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Propagation Methods for Growing Spartina alterniflora for Salt Marsh Restoration

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Propagation methods for growing *Spartina alterniflora* for salt marsh restoration

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Introduction and Background

Salt Marsh Restoration and *Spartina alterniflora*

Problem: Coastal salt marshes are one of the most productive ecosystems on earth and provide countless ecosystem services including shoreline protection from storms and flooding, nutrient removal, habitat for fish, birds and other wildlife and provide some of the most beautiful areas for hunting, fishing and recreational activities. However, salt marshes are disappearing along the east coast of the United States due to human development and sea level rise.

Solution: In order to protect salt marshes and restore the large portion of them that have been damaged, it is important to focus on the vegetation that help salt marshes function. S. alterniflora, smooth cordgrass, is a critical component of the salt marsh vegetation community. S. alterniflora is a dominant species that helps to stabilize the ecosystem, retain a seedbank of other species, uptake nutrients, and provide important habitat for wildlife.

Purpose of Project: In order to grow S. alterniflora for restoration purposes, the species must be grown from seed to provide genetic diversity and high survival rates when planted. However, low germination rates have limited the use of this species for restoration using seeds. While working with, Rhody Native, I tested different methods to achieve high germination rates for S. alterniflora including comparing soil mixes, seed colors, and root development stages. This process is essential to find a propagation method that will work effectively to obtain high germination rates for this essential species to then use for restoration in local salt marshes.

Fig.1: The Great Sippewissett Salt Marsh Cape Cod, MA

Fig.2: Herring gulls at a salt marsh

Results

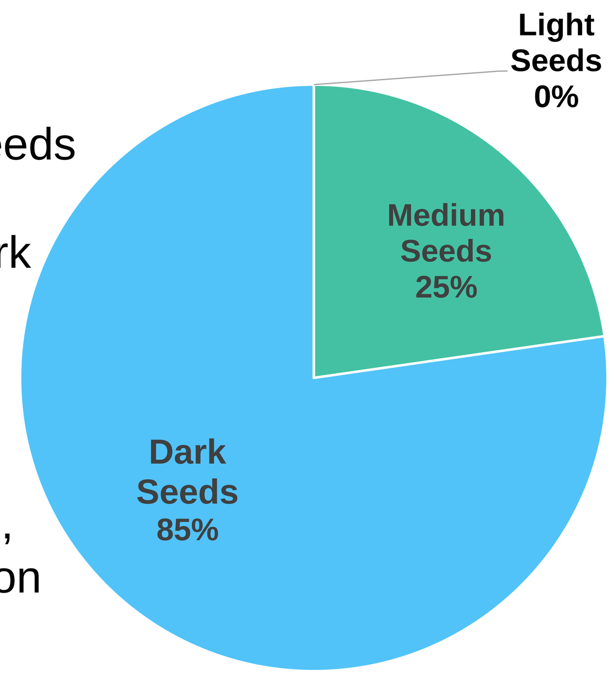
Seed Color Variation

Light seeds
- Empty seeds, lack an embryo
- Do not germinate
- Most seeds sorted were light seeds

Medium seeds
- Lower germination rate than dark seeds
- 25% germination rate
- Smallest group of seeds

Dark seeds
- Contain fully developed embryo, therefore high chance of germination
- 85-90% germination rate

Germination Rate of the *S. alterniflora* Seeds Sorted



Seed Germination Media

Sand
- Both seed types germinated at the same rate in each soil mix
- Leaf color turned yellow over time, due to lack of nutrients in growing media

1:1 sand to metromix 510
- Seedlings retained dark green leaf color
- Seedlings had better root development

Seedling Propagation

Group of seedlings transplanted at 15 days
- Less root development

Group of seedlings transplanted at 30 days
- More root development
- Higher survival rate and faster growth

Irrigation System

Half of the pots were out into an ebb and flow system while half were over head watered. The data from the different irrigation systems are in the process of being recorded.

Discussion

Result Summary

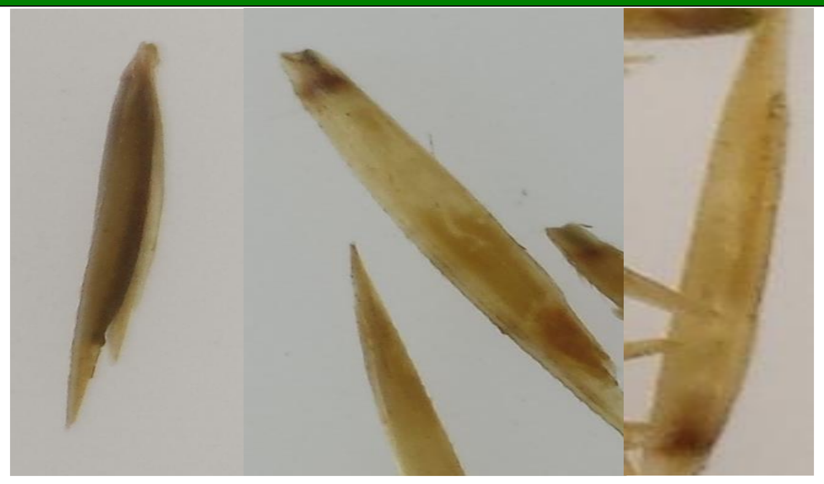
The germination rates for *S. alterniflora in* this experiment were very high. In the past with other experiments, *S. alterniflora* has had low germination rates of about 25% or lower and countless germination methods to choose from. Using the project observations and the methods that were successful, we can propagate more *S. alterniflora* seeds from local areas all along the east coast to ensure local genetic diversity, increased survival of planted seedlings and more restoration projects with successful germination of seeds.

Fig. 3: *S. alterniflora* stand in Colonial National Historic Park, VA

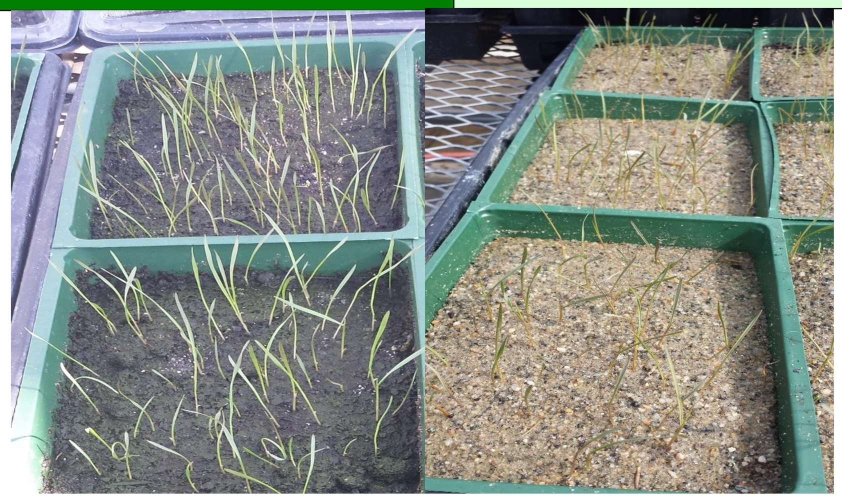
Future Work

Understanding what the next step in maturing the *S. alterniflora* seedlings and understanding what their needs are for salt levels, irrigation types and fertilizers is important to grow the seedlings to an age where they can be used for restoration purposes. There is a lot still unknown about how to restore salt marshes, with important factors like hydrology and soils, as well as, many more vegetation species to learn about. Almost 50% of the salt marshes along the east coast are gone and more disappearing yearly, therefore, it is essential to examine how to properly restore the ecosystems and maintain their priceless, irreplaceable services.

Methods/ Protocol



First, the *S. alterniflora* seeds were collected at Succotash marsh, RI, 10/20/14 and put into cold stratification for 3 months.



Second, the seeds were sorted into dark, medium and light colors and sowed into sand or 1:1 metromix 510 to sand.

Third, the seedlings were transplanted to larger pots with 1:1 sand and peat, seedlings with varying root development.

Fourth, the pots were transferred into the ebb and flow system and some were overhead watered. Eventually seedlings will be planted for restoration.

Citations/ Acknowledgements

1. Kennish, MJ. 2001. Coastal Salt Marsh Systems in the U.S.: A Review of Anthropogenic Impacts. Journal of Coastal Research 17:731-748. 2. Beck, J, DJ Gustafson. 2012. Plant Source Influence on *Spartina alterniflora* Survival and Growth in Restored South Carolina Salt Marshes. Southeastern Naturalist 11:747-754. 3. Stalter, R. 1973. Seed Viability in Two Atlantic Coast Populations of *Spartina alterniflora*. Castanea 38:110-113. 4. Biber, P, JD Caldwell, SR Caldwell, M Marenberg. Smooth Cordgrass Propagation Guide. Center for Plant Restoration and Coastal Plant Research

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