Project Unit: Planting Dune Grasses
Marine Academy of Science and Technology, Monmouth County Vocational School District

Teachers: Clare Ng and Liza Baskin

Grade Level: High School

Target Content Areas: Ecosystems: Interactions, Energy and Dynamics

NJ Student Learning Standards in Science (NJ SLSS) and Next Generation Science Standards (NGSS): As students engage in the lessons and activities in this unit, they will be developing proficiencies in the following standards (NJSLSS) and performance expectations (NGSS):
• **HS-LS2-7:** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Background for Teachers: The Marine Academy of Science and Technology (MAST) is located in the Fort Hancock Historic Area at the tip of Sandy Hook, New Jersey. Sandy Hook is a barrier spit, approximately 6 miles in length and varying from 0.1 - 1.0 miles wide, and is located at the north end of the New Jersey coastline. A spit or sandspit is a deposition bar or beach landform off of coasts or lake shores. It develops in places where re-entrance of water occurs, such as at a cove's headlands, by the process of longshore drift by longshore currents (Wikipedia).

Student Relevance: Many students were directly affected by the aftermath of superstorm Sandy. Recently, they have observed increased flooding to their transportation roads leading to the school, local trees/forest die-out due to salt invasion, and increased flooding on school grounds during rain events.
Problem(s) identified by students: The students determined that the erosion of coastal dunes during storm events was contributing to the increased flooding on their school grounds and in the community.

Student Actions: Students developed a plan to increase dune vegetation in the coastal area by planting dune grasses that had been lost due to superstorm Sandy. They partnered with the National Park Service and referenced the NJ Sea Grant Consortium’s Dune Manual for their plan.

Tools, Programs or Resources
● Emery-method topographic relief beach profiling sticks
● Dune-grass planting tools
● GPS equipment
● Dune Manual by New Jersey Sea Grant Consortium

Organizations or Partners:
● Gateway National Recreation Area – Fort Hancock, National Park Service

Lesson Plans, Rubrics or Activities:
● Dune Grass Project – Lesson Plan
● Dunes and Dune Grasses: Lesson 1
● Why Are Dune Important: Lesson 2
● Dune Grass PowerPoint
● Teacher Interviews

Learning Objectives: Students will be able to (SWBAT):

1) Understand the impacts of flooding on families, the school and the community.
   Learning focused on the increased amount of seasonal flooding that is experienced on school grounds due to climate change and human-induced activities. Students experienced this first-hand during superstorm Sandy (October, 2012) since many of them live in the surrounding coastal communities and were displaced during the storm. This school was the only high school in New Jersey to be displaced for the entire school year and classes were unable to return until the following autumn of 2013. Students shared their personal experiences with major flooding events and used personal insight to relate to this project. Learning was inquiry-based and assessed through group discussion based on evidence and individual student work.

2) Recognize the importance of sand dunes.
   Students were introduced to the importance of natural mitigation and flood control methods through native sand dunes that prevent coastal flooding and increase coastal resiliency. Students learned about the interconnectedness of nature and human communities, and how to use these ideas for solutions to the coastal environmental problems that are being faced. Learning was assessed through development of the class project to perform a dune grass planting event on the school’s local dunes. Students focused on the enduring understanding that we are all in this together and that a school community can work together to become more sustainable.
3) **Describe the importance of beach grass in a coastal dune community.**

Students identified the role that native plants play in dune building, erosion control and preventative flooding. **Learning was assessed through placed-based learning as students worked with the National Park Service and other community members to select a site and plant dune grass, in order to give students a real-life, tangible, observable and meaningful experience.** The enduring understanding that students learned was that people are all interdependent on each other and on natural systems to help ensure coastal resiliency.

**Related Projects – Student Interviews:**
- Beach Profiling to Monitor Dune Growth
- Creating a Clam Depuration Plant
- Growth and Mortality Rates of Juvenile Spiny Dogfish
- Mercury Concentrations in Local Wildlife
- Microplastics in Our Sand and Water
- Piping Plover Project
- Sandy Hook Herbarium
- Wave Powered Induction Device

**EFS Actions:** Ecological Systems and Climate Change

**Enduring Understandings:**
- We are all in this together
- Create change at the source not the symptom
- We are all responsible

**Eco-Schools USA in New Jersey:** Biodiversity and Watersheds, Oceans and Wetlands