



## **Project Unit: Protecting a Pond Ecosystem by Installing a Perimeter Garden**

Egg Harbor Township High School, Egg Harbor Township School District



**Teacher:** Christa Delaney

**Grade Level:** High School

**Target Content Areas:** Earth and Human Activity and Engineering Design

**NJ Student Learning Standards in Science (NJSLS) and Next Generation Science Standards (NGSS):** As students engage in the lessons and activities in this project unit, they will be developing proficiencies in the following standards (NJSLS) and performance expectations (NGSS):

- **HS-ESS3-4:** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
- **HS-ETS1-1:** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants
- **HS-ETS1-2:** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering
- **HS-ETS1-3:** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability and aesthetics, as well as possible social, cultural and environmental impacts.

**Student Relevance:** Areas within this coastal community in Atlantic County are affected by flooding, especially during weather events like the 2016 Winter Storm Jonas.

**Problem(s) Identified by Students:** The school property is often impacted by flooding. Students noticed that cold water from rainwater runoff, would run into the pond, which is part of the school's garden. By monitoring dissolved oxygen, ammonia, nitrogen and pH levels in the pond, the students found a build-up of

nutrients at certain times. Through their investigation they determined that rainwater runoff from the road and field near the pond were contributing to these increased nutrient levels. Students also studied coastline changes and compared coastal erosion to the shoreline changes they noticed in the pond. The students wanted to protect the pond ecosystem because it was home to the bull frogs that they loved to watch.

**Student Actions:** Students identified and drew a map of the areas on school property that experienced flooding during bad weather events. Students then decided to install plants around the edge of the pond, either in the garden or on the perimeter of the garden. Plants were selected for their ability to absorb water and provide native habitat; seeds were planted. As the plants grow and mature in the seasons to come, the students will continue to test the pond's water quality and monitor the frog inhabitants.

**Tools, Programs or Resources:**

- [Rising Tide](#) curriculum from the New Jersey State Museum
- [Surging Seas Risk Finder](#)
- [Jersey-Friendly Yards](#)
- Thermometers
- Water Testing Kits
- Data Tables
- [Spark SLS](#) (Optional)

**Organizations or Partners:**

- [Wetlands Institute](#) – Field Trip

**Lesson Plans, Rubrics or Activities:**

- [Lesson 1: Mapping Our School Grounds](#)
- [Lesson 2: Rainfall and Climate](#)
- [Lesson 3: Our Changing Coastline](#)
- [Lesson 4: Building a Sustainable Community Bordering a Marsh Region](#) (Optional)
- [Lesson 5: Mapping the Garden and Pond](#)
- [Lesson 6: Water Testing](#)
- [Precipitation Patterns Worksheet](#)
- [Rising Tide Climate Change and New Jersey Curriculum Materials](#)
- [Building a Sustainable Community - Rubric](#)
- [PBL Scenarios](#)

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

**1) Identify areas on the school grounds that could be affected by flooding**

Students determined places on the school grounds that have impervious surfaces and recorded any noted flooding at these sites during times of heavy rainfall. The learning was assessed via the graphs the students drew as well as their determination of how the school grounds could better deal with flooding. **The enduring understanding for students is that people need to read the feedback and plan better for the future. The learning was both experiential and place-based.**

**2) Research precipitation and flooding trends in New Jersey.**

Students observed changes in precipitation in New Jersey to determine if the climate is changing and how New Jersey would be affected. The learning was assessed via worksheet. **The enduring understanding for students is that we need to look into the future. The learning was inquiry-based.**

**3) Compare New Jersey Coastlines from the past with future projections, as it relates to habitat.**

Students observed New Jersey's changing coastlines and determine how animals living in specific ecosystems will be affected by climate change in the future. Their learning was assessed by the packet that the students completed. **The enduring understanding for students is that we need to look into the future. The learning was inquiry-based.**

**4) Determine how runoff (cold rain water) can be prevented from infiltrating a local pond system.**

Students tested water from the pond in the garden to determine if/how installing plants around the edge of the garden will mitigate rainwater runoff. Students will retest the pond to continually monitor the water to gauge their success in regulating the pond's water quality. **Student learning will be assessed by the completion of the data sheet and proper use of lab materials. The learning will be experiential and the enduring understanding for students is to read the feedback.**

**5) Determine if rainwater runoff affect a freshwater ecosystem differently than a saltwater ecosystem.**

Students visited the [Wetlands Institute](#) to compare flooding hazards in their freshwater ecosystem with flooding in a saltwater ecosystem. This field trip experience included a walk through various habitats and discussions about these transitional ecosystems:

- 1) Area of deciduous pine forest;
- 2) Freshwater wetlands (as evidenced by the plants);
- 3) Secondary dunes; and
- 4) Primary dunes.

While on the field trip students also investigated invertebrates and recorded wind speed, air temp, water temp, salinity and turbidity. Finally, students learned the importance of dunes by participating in this "Build a Dune" activity:

- 1) Students split into 3 groups and each group created a dune.
- 2) Each group then creates a town behind, on top of, or in front of, their dune.
- 3) A hurricane is simulated with buckets of water and students assessed the damage that was done to their towns.

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

**Enduring Understandings:**

- We Are All in This Together
- Create Change at the Source Not the Symptom
- Think Far into the Future
- Read the Feedback

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