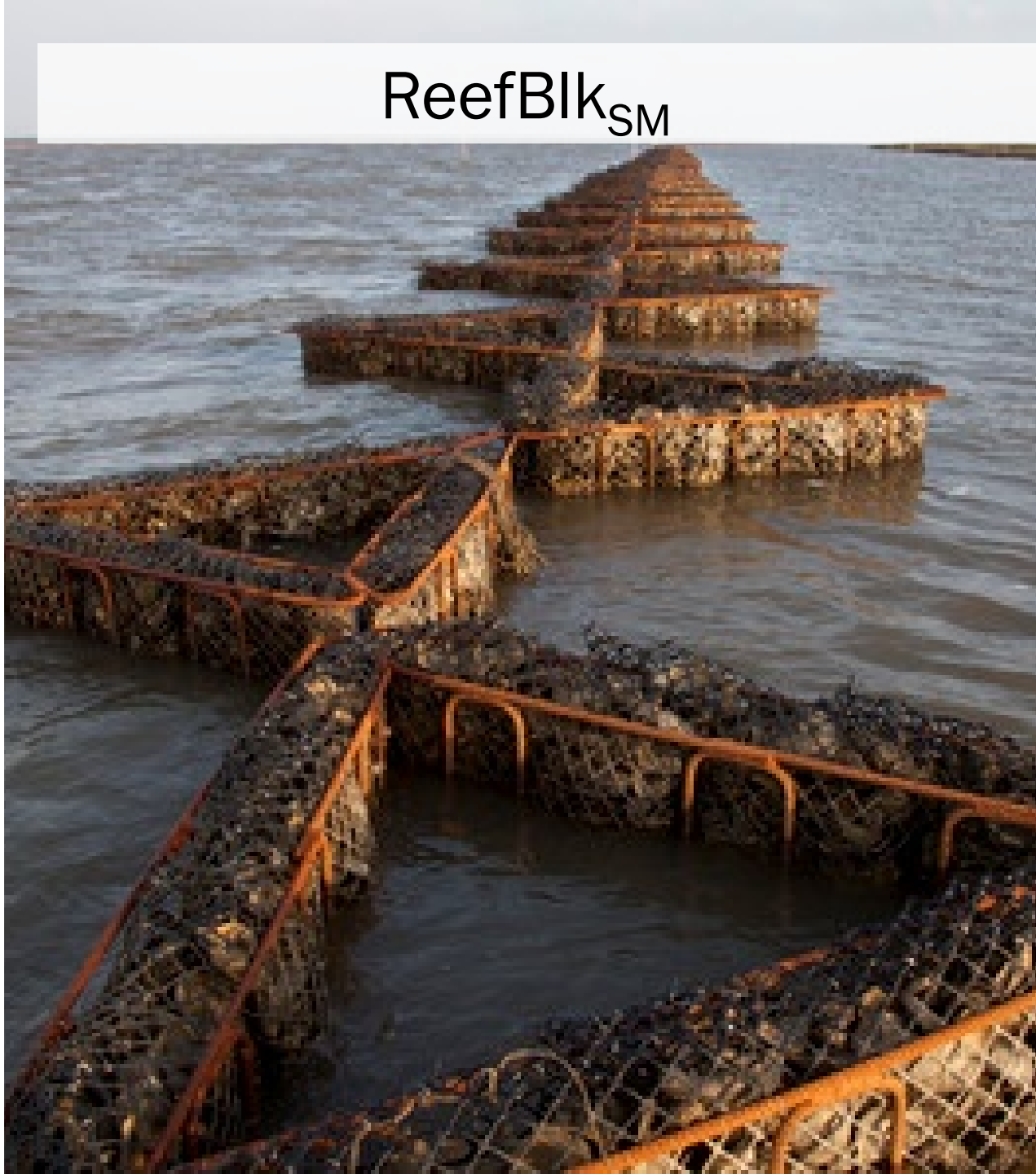
Photo:EPA

SUCCESS DEPENDS ON SETTING

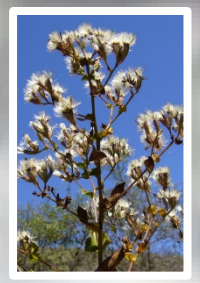


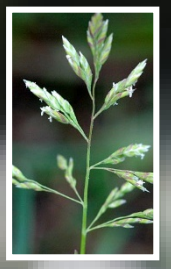
Schoenoplectus californicus

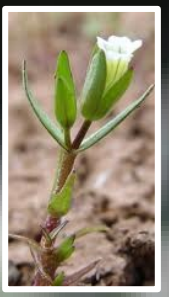
ReefBlk$_{SM}$

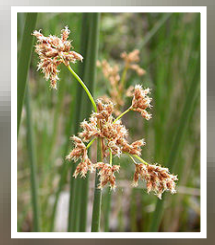



CALIFORNIA

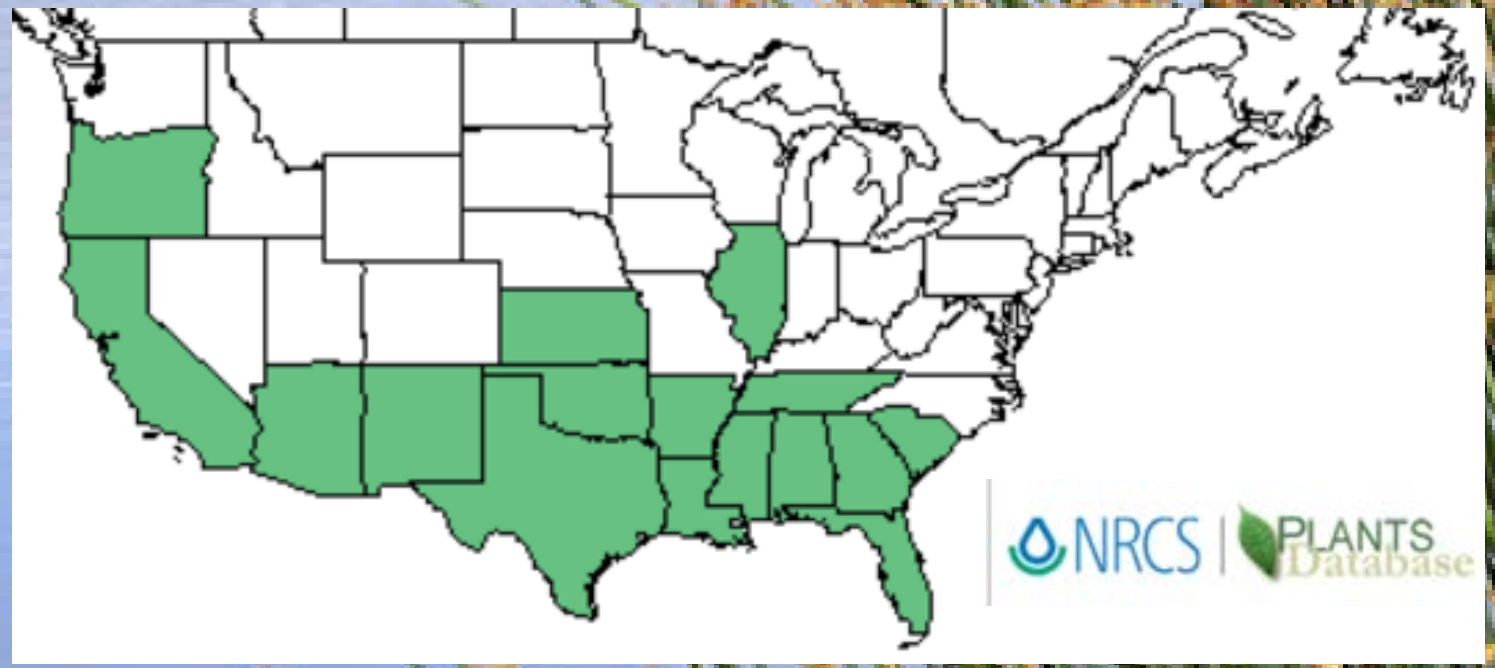












NRCS
PLANTS
Database

Lessons Learned

- Survival
- Expansion
- Constraints
  - *Flooding Depth*
  - *Soil Physicochemistry*
  - *Stem Lodging*
  - *Nutrients*

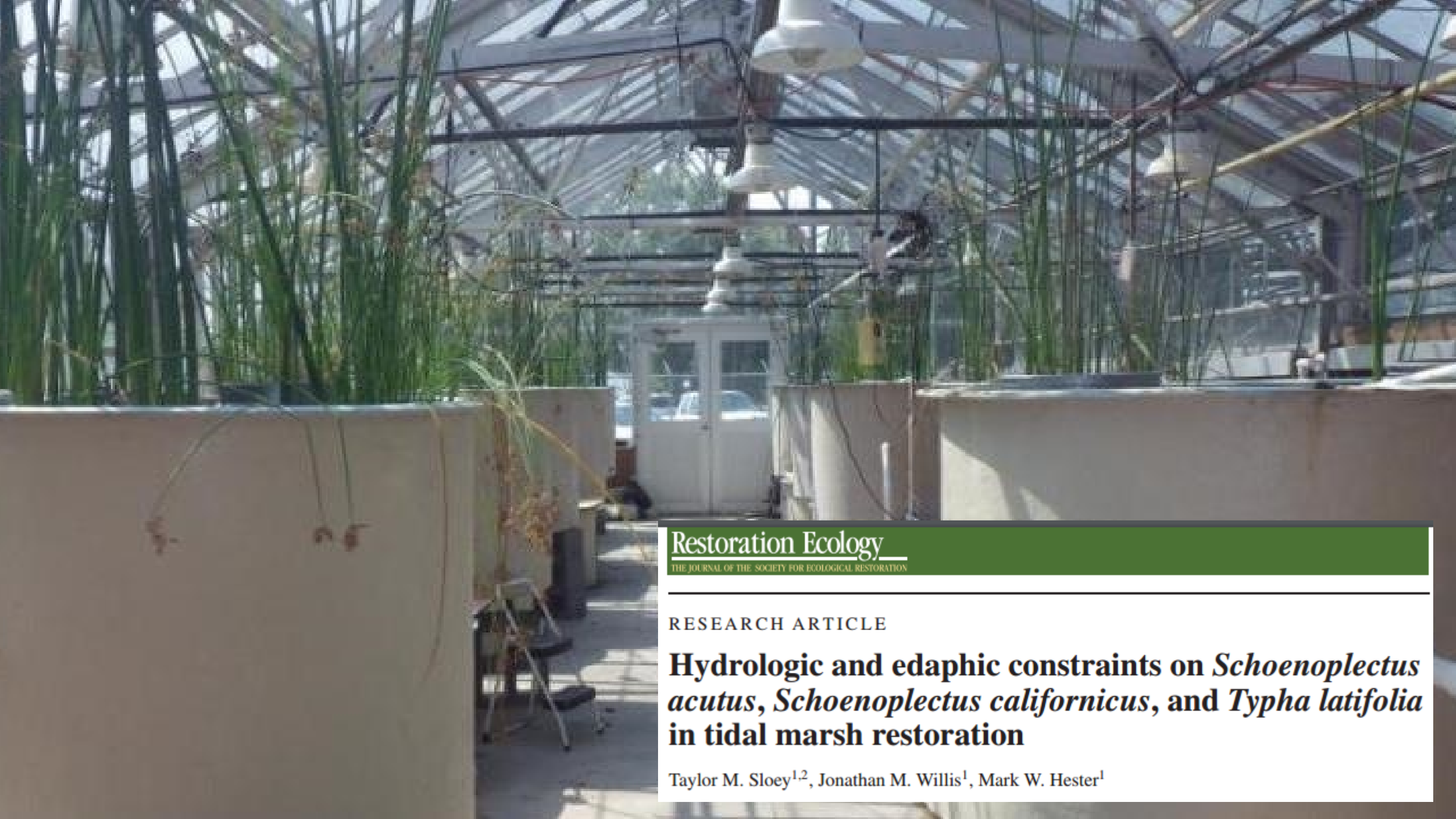
Wetlands Ecol Manage (2016) 24:33–44
DOI 10.1007/s11273-015-9448-9

ORIGINAL PAPER

Field assessment of environmental factors constraining the development and expansion of *Schoenoplectus californicus* marsh at a California tidal freshwater restoration site

Mark W. Hester · Jonathan M. Willis · Taylor M. Sloey

WEST	EAST
Annual Lateral Expansion	
0.84 + 0.03 m	0.61 + 0.04 m
Flooding Duration	
<93%	100%



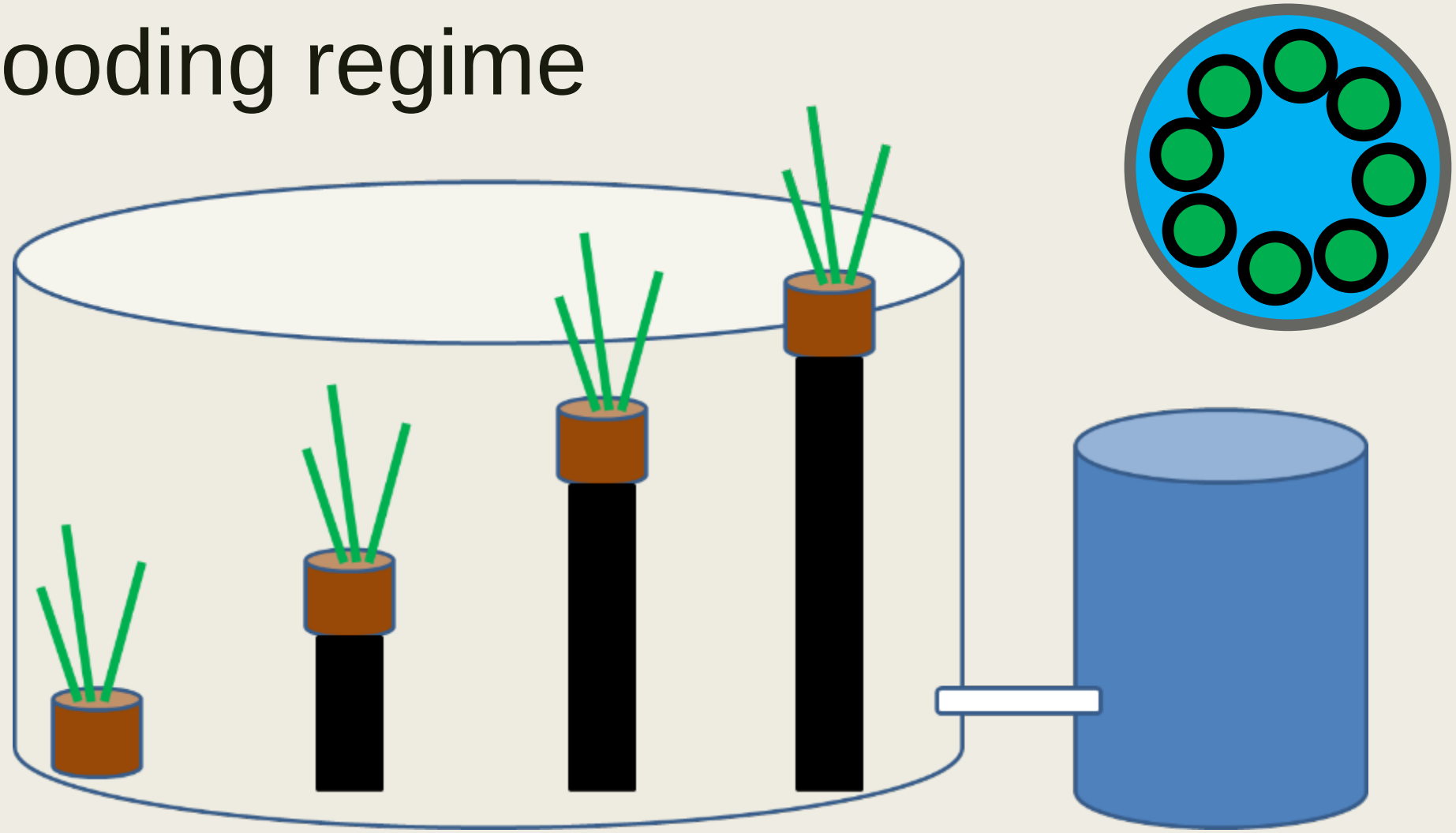
Restoration Ecology
THE JOURNAL OF THE SOCIETY FOR ECOLOGICAL RESTORATION

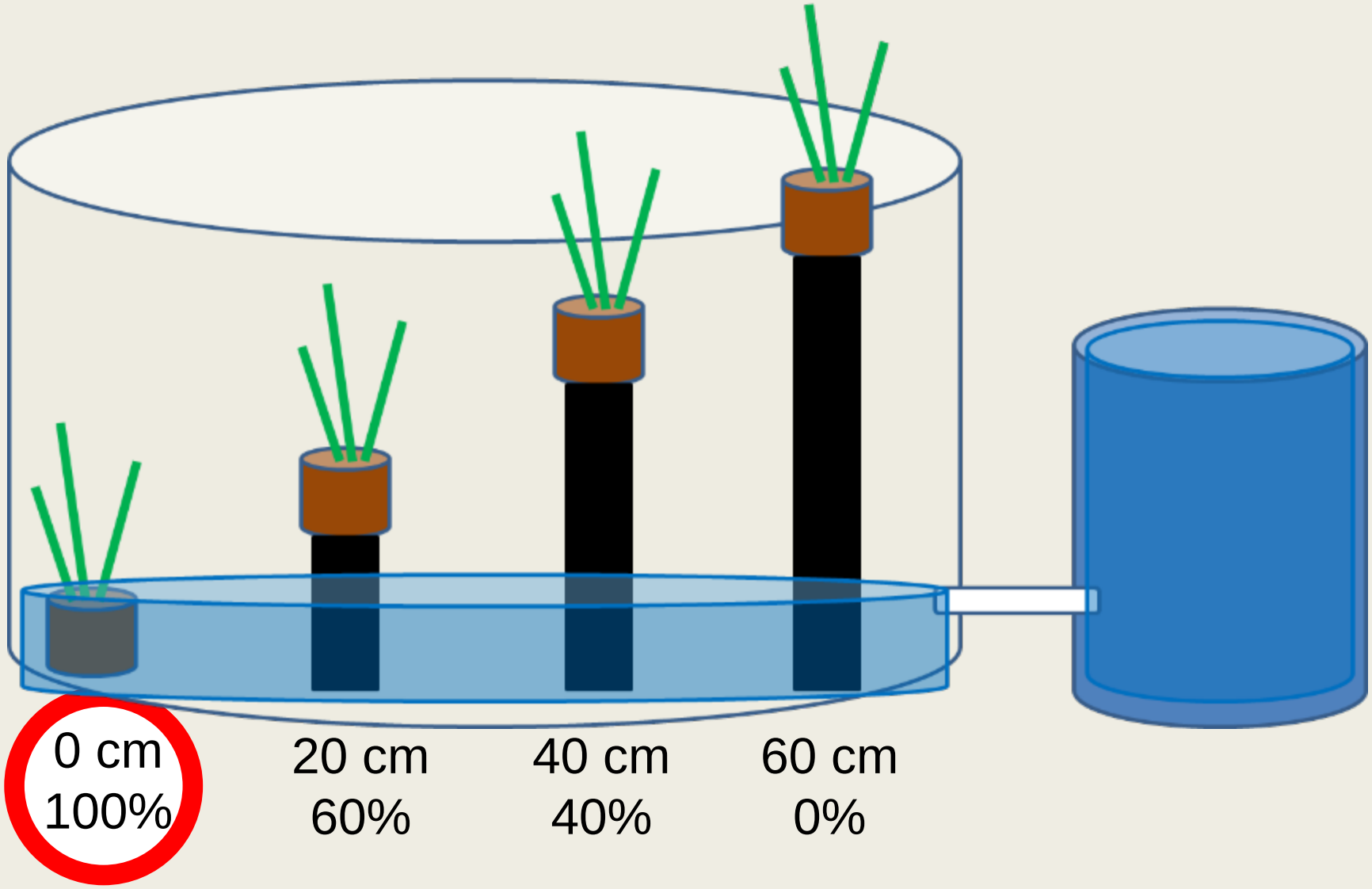
RESEARCH ARTICLE

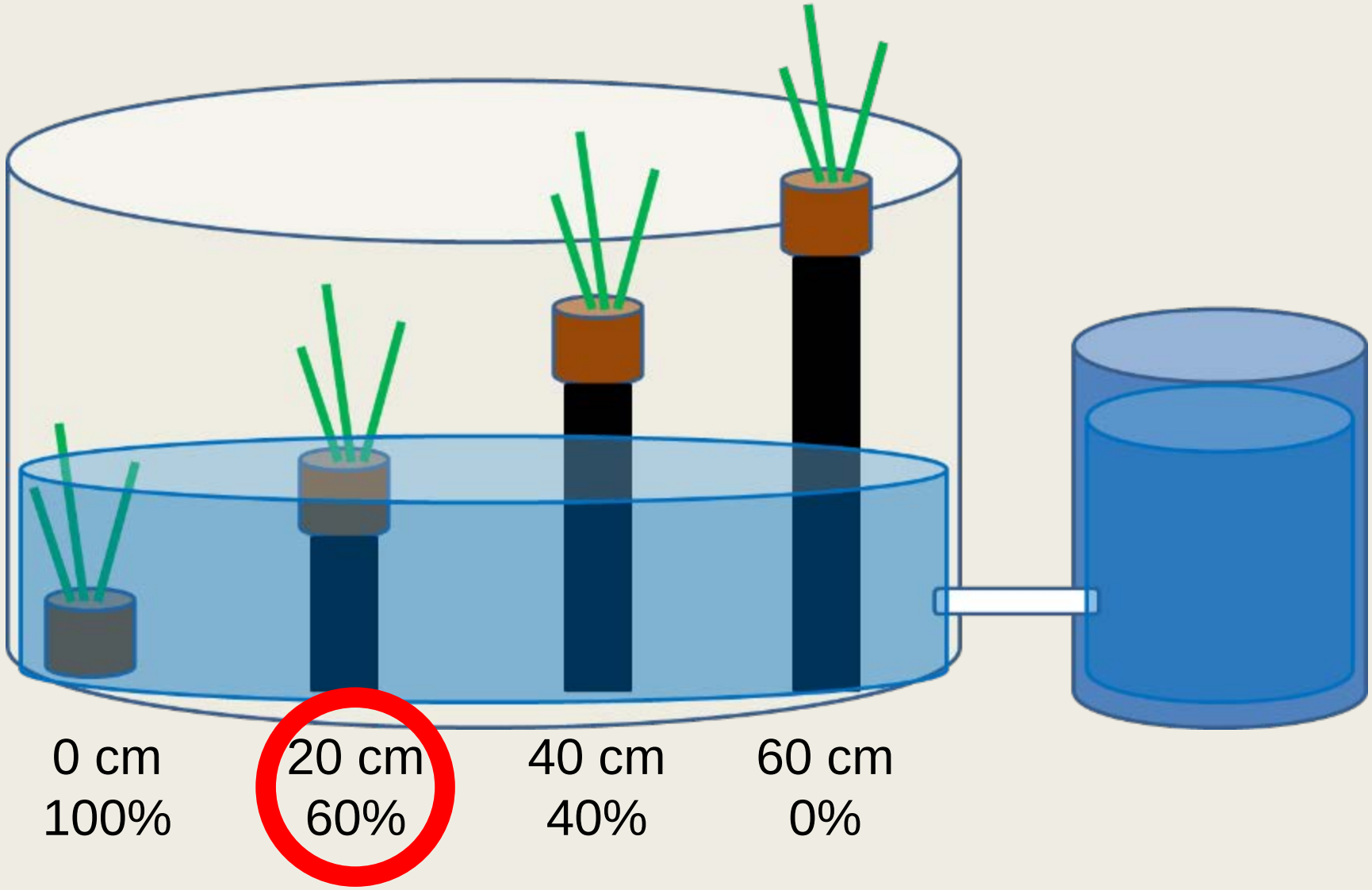
Hydrologic and edaphic constraints on *Schoenoplectus acutus*, *Schoenoplectus californicus*, and *Typha latifolia* in tidal marsh restoration

Taylor M. Sloey[1,2], Jonathan M. Willis[1], Mark W. Hester[1]

Flooding regime




0 cm
100%
20 cm
60%
40 cm
40%
60 cm
0%


0 cm
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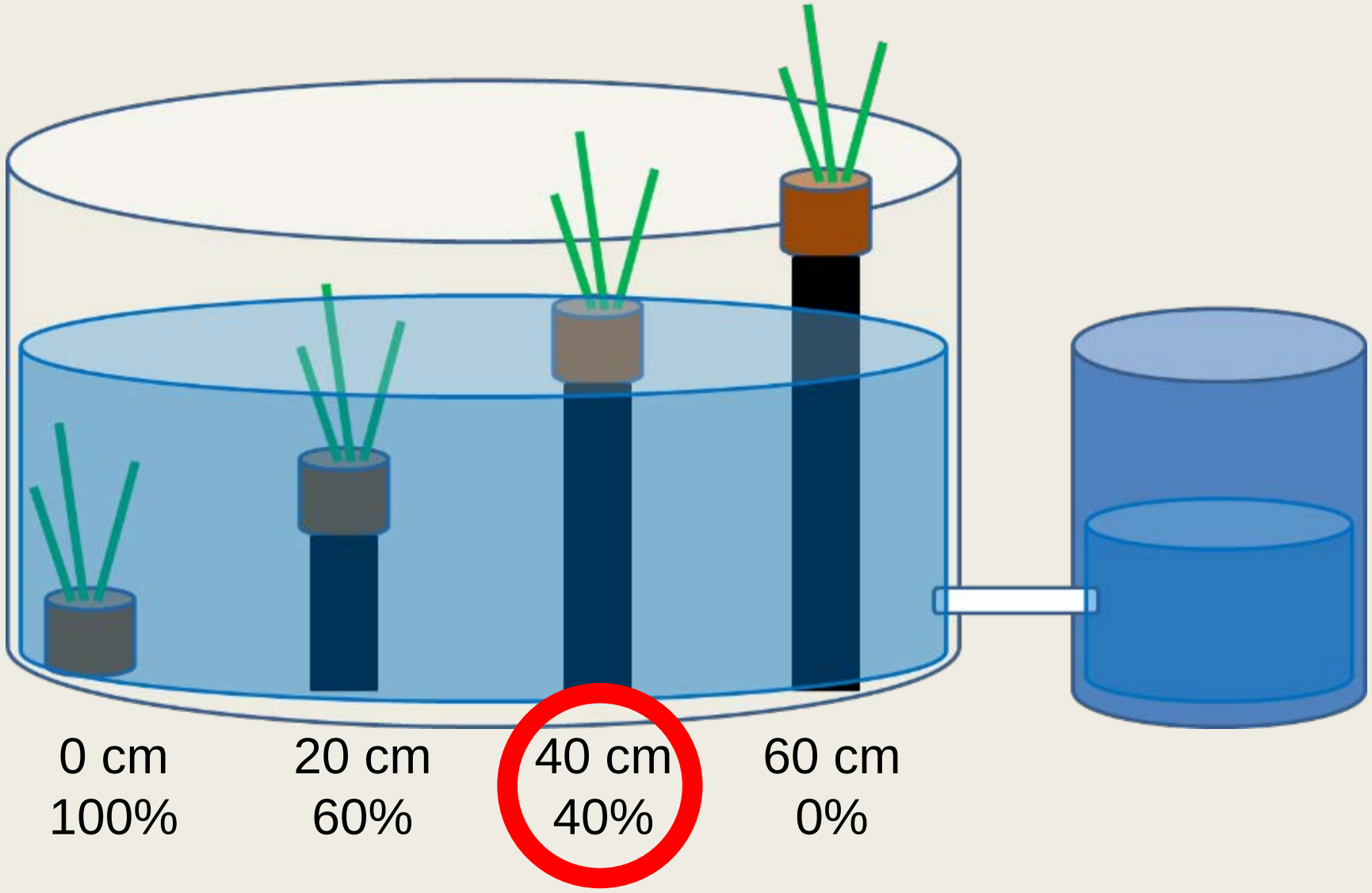
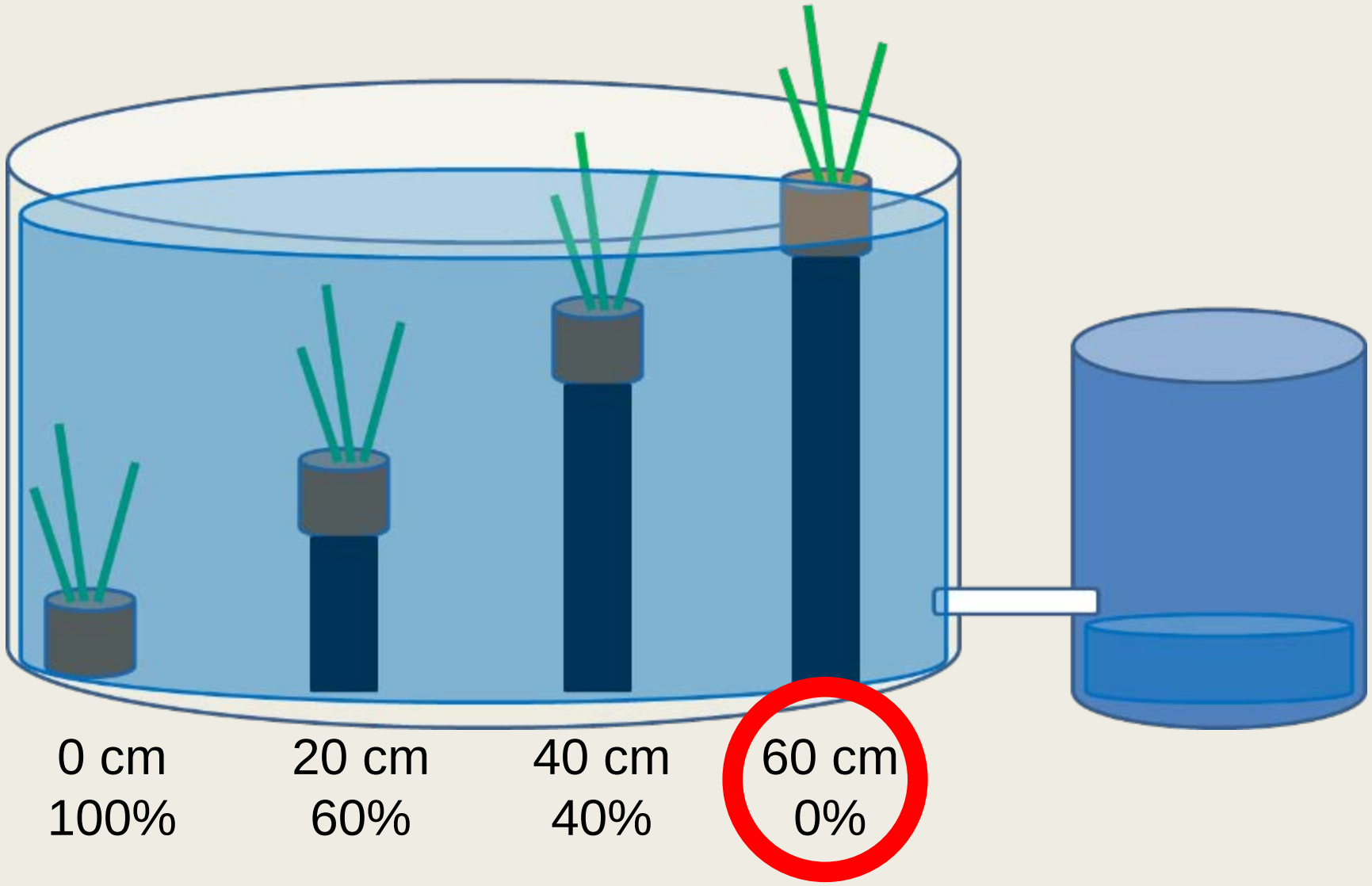
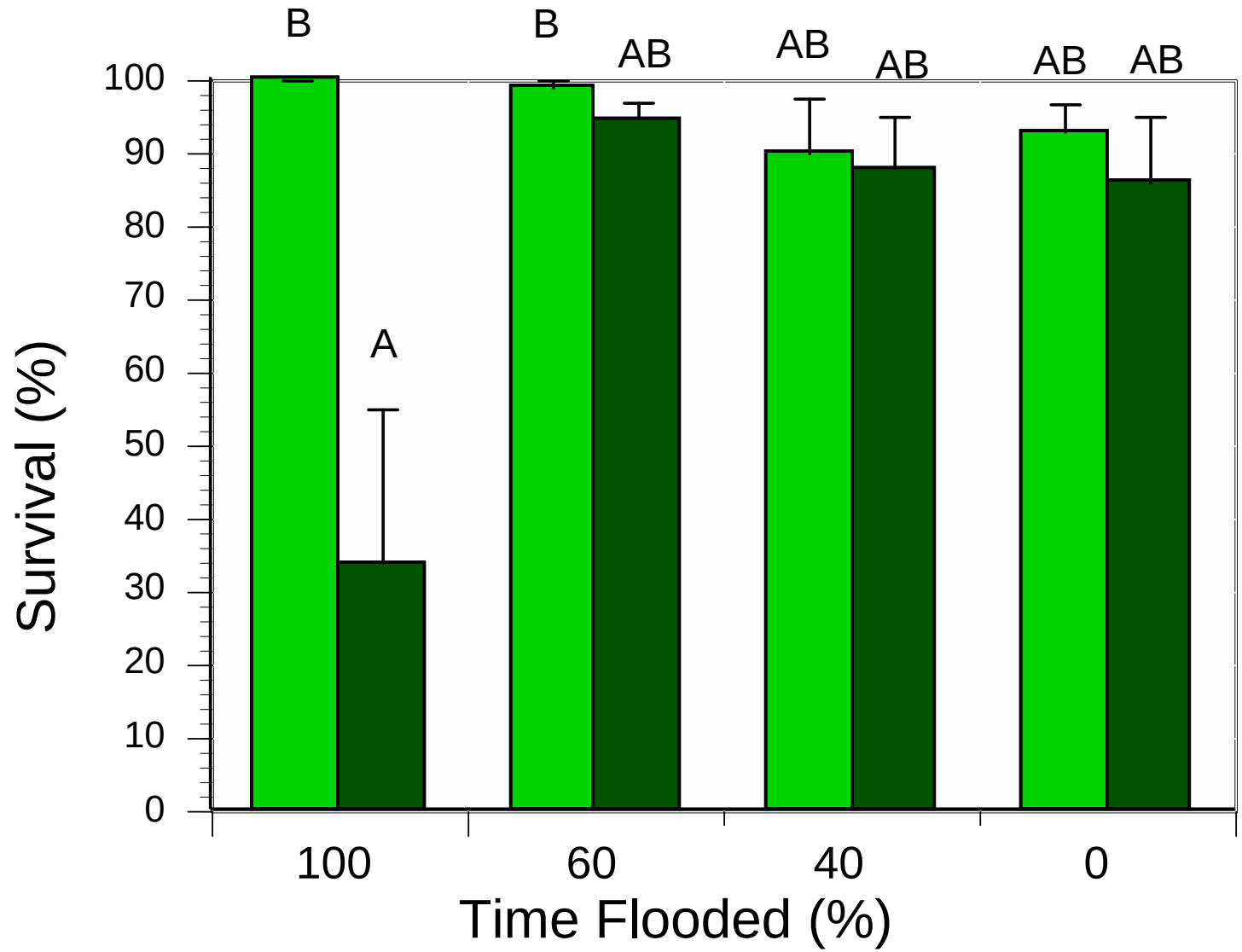

0 cm
100%
20 cm
60%
40 cm
40%
60 cm
0%


0 cm
100%
20 cm
60%
40 cm
40%
60 cm
0%

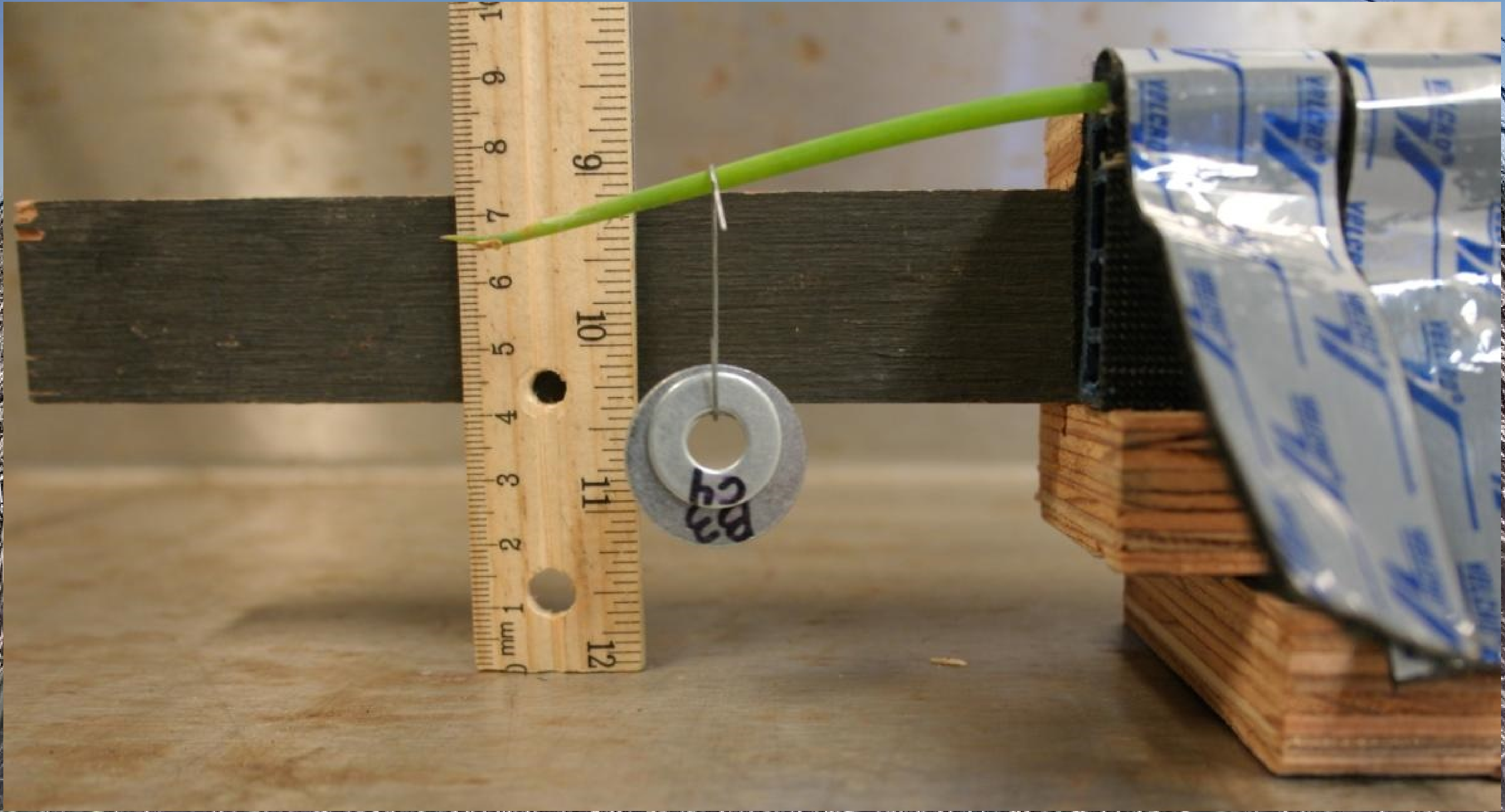
Plant survival - Adults



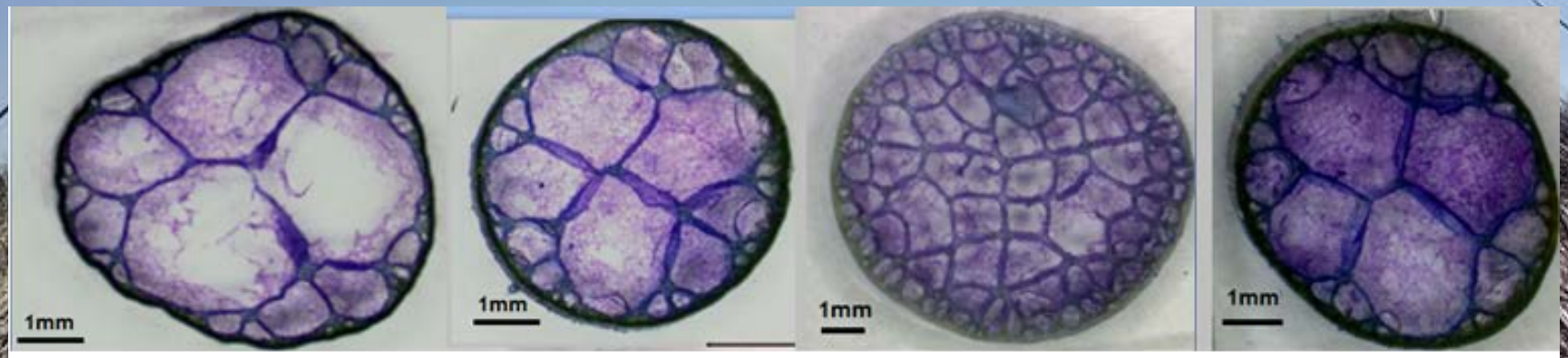
S. californicus

S. acutus

Life stage: *P*<0.0001
Elevation: *P*<0.0001



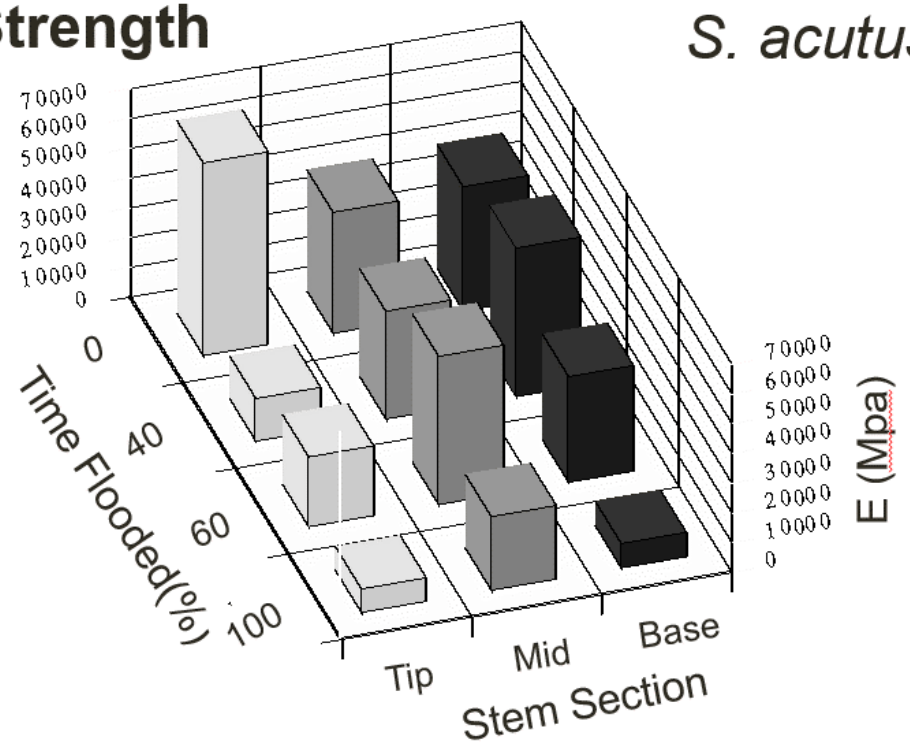
100% 60% 40% 0% Time Flooded



S. acutus

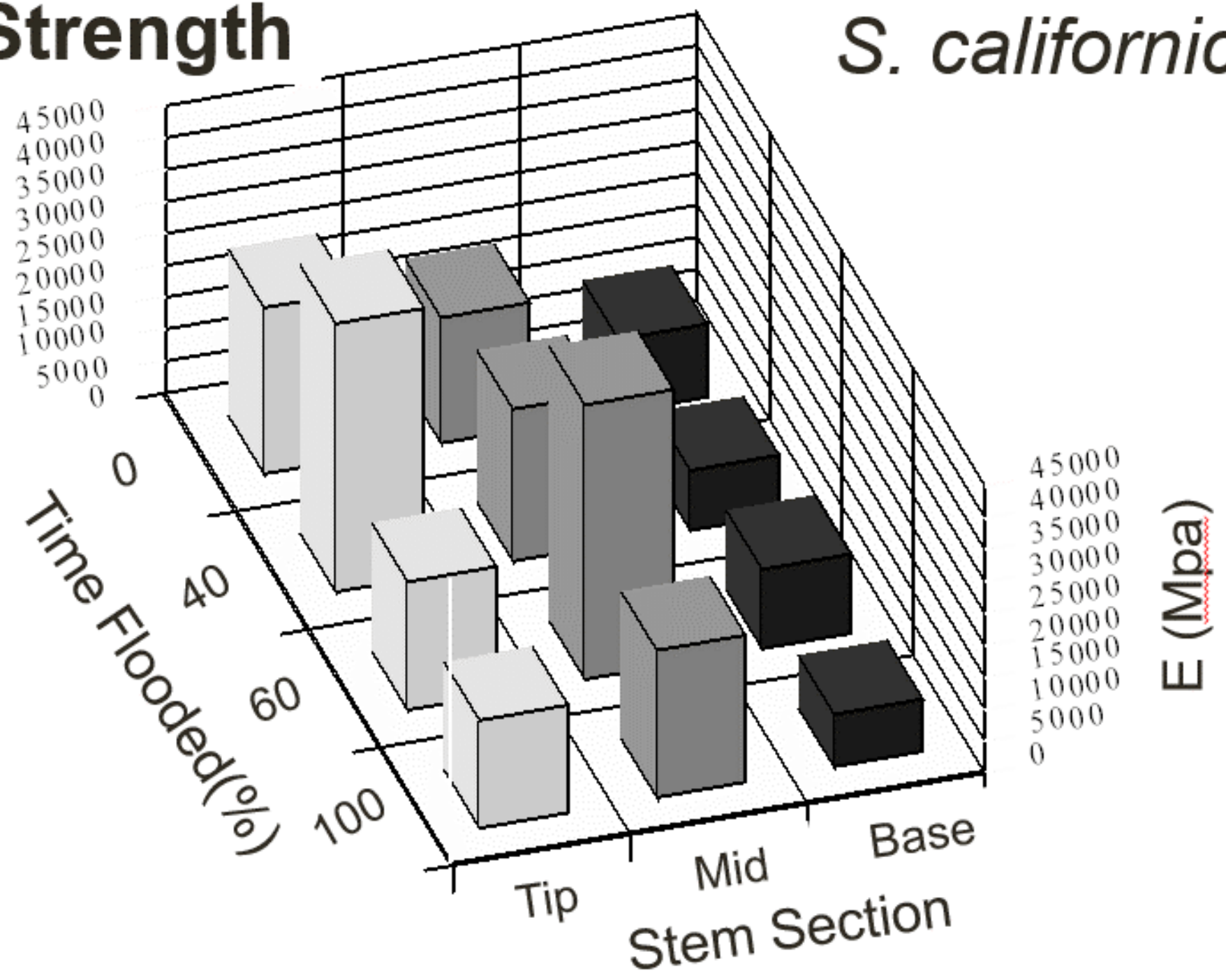
Stem Strength

S. acutus



Stem Strength

S. californicus



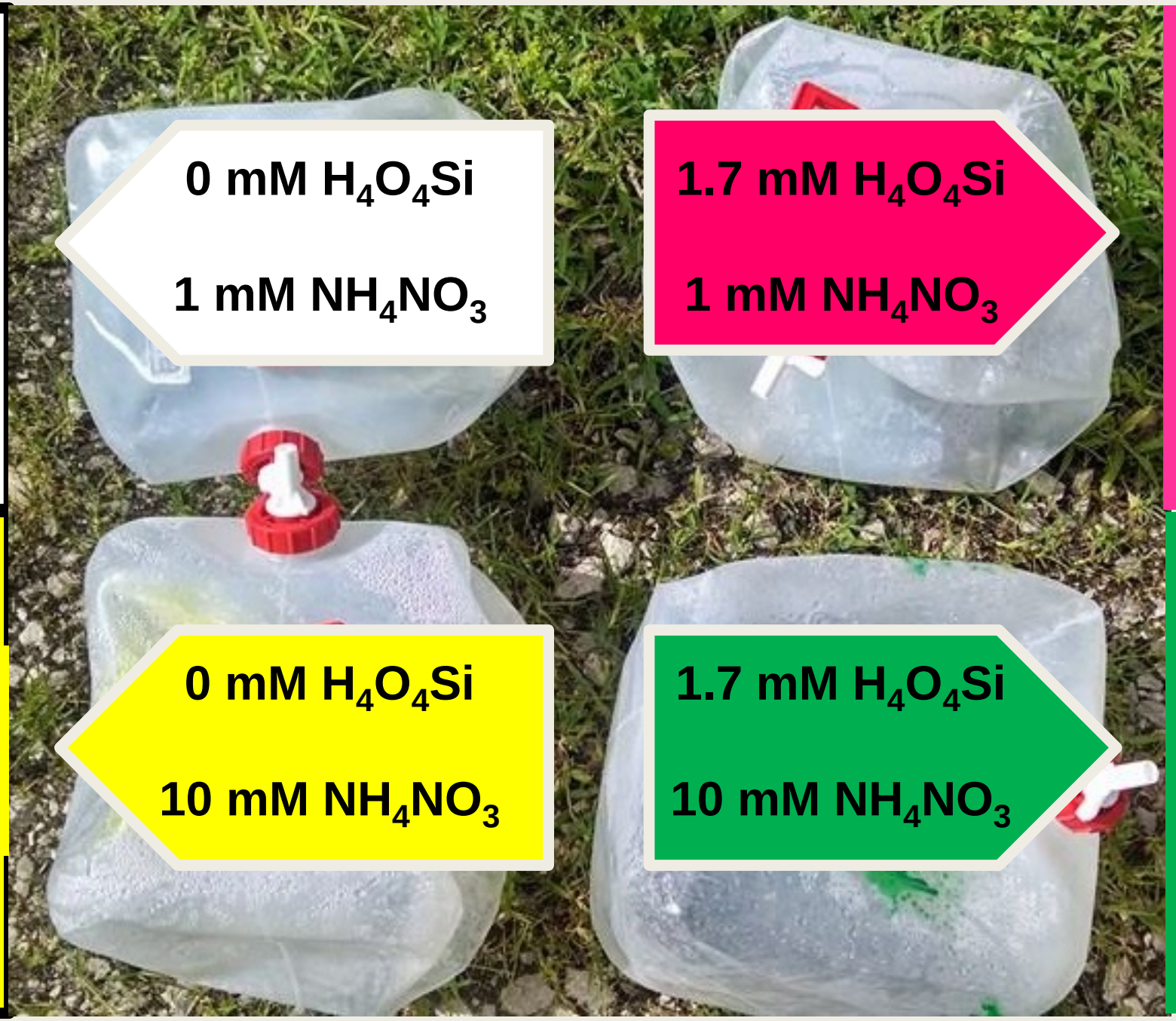
Low Si
Low N

High Si
Low N

Low Si
High N

High Si
High N

Low Si
Low N



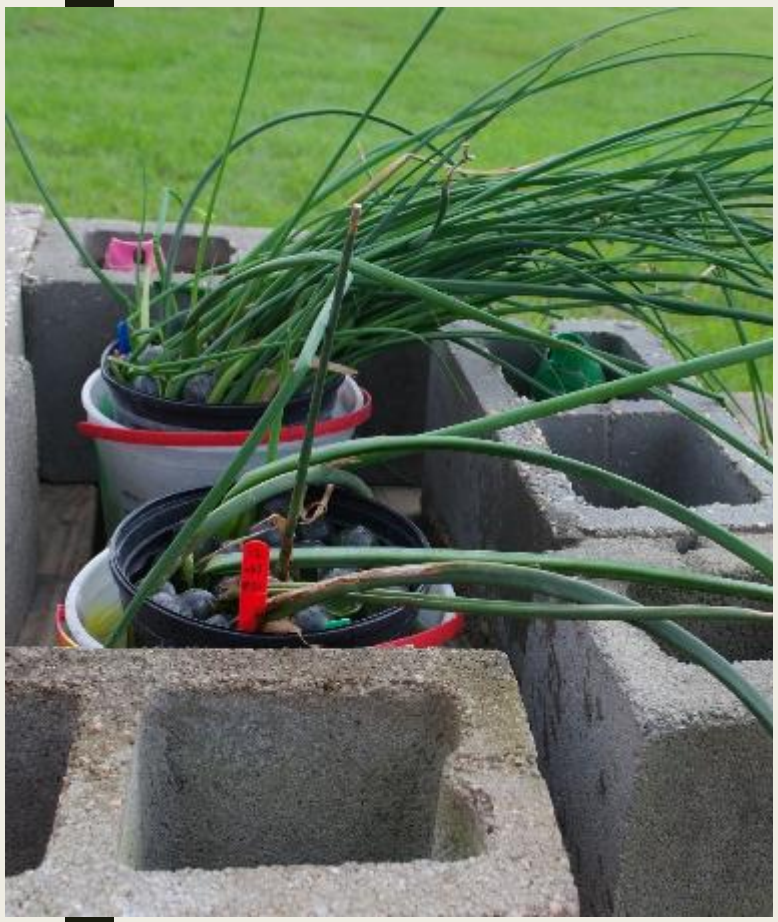
High Si
Low N

Low Si
High N

High Si
High N


14.
+N
-Si

Air Boat Hurricane




5mph
8 km/h


10 mph
16 km/h

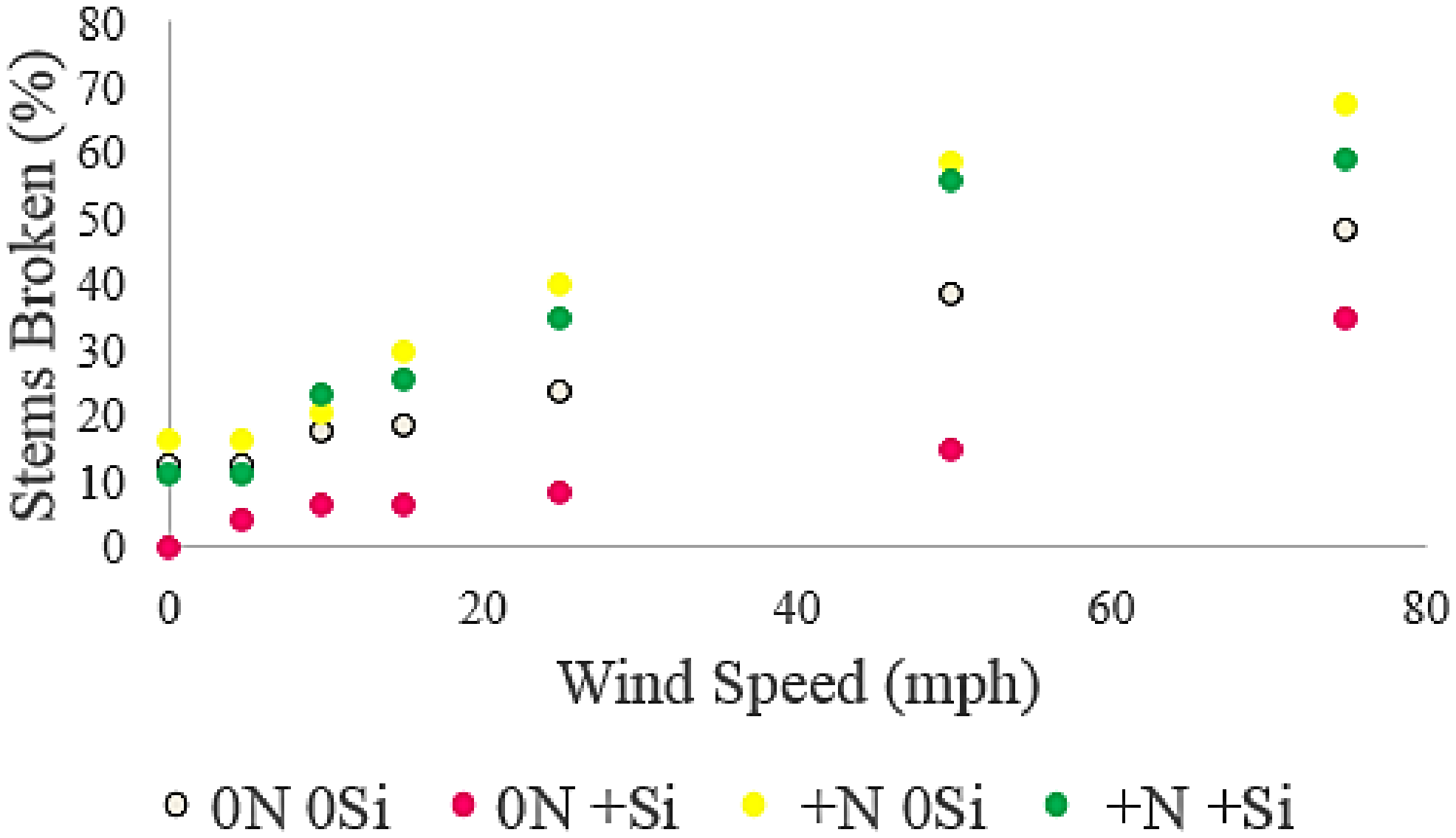

15 mph
24 km/h


25 mph
40 km/h


50 mph
80 km/h
RAGIN' CAJUNS


75 mph
120 km/h

S. californicus



LESSONS LEARNED

- Influence of Hydrology
  - *Tolerates 100% flooding*
  - *Maintains stem strength*
  - *Rate of expansion reduced*
- Maximizing Stem Strength
  - *Increase Si, especially in the presence of high N content*

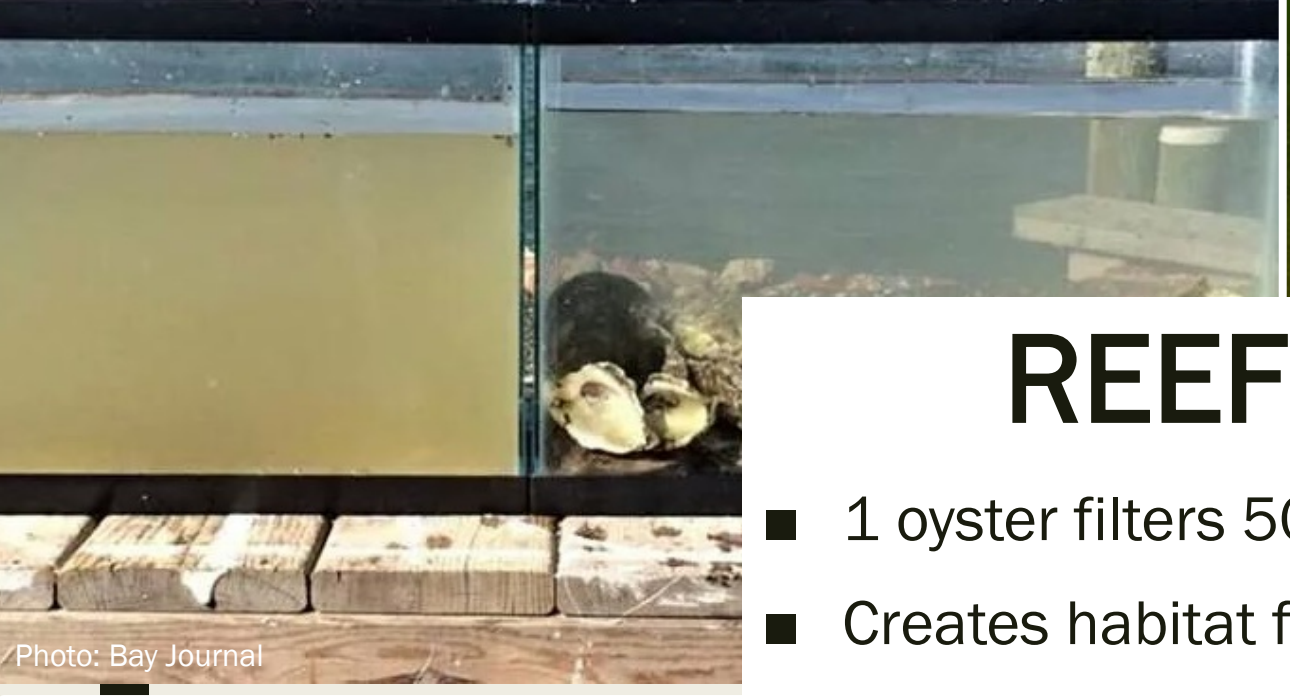
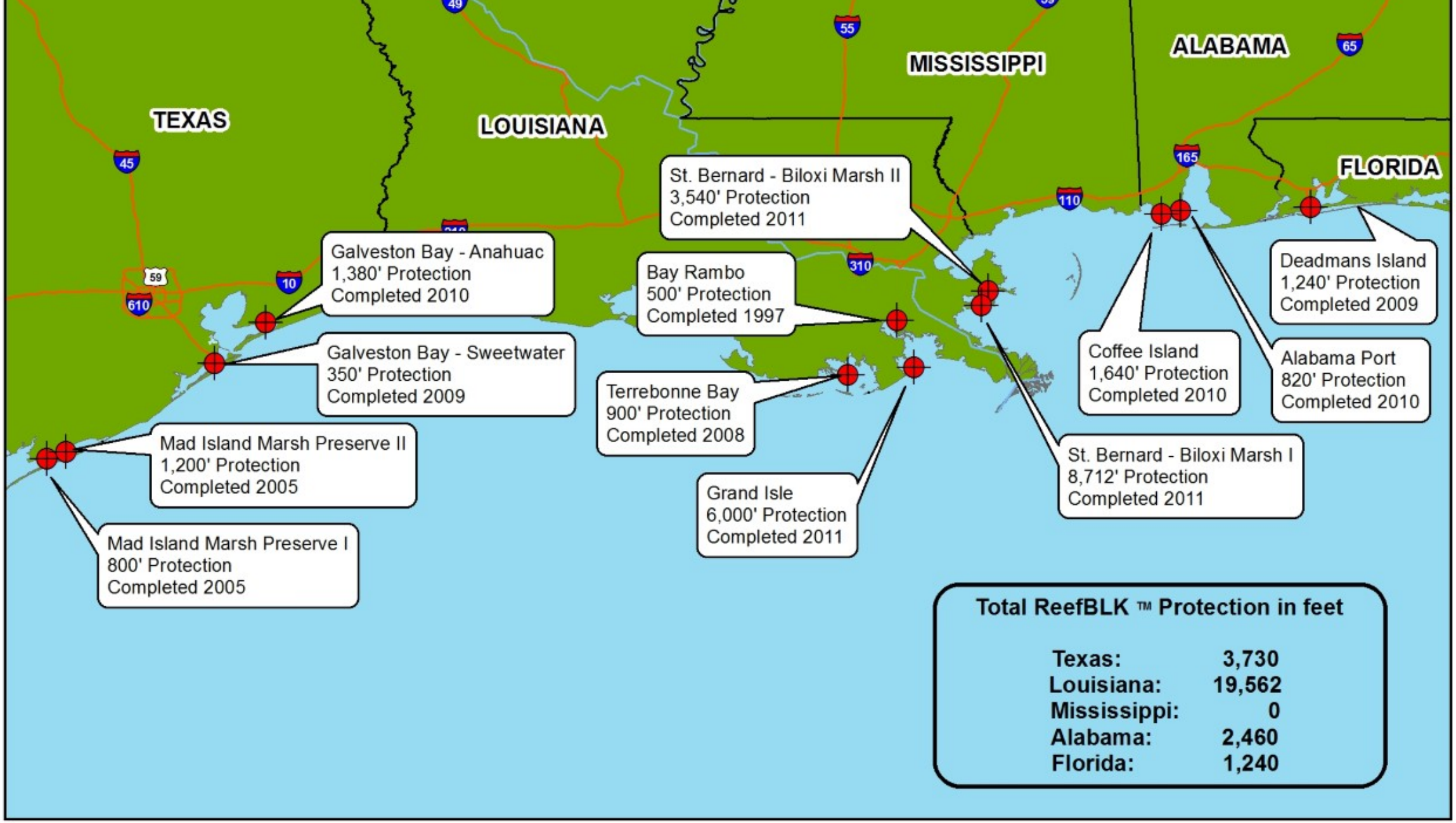


Photo: Bay Journal


Photo: cbs

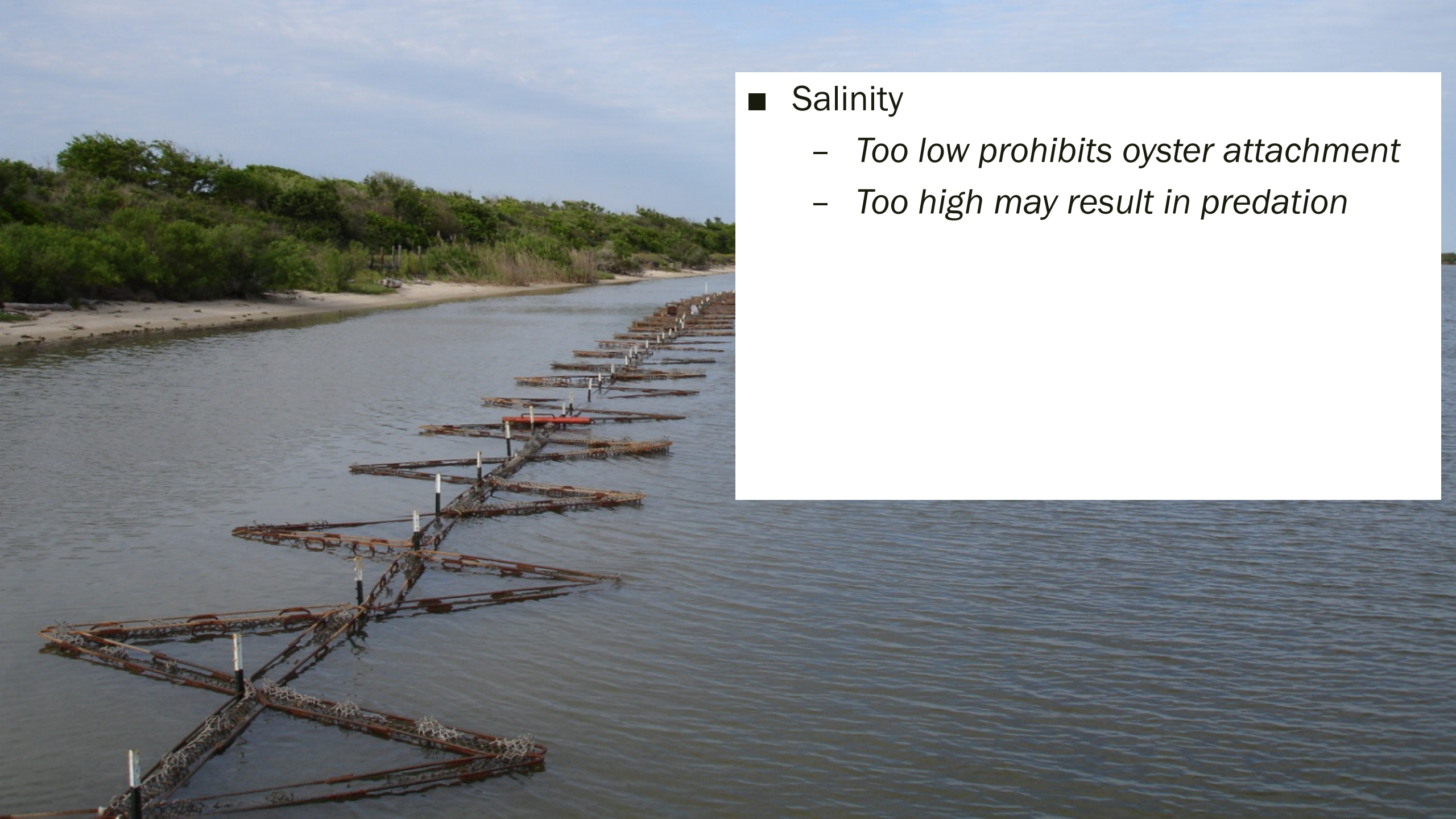
REEF BLK℠

- 1 oyster filters 50 gallons / day
- Creates habitat for other species
- Accretes sediment
- Promotes shoreline progradation



ReefBlk ™ LOCATIONS

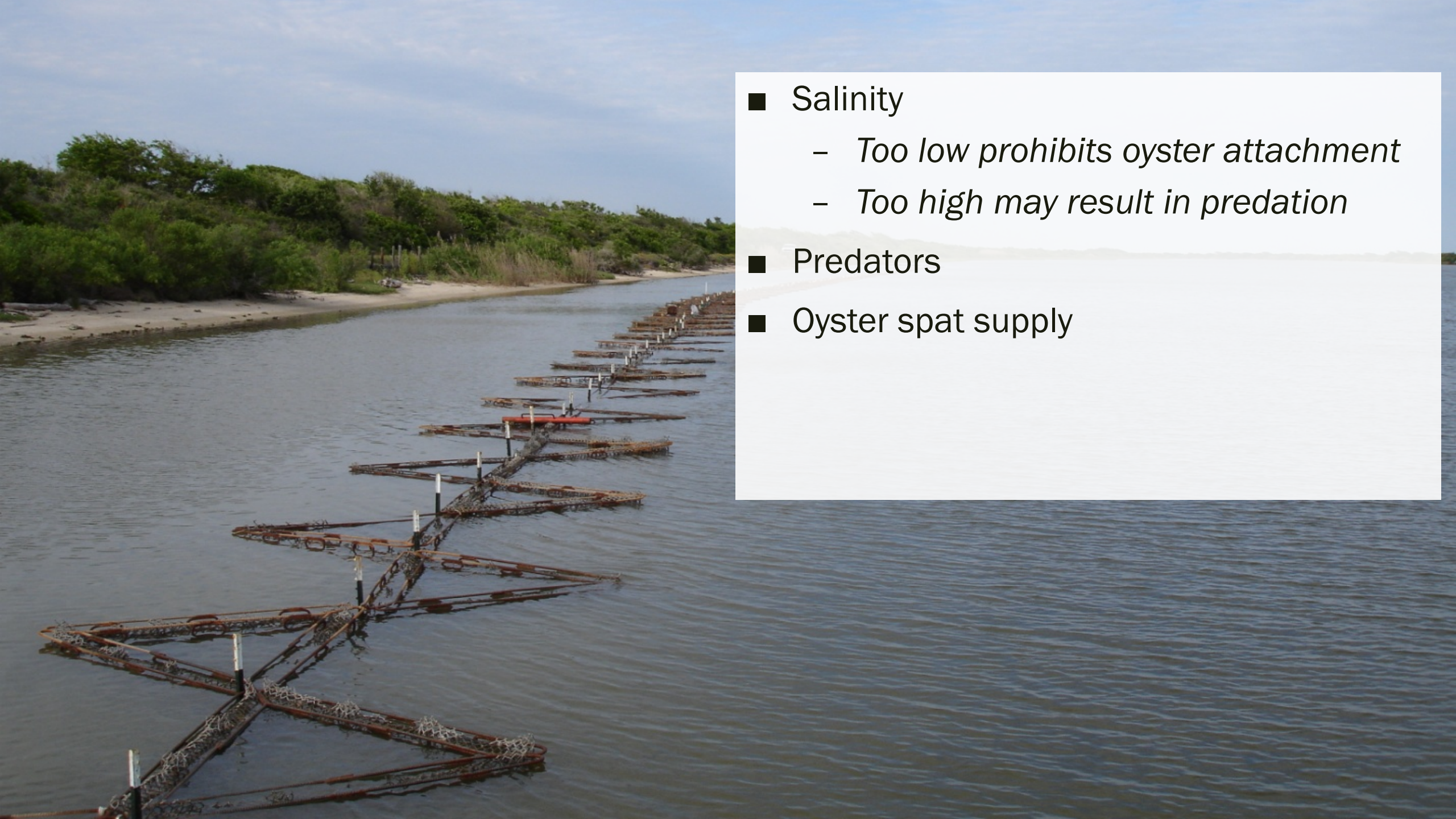
Coastal Environments Inc.



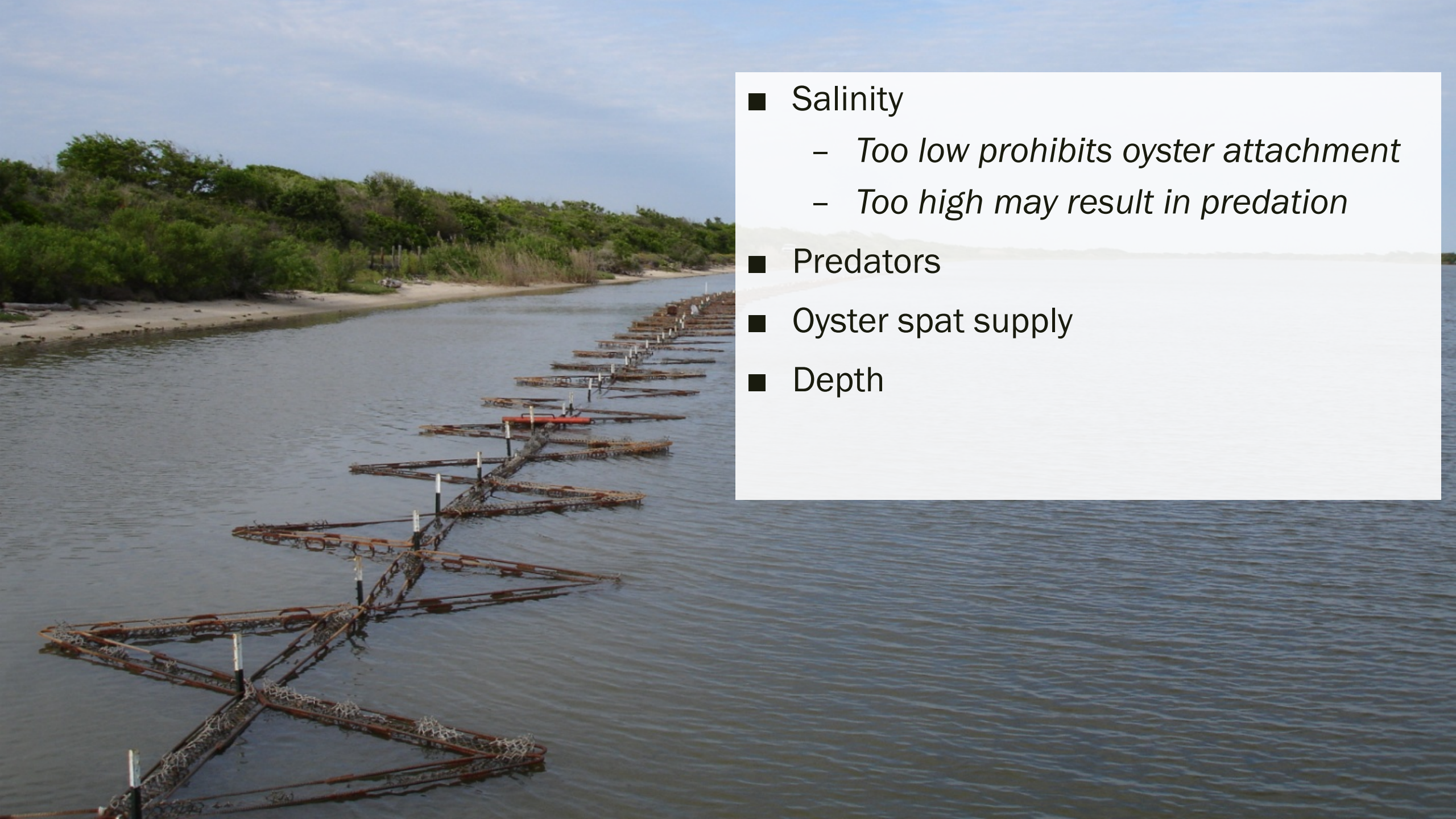
- Salinity
  - *Too low prohibits oyster attachment*
  - *Too high may result in predation*

- Salinity
  - *Too low prohibits oyster attachment*
  - *Too high may result in predation*
- Predators

Photo: PJ Stoops 2010

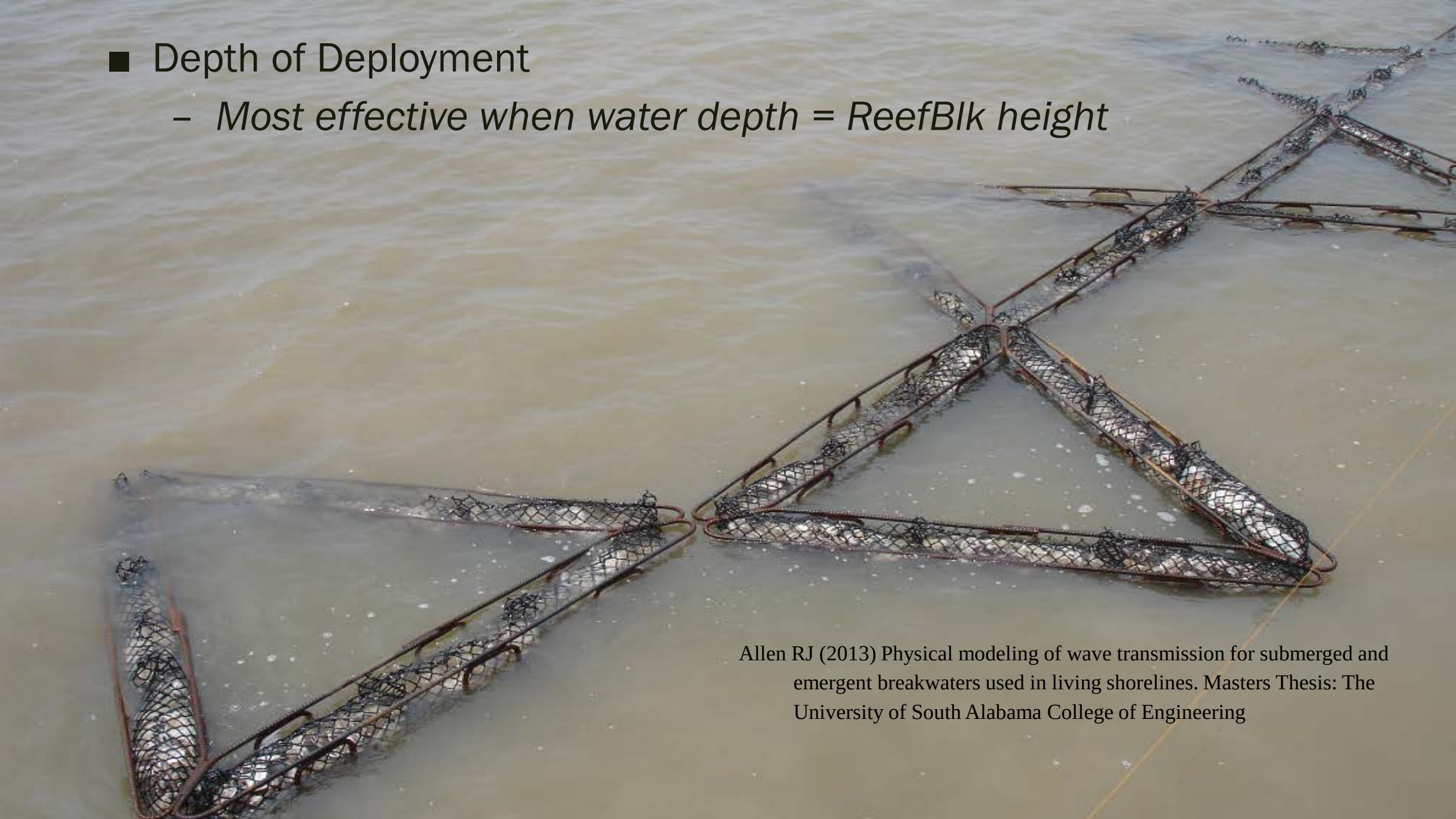


- Salinity
  - *Too low prohibits oyster attachment*
  - *Too high may result in predation*
- Predators
- Oyster spat supply



- Salinity
  - *Too low prohibits oyster attachment*
  - *Too high may result in predation*
- Predators
- Oyster spat supply
- Depth

- Depth of Deployment
  - *Most effective when water depth = ReefBlk height*



Allen RJ (2013) Physical modeling of wave transmission for submerged and emergent breakwaters used in living shorelines. Masters Thesis: The University of South Alabama College of Engineering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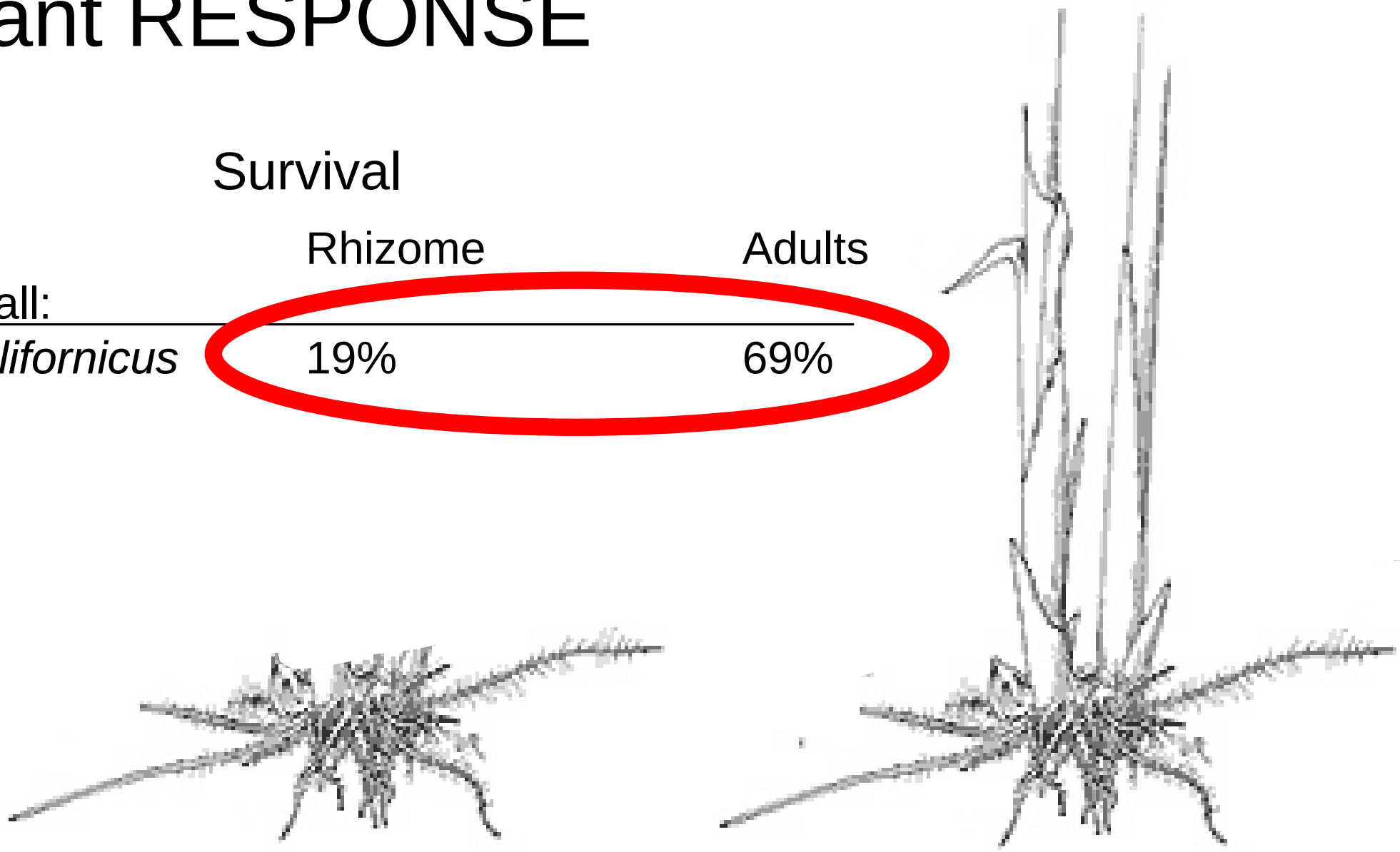
PROGRAM
USGS
science for a changing world
SWS
Society of
Wetland Scientists

Focus on performance variety under various conditions.

- Depending on type, we as planners and managers need to focus on the system type and the goals of the installation.
- Vegetation – when using you want a strong plant that can handle flooding, storm inundation, tall plants reduce wave energy,
- In higher energy environments, oyster breakwaters are more effective. There are many types, but I'm going to focus on ReefBIk as that's our company's product. Evaluate it's success depending on the system and the goals of the project.
- Pros & Cons?
- Seed-bank study, but only Californicus successful. It handles abiotic condition.
- Assess the site for species success

Plant RESPONSE

	Survival	
	Rhizome	Adults
Overall:		
S. californicus	19%	69%



PERCENT TIME FLOODED

93%

74%