Smooth Cordgrass

Spartina alterniflora

Propagation Guide

Scientific Name
Spartina alterniflora Loisel.

Common Name
Smooth Cordgrass

Group
Monocotyledon

Family
Poaceae (Gramineae)

Wetland Indicator Category
OBL

Growth Form
Rhizomatous perennial grass with robust aerial stems, forming dense colonies

Habitat
Saline or brackish marshes

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Spartina alterniflora

Spartina alterniflora inflorescence
PHOTO CPR

Spartina alterniflora in a saltwater marsh
PHOTO CPR

1 Seed Collection

Observe inflorescence development of *Spartina alterniflora* in the field. In coastal Mississippi and along the northern Gulf of Mexico this generally starts in late September. Spikelets usually mature and are ready for collecting in late November (Eleuterius and Caldwell 1984); however, this may vary from year to year depending on weather conditions.

The inflorescence of *Spartina alterniflora* is a panicle (a branched cluster of flowers) composed of appressed and overlapping spikes. Each spike consists of many (10-40) smaller spikelets. The mature spikelets are light brown and may appear slightly dried out. Inside some of the mature spikelets is a small brownish dry fruit (caryopsis) that contains a single seed.

Spikelets are best harvested by stripping them from the inflorescence by hand and collecting them into plastic bags. The spikelets must be collected within two to three weeks of maturation (no later than end of December). Mature spikelets will naturally fall off the inflorescence, especially during periods of high wind associated with cold fronts. Also try to avoid areas that are heavily infected with the ergot fungus (*Claviceps purpurea*) or where birds have eaten the seeds. Not all inflorescences mature at the same time. Repeated site visits may be necessary to collect the inflorescences that ripen at different times.

2 Seed Preparation

The *Spartina alterniflora* spikelets (which contain the seeds) must be processed as quickly as possible after collection, preferably on the same day. *Spartina alterniflora* seeds are very susceptible to drying out. If the moisture content of the seed falls below 40%, then the seeds will not germinate (Cohn and Chappell 2007).

The collected spikelets are cleaned of debris (insects, plant material, fungal-infected seeds) by sieving the seeds through a U.S.A. Standard Test Sieve No.10 (2 mm mesh size) to remove the larger pieces of undesirable material. Then small amounts of the sieved spikelets are spread out on white paper and the remaining undesirable material is removed with forceps (tweezers). This is a very time-consuming process, but essential to the successful storage conditions of the seeds. There are an estimated 230,000 seeds per pound dry weight (CPR unpublished data).

3 Seed Storage

The cleaned spikelets must immediately be stored cold and wet (tap water) in sealed plastic bags in a refrigerator at 39ºF (4ºC). The seeds require at least two to three months of after-ripening in cold, wet storage (stratification) to break dormancy (Garbisch and McIninch 1992). Seeds remain viable for about one year (Garbisch and McIninch 1992).

Seeds stored dry or at room temperature will not ripen and will probably not be viable. Seeds will need to be collected annually as seeds do not remain viable beyond about 15 months (Biber and Caldwell 2008). A tetrazolium red (TZ) dye test can be performed to determine seed viability (see Appendix A).

4 Seed Germination

The cold and wet stratified spikelets are emptied into a U.S.A. Standard Test Sieve No.18 (1 mm mesh size) and rinsed several times under tap water. This step is best performed in a fume hood or outdoors to reduce odors.

The rinsed seeds are placed in 8" (20 cm) diameter 1500 mL glass culture dishes (Carolina Biological Supply Company -741006) and filled with tap water. The water level in the bowl should be checked periodically to make sure seeds do not dry out. At least 0.5" (1.3 cm) water is recommended.

These bowls are placed under a bank of four to six fluorescent lights (60-100 W, <100 µmol irradiance) until germination occurs. Germination occurs over a range of temperatures from 77-95ºF (25-35ºC). Biber and Caldwell (2008) reported that germination can also occur in the absence of light after about four to five months of stratification.

Seeds will germinate readily in about 7 to 10 days. Seedlings should be transplanted at this stage. Stalter and Batson (1973) report that rates of seed germination vary from year to year, but are generally very low (<10%).

An alternative germination method is directly sowing the seeds onto moist sand or peat. Depending on the seed viability (based on the TZ test), the seeding rate may be higher or lower from year to year. A seeding rate that will yield about one seedling per square inch (6.5 cm²) is recommended (McIninch and Garbisch 2003).

5 Seedling Propagation

When the young seedlings are about 0.5" (1.3 cm) in height they can be removed from the glass culture dishes and transplanted into hydrated peat pellets (Jiffy Products -Jiffy 7) using forceps. Planted seedlings are then placed in 20 x 10" (51 x 25 cm) plastic bedding trays (Landmark Plastic -L1020NCR(N) no holes). These hold 50 peat pellets and should be sub-irrigated with tap water on a daily basis.

Trays with seedlings are best kept indoors in a temperature controlled room at 81-86ºF (27-30ºC) under fluorescent grow lights (60-100 W, 60-100 µ mol irradiance) on a 18:6 hour (light:dark) photoperiod. It is important to keep the young seedlings in a humid environment for one to two weeks after planting. To reduce desiccation use clear plastic propagation domes (Curtis Wagner -CW221) over the trays. Caution, heat can build up under these domes and kill the seedlings. Temperature should be kept below 95ºF (35ºC).

The trays with seedlings are then placed in a greenhouse and grown for three to four months until they reach a size of at least 6" (15 cm) tall. These larger plants can then be planted into 4 or 6" (10 or 15 cm) diameter containers with an organic soil mixture (2:1 topsoil:sand ratio), and kept sub-irrigated for a minimum of six months to form a well developed root mass (Appendix B). Plants are fertilized with a full strength (per manufacturer directions) water-soluble 20-20-20 general purpose fertilizer monthly, poured directly onto the soil. When the root mass is well developed these plants are ready to be transplanted to a restoration site or transplanted into larger containers for further growth (Appendix C).

Alternatively, seedlings can be planted directly into standard 72 well inserts (Dillen Products -D1206), which fit into the plastic bedding trays, in an organic soil mixture (2:1 topsoil:sand ratio). The advantage is that plants grown in these 1.5" (4 cm) plugs will have a quick turnaround time to get root-bound in the nursery and can be easily transported to the restoration site. However, a disadvantage to these plugs is the plants and the root ball are smaller.

If the restoration site is at a high salinity location that exceeds 15 parts per thousand (ppt), the plants can be salt hardened by gradually adding salt to the water over a period of about one month to result in a final concentration of 10 ppt.

6 Vegetative Propagation

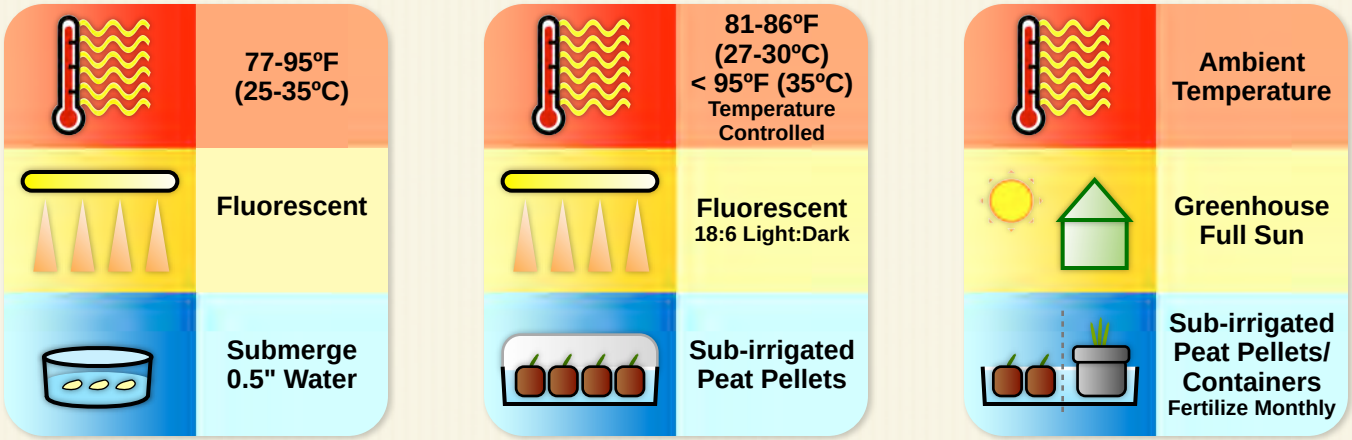
Spartina alterniflora can also be propagated vegetatively by cutting 12" (30 cm) square clumps that have been collected from the marsh into smaller units. These are transplanted into 6" (15 cm) diameter containers with an organic soil mixture (2:1 topsoil:sand ratio), and kept sub-irrigated with tap water. These plants should be ready to transplant in two to three months. However, this method is not encouraged as it damages existing marsh habitat.

Spartina alterniflora spikelets PHOTO CPR

Spartina alterniflora inflorescences and spikelets PHOTO CPR

Spartina alterniflora Propagation Guide

Seedling and Plant Propagation Charts



Seed Germination 7-10 Days

Seedlings 1-2 Weeks

Seedlings 3-4 Months
Container Plants 6+ Months

Citations

Biber, P.D. and J.D. Caldwell. 2008. Seed germination and seedling survival of *Spartina alterniflora* Loisel. American Journal of Agricultural and Biological Sciences 3(3): 633-638.

Cohn, M.A. and J.H. Chappell. 2007. Recalcitrance and dormancy in smooth cordgrass seeds. Louisiana Agriculture 50(2): 25.

Eleuterius, L.N. and J.D. Caldwell. 1984. Flowering phenology of tidal marsh plants in Mississippi. Castanea 49: 172-179.

Garbisch, E.W. and S.M. McIninch. 1992. Seed information for wetland plant species of the Northeast United States. Restoration and Management Notes 10(1): 85-86.

McIninch, S.M. and E.W. Garbisch. 2003. Propagation of Wetland Plants: Herbaceous Plants, Shrubs and Trees. Environmental Concern, Inc. St. Michaels, MD.

Stalter, R. and W.T. Batson. 1973. Seed viability in salt mash taxa, Georgetown County, South Carolina. Castanea 38(1): 109-110.

CPR Propagation Guide Team

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Further Information

USDA PLANTS Profile
http://plants.usda.gov/java/profile?symbol=SPAL

Center for Plant Restoration and Coastal Plant Research
http://sites.google.com/site/coastalplantrestoration/home

Field Guide and Images of Coastal Mississippi Wetland Plant Species
http://jcho.masgc.org/

NRCS Jamie L. Whitten Plant Materials Center
Plant Guide for Establishing Coastal Vegetation on the Mississippi Gulf Coast
http://www.plant-materials.nrcs.usda.gov/pubs/mspmspu7271.pdf

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