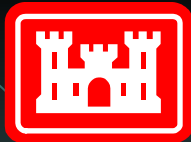


Developing Seeding Techniques for Tidal Marsh and Shoreline Stabilization

A Beneficial Use of Dredge Project



Partners in Developing New Plant Sciences for the Tidal Marsh Restoration



**US Army Corps
of Engineers
New York District**



Cape May Plant Materials Center



Seeding *Spartina alterniflora* (smooth cordgrass)

- Very limited trials done on seeding *Spartina alterniflora*
 - North Carolina State-Drs. Woodhouse, Seneca, and Broome (1970's)
 - Galveston Bay mud flats-surface broadcast seeding with airboats
 - Louisiana State University-Work with improved seeding genotypes.



Challenges seeding *Spartina alterniflora*

- Wild harvest by hand at optimum time.
- Low natural germination percentage (10-40%).
- Cold, wet storage requirements.
- Difficulty getting seed to flow through a seeder/seed drill since seed is wet.
- Proper depth of seeding to prevent seed movement/washing away.

Jamaica Bay, New York

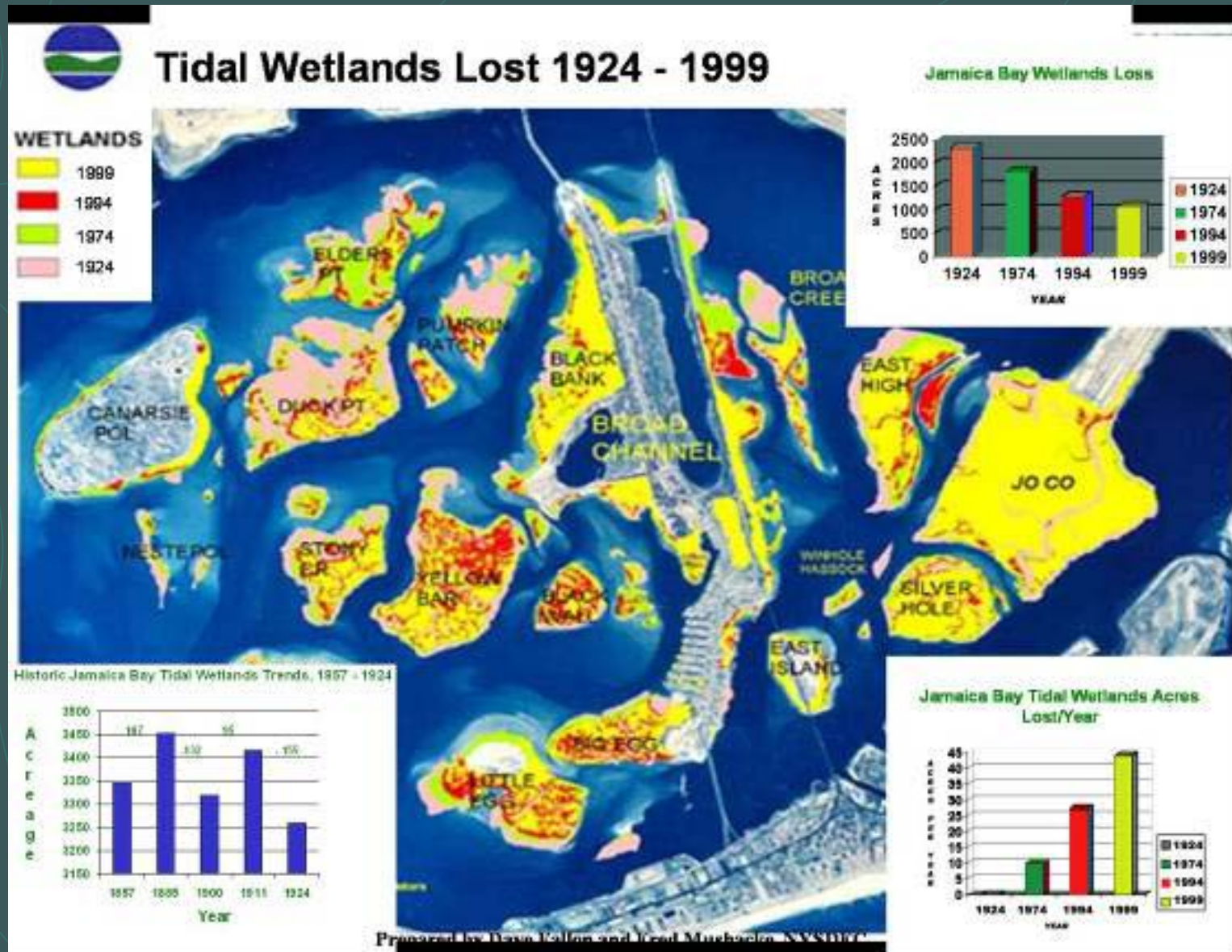


A vertical strip on the left side of the slide shows a topographic map of the Jamaica Bay coastline. It features contour lines, a yellow line representing a road or path, and various symbols indicating land use or infrastructure.

Jamaica Bay Site Conditions

- 4-5 foot tidal elevation. Spring/neap tides higher.
- Heavy waterfowl predation in fall/winter.
- High wave energy impacts northwest facing shorelines.
- High nutrient content of the bay water.

Jamaica Bay Islands Wetland Loss



Dredged sand pumped and graded





Graded area before
seeding/planting

Seeding tray germination



Plant Propagation



Plant Propagation



7.5" deep plugs produced.
Cost was \$1.00/plug.

Quart pots produced at
\$ 3.50/container

1.5 foot spacing:

Plugs- \$29,040/ac.

Qt. Pots- \$101,640/ac.





Seeding vs Vegetative Planting

● Advantages of plugs

- -quicker stabilization under high energy conditions. Used quart sized pots in highest energy shoreline fringe
- -Resistant to waterfowl “plucking” if planted by mid-July.

A vertical strip on the left side of the slide shows a topographic map of a river valley. The map features contour lines, a river channel, and some infrastructure like roads or bridges.

Seeding vs Vegetative Planting

● Advantages of Seeding

- -reduced planting costs, more mechanized
- -Cover more area less time
- -Seed is cheaper than plugs.

Seed Ripeness



Seed Harvest



Seed Harvest- Sickles/Machetes



Seed Storage/Handling

- Seed after-ripened on concrete floor with fans for air flow
- Seed was then feed through an agricultural combine to remove large stems/leaves
- Final stage through seed clippers.



Equipment Settings for Cleaning Seed of Smooth Cordgrass (*Spartina alterniflora*).

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Melissa Alvarez US Army Corp of Engineers NY District

Abstract

The purpose of this project was to determine the most efficient and yet affordable process by which to clean seed of smooth cordgrass.

Smooth cordgrass is a dominant warm season grass occupying the inter-tidal zone of estuarine plant communities. Large scale harvesting, processing and cleaning of *Spartina* seed has been limited to hand processes to ensure high levels of viable seed harvested.

*The USDA NRCS Cape May Plant Materials Center is the first known facility to utilize an agricultural combine for large scale seed cleaning equipment that resulted in hundreds of pounds of viable seed. This information will serve to advance the cost effectiveness of large scale estuary conservation.

Materials and Methods:

Building for after ripening of seed, combine, 62-D three Screen separator, germplasm storage at 1-2 Celsius, and 25 ppt salt water.



Photo to the left illustrates hand sickle harvest of seed heads from the wild. The entire seed harvesting process can be accessed by requesting a copy of:

Interagency Publication: MP-NJPMC-0501
Planning Considerations for Collecting Seed of Smooth Cordgrass *Spartina alterniflora* (L.) in the Mid-Atlantic.



Photo to the right showing harvested seed bio-mass flowing to after ripen in equipment building.



Photo to the left shows a "green" seed head on the left requiring after ripening until it finishes and turns tan like the one on the right.



Photo above shows PMC combine that was used



From left to right: Seed flowing from combine bin to cans; 62D three screen separator; staff bagging clean seed.



Photo above shows clean healthy seed extracted from 25 ppt salt water and stored in cold storage at 1-2 degrees C.

Results and Discussion:

Though many settings combine settings were experimented with the following settings yielded the cleanest and least damaged seed.

Fan Speed:	9
Cylinder Speed:	7
Concave:	12
Air Inlet:	Full-Open
Adjustable Sieves:	15 mm

The 62-D three screen separator performed best at the following settings:

Hopper Roller Opening:	2/3rd Open
Air Deflector Board:	1/4" Open
Fan Speed:	900 RPM
Top Screen:	#24
Middle Screen:	Slotted 6/64th by 3/4"
Bottom Screen:	1/25th covered with paper.
Adjustable Speed:	1/2 Turn open
Seed Discharge Door:	Closed
Top and Bottom Fan Balancer:	Air Flow Ribbon Balanced

Summary:

Cost effective seed cleaning of the coastal halophyte smooth cordgrass can be accomplished. Due to the purchase costs associated with the machinery mentioned, a propagator will need to carefully examine available labor rates, the quantity of seed that will be processed and the cost of equipping their operation with similar machinery.

Equipment Manufacturer Disclaimer:

Mention of trade and company names does not imply any guarantee, warranty or endorsement by the USDA Natural Resources Conservation Service and does not imply its approval to the exclusion of other products that are also suitable.

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Seed Storage

Salt Water: 25 ppt. flushed every tens days.
 $\frac{1}{4}$ cup Clorox per 25 gallons.



Seed Storage: 38 degrees F.



Direct seeding for tidal marsh restoration



Use of a seed
carrier is necessary:

We chose non-
clumping cat litter.

Direct Seeding Technology for Marsh Establishment



Dune Seeding Technology-1990's



Coastal panicgrass seeded in back dune-first growing season. Now specified by ACOE in many projects.

Seeding Study Method

- Plots 40 ft. long X 25 ft. wide
- 4 seeded/4 non-seeded (control plots) in both high and low energy areas.
- *Spartina alterniflora* was direct seeded into dredged sand at a 1.5 in depth using a single row push seeder (Planet Jr.)
- Wet stored smooth cordgrass seed was mixed with cheap (non-clumping) cat litter at roughly a 3:1 (seed/litter) by weight.
- Rows planted 18" apart. 17 rows/plot.
- Seeding was done May 22, 2007

Low Energy Site Conditions

- Highest elevation of the daily tidal inundation
- 70 foot wide vegetated buffer in front the planting.



Low Energy Site



High Energy site conditions

- 25 foot planted buffer of quart pots -*Spartina alterniflora*.
- Planting in Median tidal range elevation.



High Energy Site



Low Energy Site-Seeding

Sept. 07



July 08



High Energy Site Seeding

September 07



July 08



September 2007 Seedling Counts

Treatment	Average # Stems/lin. Foot (within the row)				Average
	Rep 1	Rep. 2	Rep. 3	Rep. 4	
Low Energy	6.33	3.25	1.67	1.67	3.23
Low Energy (control)	0	0	0	0	0
High Energy	0.25	1	4.5	4.75	2.62
High Energy (control)	0	0	0	0	0

July 2008 Stem Counts

Treatment	Average # Stems/lin. foot (line transect-across plot)				Average
	Rep 1	Rep. 2	Rep. 3	Rep. 4	
Low Energy	1.1	0.90	0.68	0.87	0.88
Low Energy (control)	0.30	0.70	0.18	0.07	0.31
High Energy	0	0.13	0.01	0.16	0.07
High Energy (control)	0	0	0	0.05	0.01

Plug Planting-Season 1 vs Season 2



ACOE-Yellow Bar Project-Jamaica Bay, NY



** Breaks in fencing - February 18, 2013*



Kasco Versa Seed Drill

Seed Drill Preparation/Calibration



Jamaica Bay-Yellow Bar Island



Spartina alterniflora seeding-1 growing season



Conclusions

- Seeding is a viable option in lower energy environments, in the upper $\frac{1}{2}$ of the tidal range in coarse-textured (sand) dredge materials.
- In higher energy sites, plant a shoreline fringe buffer of at least 50 foot with vegetative material. (upper $\frac{1}{3}$ of tidal range)
- **High quality seed**, properly stored and handled is necessary for seeding success.
- Plant density from seeding takes 3 growing seasons to equal second growing season from vegetative plugs.
- Drill seeding in high organic (muck) soils would be difficult and may have different results. (broadcast may work)

A vertical strip on the left side of the slide features a topographic map with contour lines in white and yellow, set against a dark green background.

USDA-NRCS

Cape May Plant Materials Center

Christopher Miller, Manager/Plant Materials
Specialist

Scott Snell, Natural Resources Specialist





Seed Cost Estimates for Comparison

- Commercial seed costs- \$15.00/lb.
- Seed at 5 lb./ac. = \$75.00/acre
- Overhead costs of combine/seed cleaning equipment.