Living Shoreline Lesson

Critical thinking exercise

- Begin by asking your students questions that prompt your students to think about the impacts of climate change on Long Island communities and shorelines.
- Have your students “build a shoreline” that is beneficial for both wildlife and for protecting our shorelines & communities from storm surges, flooding, erosion and sea level rise.
- The students will put their “scientist and engineer hats” on, read each option, and pick as little or as many of the 8 options they feel will build a shoreline that makes Long Island resilient without harming the success of wildlife and natural ecosystem dynamics.
- The students will learn the difference between “hardened shorelines” and “living shorelines” through this activity.
- This can be done digitally or in person. Students will work together in groups or individually to choose options that they feel will build a shoreline that reaches the end goal. Then they can present their choices and explain why they chose them for the class.

Living Shoreline Lesson

Answer:

- The students should choose ribbed mussels, Spartina grass, American beachgrass, rocks, and sediment as their constructed shoreline. These components make up a “Living Shoreline “ and allow for wildlife to continue using the shoreline to find food, shelter and a place for nesting habitat, while also keeping Long Island resilient to strong storms, erosion and sea level rise. The roots of the grasses provide stable sediment while rocks are sturdy and natural to the environment. Clusters of ribbed mussels also keep sediment stable and while filter feeding, they clean polluted runoff before entering the bay. These living shorelines are also able to migrate inward as sea level rises and keep open access for the community. Natural shorelines can absorb flooding while hard structures cannot.
- Hard structures like seawalls, bulkheads, revetments and breakwaters further erosion problems in other areas as wave energy is not absorbed by the hardened structure but rather forcefully reflected off to a neighboring shoreline. Shoreline shape is changed by these structures as they interfere with natural sediment movement patterns, and they also block wildlife’s access to nesting and foraging habitat. Open access for people to get to the water is also reduced, and hard structures prevent the migration of natural salt marshes inward as sea levels rise. The hard structures also reduce the amount of flood absorption.

Ribbed Mussels

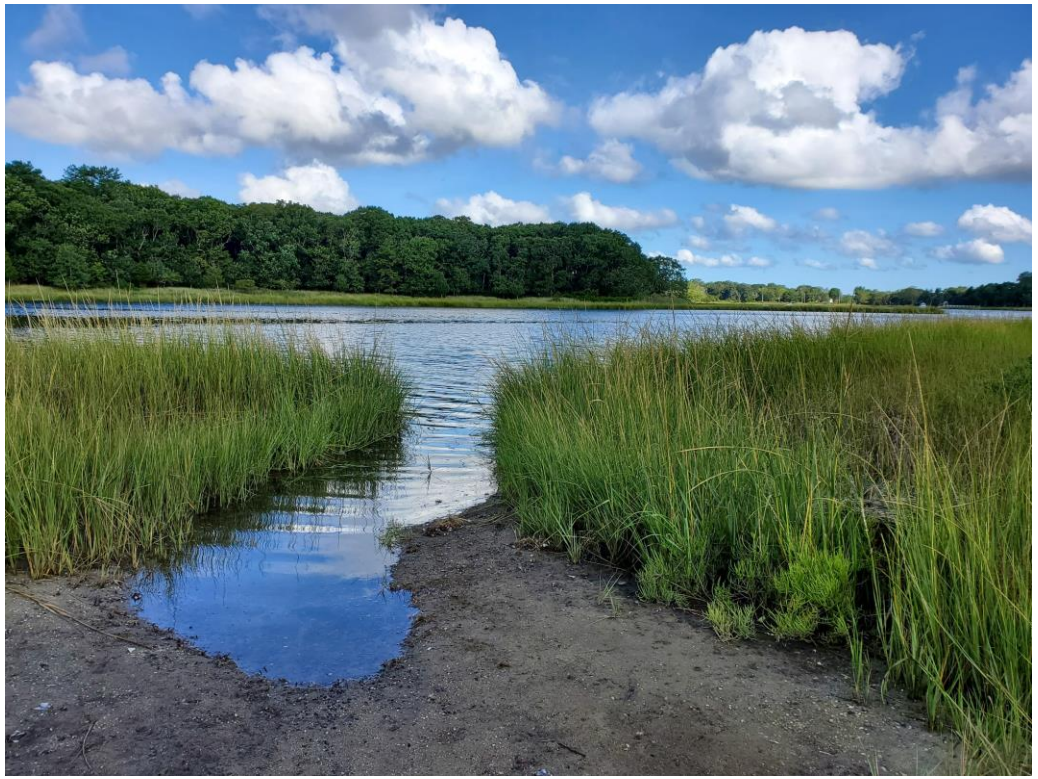
Photo Credit: Charleston Magazine

Ribbed mussels anchor themselves into the sand by creating strong thread-like strands (byssal threads) that attach to the roots of marsh grass, to rocks, and to each other.

These mussels are also filter feeders. During high tide, they open their shells slightly to draw in water - filtering out algae, particles, and pollutants from the land.

You'll find these mussels close to the bay's edge.

Spartina Grass



Located in lower marsh areas, Spartina grass is flooded twice daily by the tidal action of the estuary.

The roots of these plants help bind sediment or sand together, helping to keep the shoreline intact when waves and flooding come up to greet it.

Spartina grass is adapted to living in brackish (fresh and salt water mixed) water. This is water found in a bay or estuary.

Provides habitat for ribbed mussels, fiddler crabs, mud snails, shorebirds, horseshoe crabs, and the diamond back terrapin among other animals.

American Beachgrass

Photo Credit: Maryland Biodiversity Project

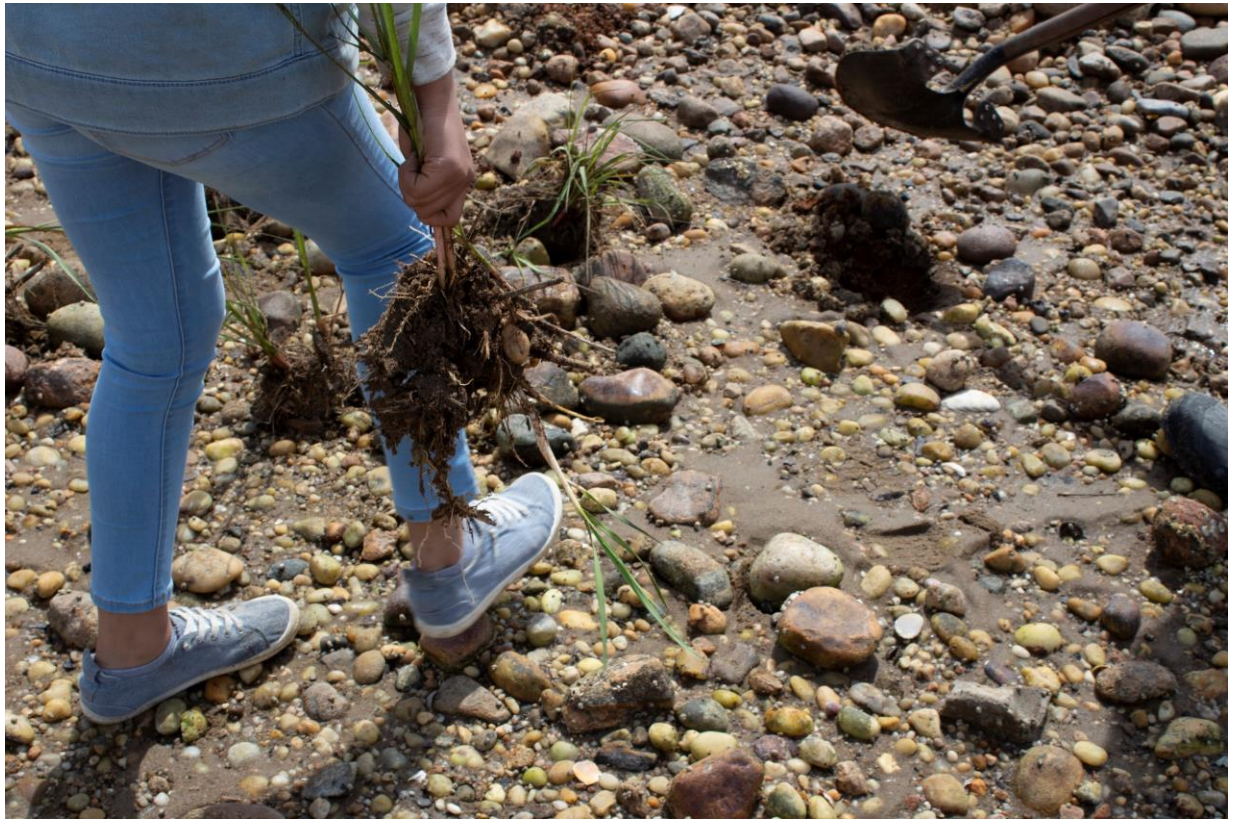
American Beachgrass sits further away from the water's edge. This grass harbors the dune habitat and is adapted to the dry, windy, and salty conditions.

Its root systems keep the dune together by holding the sand in place, ultimately forming the dune. It has the ability to continue to grow even as new sand blown by the wind is introduced to the area. As the grass captures sand that the winds blow across it, dunes are built. The grass responds to sand burial by sending up a new rhizome (underground stem). From the new rhizome, a new shoot forms.

Once the American Beachgrass starts to die off, the stability of the dune is threatened.

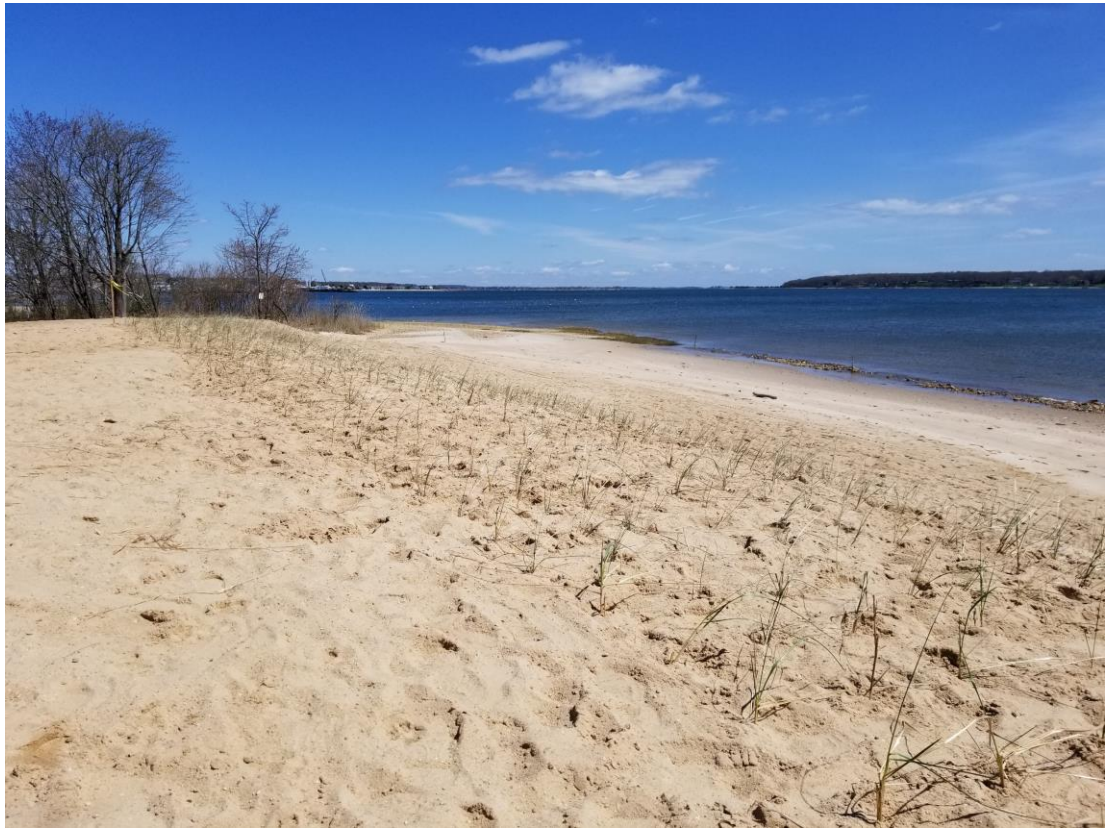
Provides habitat for numerous animals.

Rocks



A natural creation on Earth, rocks will help keep sediment in place. The rocks have a hard surface that can withstand waves and flooding without easily being changed. Over time, rocks do erode from long term wind and wave action.

Sediment/Sand



Sediment/sand makes up Long Island's shorelines. A long time ago, a massive glacier dropped sediment and other land debris, creating Long Island! Water and wind will change the shape of our land over time, eroding away and creating new land forms as sediment is carried by these forces and dropped in other areas.

Sand is made of different minerals that over time were broken down from rocks. As rocks weather from wind and wave energy, they deposit sand (minerals) on shore. Minerals include – mica (black – magnetic!), garnet (red – January birthstone!), feldspar (tan), quartz (clear).

Provides beach for people to enjoy and for animals to find habitat.

Sea walls/Bulkheads

Photo Credit: firecoastal.com

Sea walls and bulkheads are ‘hard structures’ that are built at the edge of the shoreline to prevent water from touching the land. The wave energy hits the structure and bounces off the structure to another location instead of being absorbed by the land. These structures also prevent animals from getting to the natural habitat.

Revetment

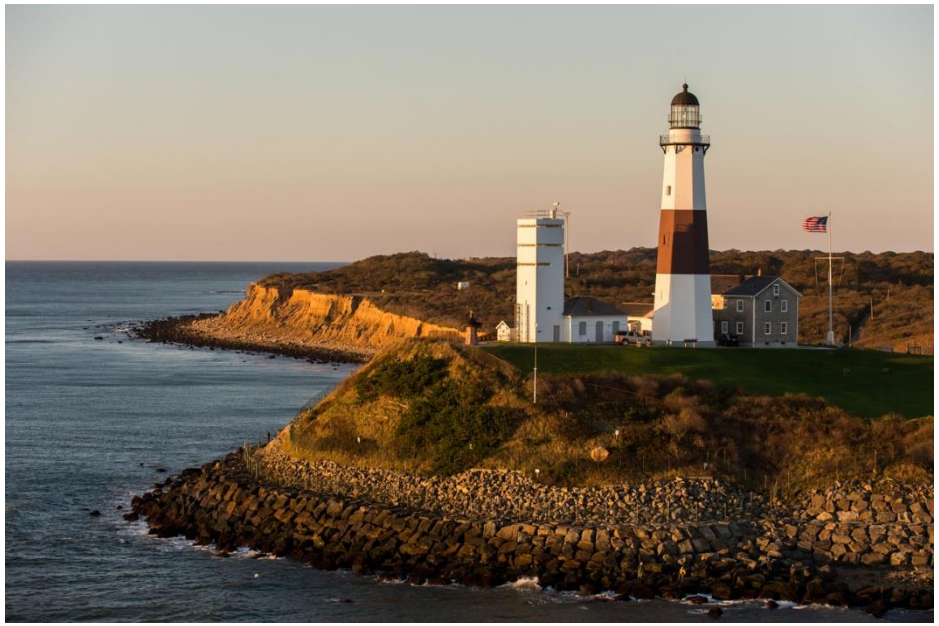


Photo Credit: Path Through History

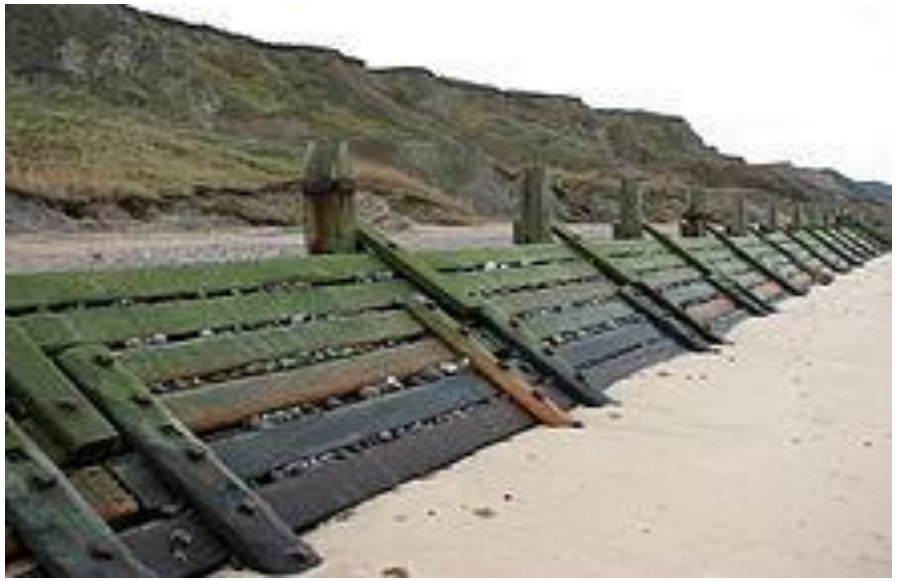


Photo Credit: wikiwand

A revetment has a distinct slope while a seawall is often almost vertical. The height of a revetment does not necessarily fill the total height difference between beach and mainland (a seawall often covers the total height difference).

A revetment protects against erosion caused by wave action, storm surge and currents.

The main difference in the function of a seawall and a revetment is that a seawall protects against erosion and flooding, whereas a revetment only protects against erosion.

Lose habitat and land where structure is placed.

Breakwater

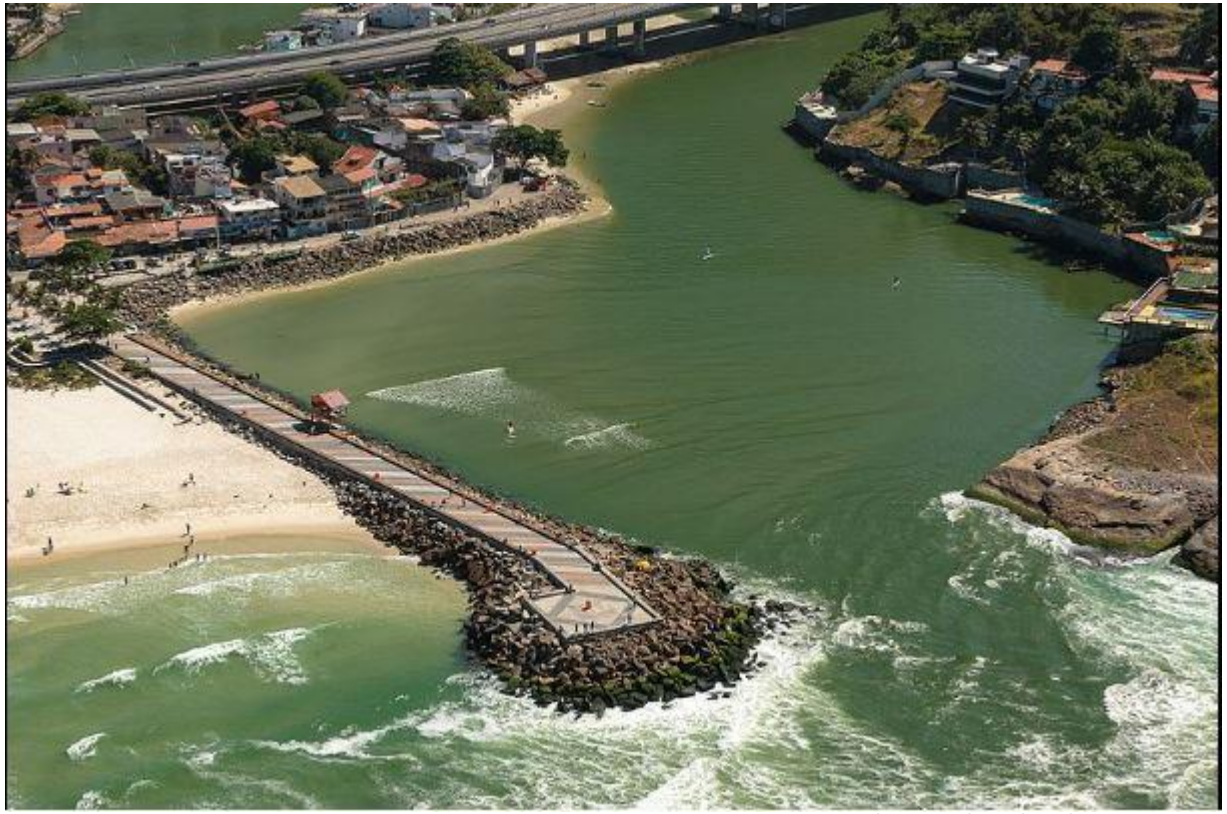


Photo Credit: wikipedia

Breakwaters reduce the intensity of wave action for a nearby shoreline for the purpose of reducing erosion.

The sand trapped behind breakwaters causes a shortage of sediment downdrift in the direction of dominant longshore transport of sediment, leading to additional shoreline retreat (e.g. beach and dune loss)

LIVING SHORELINES SUPPORT RESILIENT COMMUNITIES

Living shorelines use plants or other natural elements—sometimes in combination with harder shoreline structures—to stabilize estuarine coasts, bays, and tributaries.

One square mile of salt marsh stores the carbon equivalent of **76,000 gal of gas** annually.

Marshes trap sediments from tidal waters, allowing them to **grow in elevation** as sea level rises.

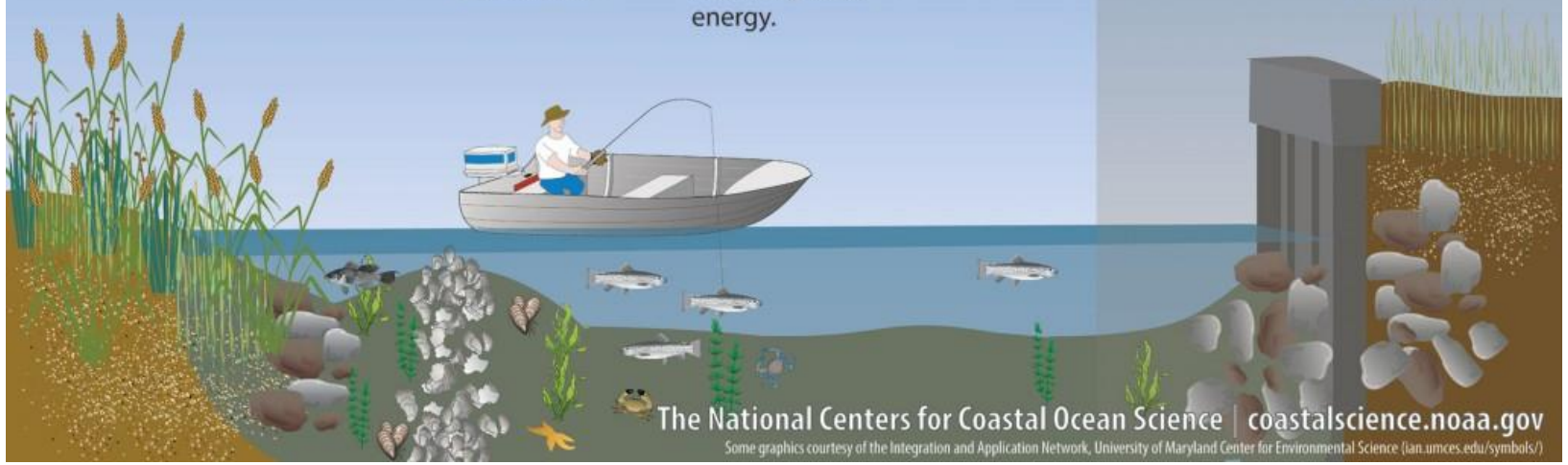
Living shorelines improve **water quality**, provide fisheries **habitat**, increase **biodiversity**, and promote **recreation**.

Marshes and oyster reefs act as natural **barriers** to waves. **15 ft** of marsh can **absorb 50%** of incoming wave energy.

Living shorelines are **more resilient** against storms than bulkheads.

33% of shorelines in the U.S. will be **hardened** by **2100**, decreasing fisheries habitat and biodiversity.

Hard shoreline structures like **bulkheads** prevent natural marsh migration and may create seaward **erosion**.



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Some graphics courtesy of the Integration and Application Network, University of Maryland Center for Environmental Science (ian.umces.edu/symbols/)