# STEAMing with *Spartina* Seeds

This STEAM-based activity is designed specifically for the From Seeds to Shoreline® program

### Educator Activity Plan

*Original activity by E.V. Bell, Marine Education Specialist, with adaptations from the National Oceanic and Atmospheric Administration's Activity: Make Seed Paper (2023)*

## About This Activity

**Suggested Grade Levels:** K–6

## South Carolina Education Standards

**Science Standards:** 1.E.4; 2.L.5; 3.E.4; 4.E.2; 5.E.3

**Math Standards:** K.NS.2; K.NS.3; K.NS.4; 1.NSBT.1; 1.NSBT.3; 2.MDA.10; 3.NSF.1; 3.MDA.3; 6.NS.9; 6.RP.3

## Ocean Literacy Essential Principle

#1: The Earth has one big ocean with many features.

#5: The ocean supports a great diversity of life and ecosystems.

## Focus Questions

- Why is the salt marsh important to our lives and wildlife?
- What role(s) does salt marsh grass (*Spartina alterniflora*) serve in the salt marsh habitat?

- How does *Spartina alterniflora* reproduce?
- How can we be good stewards of the salt marsh?

# Objectives

- Describe the role that *Spartina alterniflora* serves in the salt marsh ecosystem.
- Connect the salt marsh ecosystem with human and wildlife well-being.
- Examine the percentage of germinated vs. ungerminated seeds from harvested *Spartina alterniflora* stalks.
- Engage in stewardship and recycling efforts to promote the salt marsh.

# Materials

## Part 1: Calculating Percentage of Germinated *Spartina* Seeds

- *Spartina* seeds (germinated and ungerminated). The germinated seeds can already be planted.
- From Seeds to Shoreline Teacher Data Sheet (seed collection data).
- Calculator.
- *Spartina* Seed Calculation Worksheet (see pages 6–7).

# Part 2: Creating *Spartina* Seed Paper

- Recycled/used (recommended) or new notebook, printer paper, or newsprint.
- One large bowl.
- Access to water.
- Mesh, screen, or splatter guard.
- *Spartina alterniflora* seeds (those that have not germinated).
- Optional: an old blender (the blender may not be safe for food after using it to make paper).
- Optional: dried flowers, biodegradable glitter, food coloring, fruit and vegetable dyes.

# Background

This lesson plan is designed to be used as part of the From Seeds to Shoreline® (S2S) youth salt

marsh restoration program, where students and teachers cultivate *Spartina alterniflora* (smooth cord grass) at their schools and then transplant young seedlings to designated areas of salt marsh along the coast. *Spartina alterniflora* provides one of the key foundational components of the salt marsh–stabilizing sediment, trapping and filtering pollutants, and providing habitat for numerous species such as the fiddler crab, periwinkle snail, and oyster.

As part of the restoration process, hundreds—even thousands—of seeds are harvested; however, only a small percentage of collected seeds will germinate. This phenomenon is not particular to the S2S program, but, in fact, occurs in nature. Besides seed dispersal, *Spartina alterniflora* spreads through rhizomes (and underground stem that spreads horizontally and produces new shoots) (SCDNR 2016).

In nature, there is a wide variability with seed germination ranging from 3.5% up to 80% due to environmental conditions, stressors, and other factors (USDA 2022). In a controlled environment with the S2S program, a low germination rate is the typical trend with large amounts of ungerminated seeds leftover after the project has completed. These seeds can be returned to the salt marsh or recycled/used for educational purposes.

This activity is divided into two sections. Part 1 focuses on the calculation of germinated vs. ungerminated seeds and Part 2 is designed as a stewardship project to promote the importance of *Spartina* and use the remaining seeds in a meaningful way.

# Activity Directions

## Part I. Calculating Percentage of Germinated *Spartina* Seeds

**Step 1—Total Seed Count:** As part of the From Seeds to Shoreline program, participating schools capture the estimated number of seeds collected (per location) on the Teacher Data Sheet (provided at the training).

This number is calculated by:

- Removing the seeds from two stalks.
- Counting the seeds and then taking the average.
- Multiplying the average number of seeds by the number of stalks from which seeds are collected.

*Example:*

*a) Stalk 1 (56 seeds) + Stalk 2 (78 seeds) = 134*

*b) Average: 134/2 = 67*

*c) Number of stalks from which seeds are harvested = 59*

*d) Estimated number of seeds collected = 67 x 59 = 3,953*

*Note: This calculation is for one location. To get the total number of seeds from multiple locations, you would repeat steps a) – d) and then add the totals.*

**Step 2—Calculation of Germinated Seeds:** It's recommended that this step take place after the germinated seeds are planted in pots. For ease, be consistent with the number of seeds planted/ pot and it will be a simple multiplication problem:

*Example: 4 seeds planted per pot and there are 180 pots = 720 germinated seeds.*

**Step 3—Calculating Percentage of Germinated Seeds:** To calculate the percentage of germinated seeds:

- Divide the germinated seed total by the total number of seeds collected.
- Multiply this number by 100 to calculate the percent.

*Example (using the previous example totals):*

*a) 720 (germinated)/3,953(total seeds collected) = 0.18*

*b) 100 x 0.18 = 18%*

The percent that is calculated is the percent of seeds that germinated from the ones collected.

## Part II. Creating *Spartina* Seed Paper

- Tear up your paper into small pieces. You can use your hands, scissors, box cutter, etc.
- After shredding the paper, soak your paper in a bowl of water for a minimum of a few hours to soften it (if you can soak overnight, that is preferable).
- Once the paper has softened, use your hands to mash into a pulp (and until it doesn't resemble paper).
- At this point, you can either use a blender to continue the process of turning the paper into pulp or you can continue to work it with your hands. If you use a blender, add a little water

to the pulp before blending. *Also, it is strongly recommended that you do not use the blender for food prep after this process.*

- After you achieve a pulp consistency, drain excess water from the bowl or blender.
- Add your *Spartina* seeds to the pulp and fold in gently. (Optional: add food coloring, natural "dyes", etc.)
- Next, while standing over a sink or bowl, spread the paper pulp over your screen in a thin layer (you may need to do these next steps a few times).
- With your hands (or using a rolling pin or hard, flat object), press the pulp into a flat sheet and squeeze out as much water as you.
- Allow the paper to dry. Once it is dry you can lift it off the screen.
- *While the seeds will not germinate, use the paper for nametags, the front of journals, and/or as a promotional tool to support salt marshes!*

## Resources

Materne, M., T. Bush, M. Houck, and S. Snell. 2022. *Plant Guide for smooth cordgrass* (Spartina alterniflora). USDA Natural Resources Conservation Service, Louisiana State Office. Baton Rouge, LA.

National Oceanic and Atmospheric Administration. Make Seed Paper.

Sanger, D. and C. Parker. 2016. *Guide to the Salt Marshes and Tidal Creeks of the Southeastern United States*. South Carolina Department of Natural Resources. Charleston, S.C.

# *Spartina* Seed Calculation Worksheet (Example)

## Part 1

| Location | Seeds (Stalk 1) | Seeds (Stalk 2) | Average Seeds (Both Stalks) | Number of Stalks Where Seeds were Collected | Estimated Total of Seeds Collected |
|---|---|---|---|---|---|
| *Charleston Harbor* | *56* | *78* | *134/2 = 67* | *59* | *3,953* |
| *James Island Creek* | *89* | *43* | *132/2 = 66* | *10* | *660* |
| *Shem Creek* | *55* | *45* | *100/2 = 50* | *25* | *1,250* |
| | | | | **ESTIMATED TOTAL** | ***5,863*** |

Estimated Total =

## Part 2

| Number of Germinated Seeds per Pot | Number of Pots | Number of Germinated Seeds | Percent of Germinated Seeds |
|---|---|---|---|
| *4* | *100* | *400* | *400/5863 X 100 =* **6.8%** |

# *Spartina* Seed Calculation Worksheet

Part 1

| Location | Seeds (Stalk 1) | Seeds (Stalk 2) | Average Seeds (Both Stalks) | Number of Stalks Where Seeds were Collected | Estimated Total of Seeds Collected |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Estimated Total =

Part 2

| Number of Germinated Seeds per Pot | Number of Pots | Number of Germinated Seeds | Percent of Germinated Seeds |
|---|---|---|---|
| | | | |