EIA: Wetland Wonders

Grades: K - 3

Time: 50 minutes

Engineering Challenge: Students will plan, build, and test a tool that removes various pollutants from a model wetland.

Rationale and Context:

Living and non-living things contribute to the complexity and dynamic systems of a wetland habitat. Students will consider the value of a wetland habitat, its unique properties, the existence of unique animals and plants, and how scientists are working to protect these vital environments. Students will use the Engineering Design Process (EDP) to define and construct a solution to a presented problem facing the Lake Champlain Basin. The EDP is a series of steps that engineers employ to develop solutions to a given problem. It is a cyclical process that can be applied to any problem requiring a technological solution. Many of the environmental challenges facing the Lake Champlain Basin benefit from engineered technologies, such as management of invasive species and stream monitoring. Students will come to see that the EDP can be used to solve problems in a diversity of contexts and themselves as possessing the ability to design and improve technologies.

Teacher Background Information:

Marshes, bogs and swamps (wetlands) are generally characterized by slow or still water bordered by forest, open water or meadows. Conditions exist in a wetland that allow absorption of floodwaters, improvement of water quality by gradual decomposition and filtering of pollutants, and nutrient-rich soil to support aquatic plants upon which a broad diversity of animals depend for reproduction, protection, food, nesting and development of young. The importance of the wetland habitat has become more widespread as a vital environment that can support water quality for all.

Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. The Engineering Design Process (EDP) is a set of steps engineers follow to solve problems. Steps include: Define, Plan, Build, Evaluate, and Revise. The process is designed to be cyclical with students repeating the steps as many times as necessary to refine their ideas. Fundamental to this process is the ability of students to solve problems creatively and work together. Typically solutions involve designing a product that meets certain criteria and possible solutions to a problem are limited by available materials and resources (constraints). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success. Different solutions need to be tested in order to determine which of them best solves the problem.

Next Generation Science Standards

Disciplinary Core Idea	K-2	3
ESS3.A	Living things need water, air and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do.	
ESS3.C	Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things	Societal activities have had major effects on the land, ocean, and atmosphere, and even outer space. Societal activities can also help protect Earth's resources and environments
LS1. B	Parents and offspring often engage in behaviors that help the offspring survive.	Reproduction is essential to every kind of organism. Organisms have unique and diverse life cycles.
LS2.A	Plants depend on water and light to grow, and also depend on animals for pollination or to move their seeds around.	The food of almost any animal can be traced back to plants. Organisms are related to food webs in which some animals eat plants for food and others eat the animals that eat the plants, while decomposers restore some of the material back to the soil.
LS4.C		Particular organisms can survive only in particular environments.
LS4.D	A range of different organisms live in different places.	Populations of organisms live in a variety of habitats. Changes in those habitats affect the organisms living there.
Science and Engineering Practices	Define a simple problem. Generate and compare. Plan and carry out fair tests in which variables are controlled.	
Cross Cutting Concepts	Patterns Cause and Effect Systems and System Models Stability and Change	

Learning/Behavioral Objectives:

1. Learn about the important role a wetland plays in keeping an ecosystem balanced and healthy.
2. Using a wetland model, determine which animals and plants live in a wetland.
3. Explore the regions of a wetland (shore, surface, bottom, open water and sky).
4. Define a problem facing the Lake Champlain Basin.
5. Use the EDP to collaboratively plan and build a solution, taking into account material/time constraints and criteria for success.
6. Through testing and group discussion, evaluate designs.
7. Revise solutions, considering how the structure of their original designs impacted their function.
8. Reflect on the EDP and its application in everyday life.

Vocabulary:

Buffer
Constraints
Criteria
Design
Engineering
Engineering Design Process
Filter
Habitat
Naturalist
Nursery
Observation
Pollutant
Prototype
Wetland

Focusing Questions:

1. What are the components of a wetland?
2. Why are wetlands important?
3. How can we protect wetlands?
4. How can we use the Engineering Design Process to solve problems in everyday life?
5. How does the availability of materials and resources impact the Engineering Design Process?
6. How should a piece of technology's end user influence its design?
7. How does the structure of a design affect its function?
8. How does one determine the success of a design?
9. What is the role of failure in the EDP?
10. How do groups of people work together to solve problems?