

## Interagency Technology Publication

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# Planning Considerations for Collecting smooth cordgrass (*Spartina alterniflora* L.)



### Publication Objective:

This publication will transfer information pertaining to planning considerations for the collection of *Spartina alterniflora* seeds from the naturally occurring stands.

**Target Audience:**

Coastal advocacy groups, community organizations, consultants, estuary land managers, local, state and federal entities involved estuary restoration.

**Background:**

Smooth cordgrass (*Spartina alterniflora*) is considered a primary species of grass used in the conservation of coastal estuarine habitat in the eastern United States.

Conversely it is considered a highly invasive and undesirable plant on the west coast of the U.S. Publications continue to cite that commercial production and establishment is primarily accomplished through vegetative means due to the poor seed production and viability associated with smooth cordgrass.

Recent experiences associated with the collection, processing and storage of *Spartina alterniflora* seed indicates that this species has excellent potential for large scale seed production and establishment by seed.

**Description:**

Smooth cordgrass is a long lived perennial warm season grass that is the most prevalent species found in the intertidal zone of mid-Atlantic estuary ecosystems. It has been noted to grow to 10 feet in height and spreads by seed and rhizomes. Flat leaf blades are 12-20 inches long, tapering to a long inward rolled tip. This important estuary grass flowers from July – September with seed mature from September through early November.

**Getting Started Checklist:****Radio or Cell Phone**

Make sure someone on the collection crew has a cell phone or means of communication to obtain emergency assistance if it should be needed. When collecting from remote locations alone or with a small crew, a GPS locator device would enable you to apprise emergency responders of your exact location.

**Tools**

Grass hooks, hand held sickles, nursery scissors, pruning shears, trimmers, machetes, rope and twine.

Sharpeners

Work gloves, safety gloves preferably Kevlar reinforced.

Trash cans, king size sheets.

Floating devices or canoes.

Wire labels and indelible markers.

Collection note taking supplies.

Camera and photographic equipment.

First aid kit with insect repellent

Sun screen

Hats or portable shade units.

Cooler packed with water and light sugar enriched snacks.

Protective foot wear that will resist puncture by glass and nail laden driftwood.

Safety review checklist for explaining to crew on site at onset of collection.  
**Ecosystem Considerations:**

### **Site Accessibility**

Suitable collection sites can be in locations that are accessible by car and foot traffic or solely by boat. If the ecosystem is limited you may only have one option available to you. In very large systems both site accessibility options may exist. There is little doubt



sites accessible by car/foot are in many cases more economical and time efficient. Such sites can be accessed during storm periods when small craft advisories are issued and boats use is restricted. Conversely, many healthy and robust populations are found away from mainland and roadway systems. If maximizing potential genetic variation within your seed collection is a goal, you will undoubtedly employ both site accessibility options due to the phenotypic and possibly genetic variation that exists within the system.

### **Consult Your Tide Tables**

Determine high and low tide periods for your specific site. There is a lag time between ocean surf low tide and the time it takes for the back bay areas to drain down. Depending on the expanse of the estuary and the volumetric discharge capability of the mouth of the bay, the lag time could be up to a couple hours. Also consult local resources to determine the vertical tide change. In the New York, NY area, vertical tide changes can be up to 4'-5'. In the Northern North Carolina systems such as Albemarle, Pamlico and Currituck sounds vertical tide changes are less than 2' and can be influenced more by wind than lunar cycles.

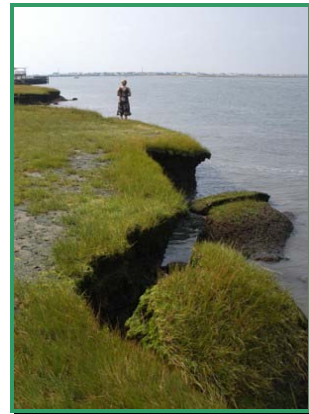
If you have decided that your collection site will be at an eroded vertical shoreline and you have to access it by boat, timing with tide stages is crucial. If you try accessing when the tide is out, your crew may not be able to scale the vertical escarpment and collect in a timely manner. If you access an eroded site by boat at the peak of high tide in an area where vertical tide ranges are 4' or more, your crew could wind up swimming instead of seed collecting. Visit your collection locations several times before the collection dates and during various tide stages to avoid problems.

### Seed Containers Float Away



Irregardless of how well you plan and start your seed collection, site conditions are never stagnant. The ebb and flow of the tides into and out of the estuaries are as constant as a human heartbeat. At some point during collection the tide will start coming back in. When it does, the containers will want to float away or flip over and fill with water. Our crew found that wide bottom trash cans were a little more stable when floating than the taller narrower cans which are top heavy. A canoe proved to be incredibly versatile for providing not only a stable platform for seed containers but also protected tools, coolers and photographic equipment.

### Shoreline Shape and Ease of Access



Estuary shoreline profiles within any one ecosystem are as variable as fingerprints on humans. The endless potential combinations of solar energy, aspect, soil, plants, water craft energies and storm surges perpetually shape and reshape the configurations of this fragile yet resilient system.

The two main shoreline shapes you will need to consider if your selected locations have a natural repose with a shallow sloped beach or a vertical escapement with banks too steep to climb at low tide.

## Variations of Stand Pheno/Geno-type:



Only a handful of grass species can survive and thrive in the coastal marine estuarine ecosystem. In the mid-Atlantic these would include and not be limited to smooth cordgrass (*Spartina alterniflora*), salt meadow cordgrass (*Spartina patens*), spike grass (*Distichlis spicata*) and tall cordgrass (*Spartina cynosuroides*) to name a few. However, within each species there is displayed tremendous phenotypic variations which include flowering date, date of anthesis, date of seed ripeness, flag leaf length, leaf width, leaf thickness and height of plant. On a single morning our team located stands varying from 18" in height to 10' (feet) in height both with mature seed and within 1 mile of each other.

In a shoreline that is not seriously degraded you will notice that the taller eco-types tend to be along the edges of the tributaries and creeks. Then depending on the site width, a smaller ecotype is generally located immediately behind it. It appears that height differences are not induced by edge effect since the smaller type will not grow larger once the taller is removed by erosive forces.

If your restoration goals are to plant new materials on the high energy edges of the land water interface then collecting similarly structured and placed ecotypes from the natural community could be best. If you are restoring behind the frontal systems in the shorter mix areas collecting the shorter eco-types could be more beneficial. Remember, depending on the site, the shorter stature material allows for plant community diversification and in the mid-Atlantic you will see spike grass and *Salicornia sp.* mixing in with the shorter *Spartina alterniflora*.

In either case, keep in mind that cross pollination between the geo- types occur and only when monotypic stands exist isolated from each other will the seed collected have a higher percentage of expressing the parental growth forms

### **Verify Seed Maturity:**



Seed set and ripeness vary tremendously within any one ecosystem depending upon a number of factors. Some of these factors can include population genetic variation, hydrology, salinity, freshwater lenses, wildlife disturbances, age of stand, soil fertility, prevailing wind direction, pollinator abundance or absence, insects, disease and environmental stresses.

It is important to identify stands within the ecosystem that has mature seed ready to harvest. For the mid-Atlantic region visit your site within the first week of September and visually inspect the seed heads. If anthers are still present, use a hand lens and determine if the anthers still look moist and viable. If so, harvest could be several weeks to a month and a half off. If the anthers are wilted and looking faded, then seed ripeness could be within a week or two.

### **Determining if Seed Are Present:**



Starting at the base of the seed head, slide the seed head between you thumb and index finger as you apply a squeezing pressure to the seed head. You may be able to feel the seed like lumps as you go up the head. In many locations you might experience “blanks”. These are empty florets where the ovaries were not fertilized and the seed was not developed. If you don’t feel any seed don’t worry. Try a couple more heads. If still no seed, sample in a different area within the site, keeping in mind the blanks may be localized and there still maybe viable seed at that site.

### Seed Physiology Basics:

#### Soft Dough versus Ripe Seed:

In seed physiology, there are four distinct levels of seed maturation:

- Milky dough
- Soft dough
- Hard dough
- Ripe seed

Once you have located the seed within the seed head, pull it out. You will need to pull back the chaffy parts referred to as the glumes. Once you peel these pieces back (not always an easy thing to do) look at the seed.



Then squeeze the seed. If the seed squishes and milky stuff comes out, that’s referred to as “milky dough stage”. If the seed squishes and no milky substance comes out it’s referred to as soft dough. If you squeeze it and it’s not real soft but is firm and requires a lot of pressure to squeeze out that’s referred to as “hard dough”. When you chew the hard dough it literally will make bread like dough in your mouth. When seed won’t squeeze, and can actually be “snapped” in half, that’s fully ripened seed. Spartina will begin shattering and falling to the ground just after its hard dough and approaching fully ripened.

Due to individual variation from one plant to another and one part of the estuary to another it is common to locate plants that are in all stages of seed development at the same time and in the same location. The final days of seed ripening can be sudden or

prolonged as influenced by temperature and soil climate interactions. Try to collect those portions that are hard dough to fully ripened seed.

### **Helpful Spartina Collection Tips:**

#### **Hand labor**

Tidal marsh estuary ecosystems are particularly vulnerable to soil compaction. Slight changes in elevation in these ecosystems will have drastic adverse effects on hydrology and plant communities. Due to the lack of equipment that can access estuaries without imposing damaging effects, harvesting of seed is still carried out by hand.

Many hand held tools have been and are currently used by different collectors. Hand held grass hooks or sickles proved to be far more productive than large nursery scissors, pruning shears, knives, clippers or gas power cutters. However, when working with large collection crews, make sure you have a diversity of cutting tools on hand. Many non-field personnel who may be office based volunteers are very intimidated by grass hooks and prefer to use less efficient means. After training in the use of the grass hook, if crew members are still uncomfortable, let them use other cutting alternatives. In the long run you will lose greater cutting efficiencies if that person suffers lacerations that require transport to the hospital.

Before taking collection crews out visit the site ahead of time.

#### **Cutting technique:**

- Wear safety gloves. We suggest using Kevlar reinforced gloves as we have had collection team members slice completely through new leather gloves and require 15 stitches.
- Always point the sickle away from you.
- Use the tip of the sickle in a circular motion to gather a group of seed heads and grasp with the non-cutting hand.
- Use a sliding/shearing cutting motion as you push the blade away from you and cut under the hand holding the stems.
- AVOID using a whacking motion as this will result in shaking the seed and losing quite a bit to the ground (or water).
- Keep the trashcan constantly next to you so you can put it directly into the can. If possible, position the can to receive materials in the direction you cut to create a smooth transition less motion., which will allow for less seed to be lost. Having the can below the area you are cutting from catches the seed that maybe shaken loose from the cutting motion.





**Note:** Grass hooks which are commonly found in rural areas with farm and feed stores are becoming scarce in the eastern U.S. Another highly efficient alternative was a sharpened machete which is more readily available from outdoor equipment catalog companies.

### **Keep materials dry**

Spartina seed heads are found above the water level. When collecting material continue to keep them that way and keep them as dry as possible. Large amounts of wet bio-mass will only make after harvest processing more difficult.

### **Moving the Collected Materials:**



If you have multiple collectors or teams collecting then you will start to gather a lot of bio-mass quickly. Bio-mass is a term referring to the stems, leaves and seed heads combined. Our team found that the use of king size bed sheets worked very well for holding 3 to 4 full trashcans of bio-mass per sheet. The sheets are strong and unlike plastic tarps, the sheets breathe and allow for oxygen to move through the bio-mass.

### **Critical Management of Harvested Materials**

#### **Plan ahead**

When you harvest materials it will contain seed heads, leaves and stems. The “green” parts of the plant will continue to respire after you cut them. When you start making large piles of bio-mass, the respiratory heat output will cause the pile to heat up and if left unmanaged will actually “cook” the seed embryo’s and decrease seed viability.



### **After Harvest Drying and Ripening:**

Look at your material closely. There will be a slight greenish hue to the rachis along the stem where the seed attaches to the stem. You will be allowing for this material to dry long enough to allow most of the rachis to “brown up”. Just as seed heads were in varying stages of ripeness within the stand, so seed ripeness on the heads will vary as well. This will result in some seed falling off the stem ahead of other seed. That’s OK.

It is very important to:

- Keep piles shallow enough to not build up heat.
- Keep harvested materials out of the sun as soon as possible.
- Avoid storing materials in closed areas like vans, trailers etc.
- Get materials out of the sheets and spread out in a building for after ripening of the seed.
- Barns, equipment sheds, and large warehouse type structures that provide shade and allow air movement are ideal.
- Materials should be kept slightly moist so that the seed does not completely dry out while after ripening processes are active.
- Once a day use a hose with a spray nozzle and mist the piles of materials.
- Each day, put your hand to the bottom of the pile. If it feels warm flip the pile over with pitch forks.
- When flipping pile over if you notice a lot of seed falling off, sweep it up immediately and store it in water.
- The time required for after ripening will vary with local weather conditions. For our efforts in the mid-Atlantic, collections at during the last two weeks of September completed after ripening within 10 days.

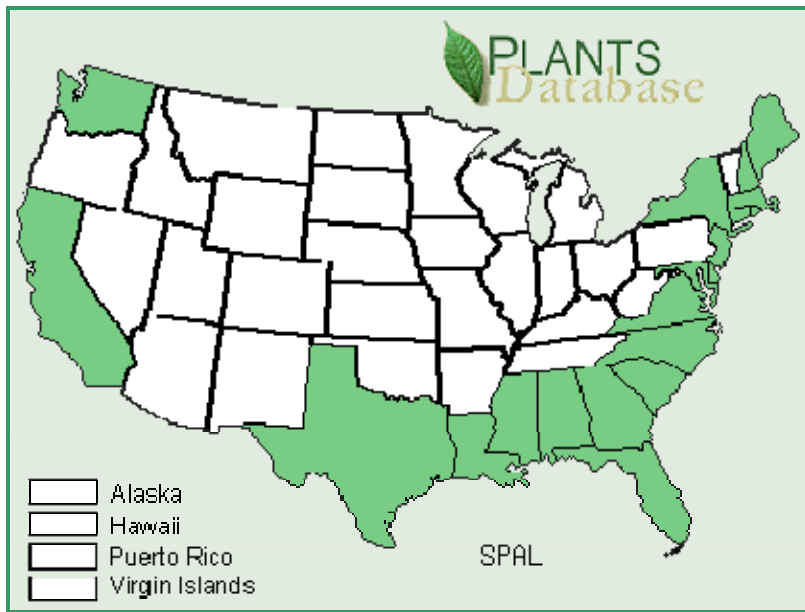
### Seed Cleaning and Storage:

For detailed information on seed cleaning equipment, refer to USDA publication: TN-NJPMC-05-02. This publication is posted on our website at:

<http://plant-materials.nrcs.usda.gov/njpmc/> Just click on publications.

### Plant Distribution:

The following Plant Distribution Map is a product of the National Plants Database which is on the web at: [http://plants.usda.gov/cgi\\_bin/topics.cgi?earl=noxious.cgi](http://plants.usda.gov/cgi_bin/topics.cgi?earl=noxious.cgi)



Plant Distribution by State

*Spartina alterniflora* Loisel.

SPAL

See county distributions for the following states by clicking on them below or on the map.

CA	CT	FL*
GA	ME	MA
NH	NC	RI
SC	VA	

\* Offsite source.

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Alabama	Florida	Maryland	New Jersey	South Carolina
California	Georgia	Massachusetts	New York	Texas
Connecticut	Louisiana	Mississippi	North Carolina	Virginia
Delaware	Maine	New Hampshire	Rhode Island	Washington

**\*\*Invasive Disclaimer: Smooth cordgrass is considered invasive and highly undesirable on the West Coast of the U.S. This map nor any publications of the USDA NRCS supports or encourages the use of this plant in the Western U.S.**

### Acknowledgements:

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