Monitoring the Living Shoreline

Author: Cara Bennett & Amy Sneed

Overview. Across three tasks, students will take on the role of a conservation biologist to observe, analyze data about, and assess the impact of the living shoreline on health of the marsh.

Learning Framework.

GA Standards of Excellence	Primary Learning Goal
S6E6 S7L4	• Use observation and analysis of longitudinal data to explain how the living shoreline along Lawrence Creek at Cannon's Point is impacting the health of the marsh.

Materials.
Pencil (1 per student)
Clipboard (1 per student)
Calculator (1 per team)
Investigation: Task One, Two, & Three (1 per student or team)
Colored pictures of Lawrence Creek before the living shoreline (1 per team)

Background Information. Erosion is a natural process along bodies of water such as rivers and tidal creeks. Erosion can be accelerated by natural events (e.g., hurricanes) and human impacts (e.g., development of coastal structures, overharvesting of oysters and mussels). A traditional method to preventing erosion along shorelines has involved the installation of hard structures such as concrete seawalls or bulkheads. Problematically, these structures can disrupt natural ecosystem function and minimize habitat. In coastal Georgia, living shorelines are being used and studied as an alternative and natural way to protect shorelines.

What is a living shoreline? Living shorelines use natural materials such as oyster shells as well as the incorporation of native plants such as marsh grasses to stabilize and preserve natural processes along shorelines. Living shorelines are especially beneficial in providing a habitat for many plants and animals, buffering the shoreline from waves and storms, and improving water quality by filtering pollutants.

Why was the living shoreline created at Cannon's Point?
Due to shoreline erosion along Lawrence Creek, the Saint Simons Land Trust (SSLT), along with many partners created a living shoreline in 2015. Over 8,000 bags of recycled oyster shells in conjunction with vegetation such as cord grass were incorporated into the shoreline. Colonized by oysters, these bags of oyster shells are part of a living oyster reef that not only provide a rich habitat for aquatic and terrestrial animals, but help to buffer wave action. Also, a habitat for myriad animals, smooth cord grass (*Spartina alterniflora*) has a root system that helps stabilizes soft sediment. Together, oysters and *Spartina* are working to prevent erosion and enhance habitat along Lawrence Creek.

References.

Georgia Department of Natural Resources. 2013. Living shorelines along the Georgia coast: a summary report of the first living shoreline projects in Georgia. Coastal Resources Division, Brunswick, Ga. 43 pp. plus appendix.

"Living shoreline" a habitat for oysters, fish, plants. (2015, Summer). *St. Simons Land Trust News.* Retrieved from https://www.sslt.org/images/Newsletters/Summer2015.pdf

Myszewski, M. and Alber, M. 2016. Living shorelines in the Southeast: Research and data gaps. Report prepared for the Governor's South Atlantic Alliance by the Georgia Coastal Research Council, University of Georgia, Athens, GA, 35 pp.

Student Field Experiences Overview.

Task One: Observing Lawrence Creek Before and After the Living Shoreline

1. Explain to students that they are now conservation biologists! They have been brought to Cannon's Point Preserve to help determine the influence of the living shoreline on the health of the marsh. Discuss the meaning and function of a living shoreline. *If possible, do this before visiting Cannon's Point.
2. Hand-out the "Monitoring the Living Shoreline" investigation guide. To begin, have students examine the provided photos of Lawrence Creek prior to the installation of the living shoreline. *We recommend making several color copies and putting these in plastic protectors for sharing. Making sure that you are near the dock for this next part, have students draw a detailed picture of the shoreline along Lawrence Creek today. Prompt them to include Lawrence Creek, the dock, and any plants and animals that they observe.
3. Using the T-Chart, have students compare observations of the marsh before the living shoreline to the observations they make on the date of the visit. They may think about factors such as the steepness of the shoreline, level of erosion, and the diversity of organisms (plants and animals). *What do you see? What don't you see?*
4. Based on this observational data, ask students to think about and explain how and why the living shoreline is impacting the health of the marsh. Facilitate a whole-group discussion about this.

Task Two: Analyzing and Interpreting Longitudinal Data to Assess the Impact of the Living Shoreline on the Health of the Marsh

1. Explain to students that teams of scientists and volunteers have been monitoring the living shoreline at Cannon's Point over time. Specifically, they have collected data on the densities of oysters (*Crassistrea virginica*) and the densities of cordgrass (*Spartina alterniflora*) in the intertidal zones. In general, they do this by counting the number of oysters measuring at least 10mm or the number of stems of *Spartina* in a .25m^2 quadrat, or square of PVC pipe at 8 transects placed perpendicular to Lawrence Creek. If possible, show students how this data is collected with a quadrat.
2. Using data provided by C.T. Holbrook & CCGA BIOL 4020 students (personal communication, September 19, 2018), small teams of students will (1) calculate and graph the average number of oysters (#/m^2) and *Spartina* (# of stems/m^2) per year, (2) describe changes in

these animal/plan densities over time, and (3) use this data to think about and assess the impact of the living shoreline on marsh health. **Please note that this data may only be used for the purposes of student learning in this lesson only.* Students should find that the oyster and *Spartina* densities have increased over time since the installation of the living shoreline.

Task Three: Assessing the Impact of the Living Shoreline on the Health of the Marsh

1. Using observations and the data analysis as evidence, students will prepare a communication of choice (e.g., letter, infographic/illustration, speech) to leadership team at Cannon's Point informing them of how the living shoreline is impacting the health of the marsh. *This may be done as a post-trip learning experience.

Monitoring the Living Shoreline

Name(s):

As a conservation biologist, you have been brought to Cannon's Point Preserve to help determine the influence of the living shoreline on the marsh. By (a) comparing observations of the shoreline along Lawrence Creek before and after the installation of the living shoreline, and (b) analyzing and interpreting longitudinal data of both oyster and *Spartina* densities, your job is to explain the impacts of the living shoreline on the health of the marsh.

TASK ONE. Examine the provided photos of Lawrence Creek prior to the installation of the living shoreline. Then, in the space below, draw a detailed picture of the shoreline along Lawrence Creek today. Please include Lawrence Creek, the dock, and any plants and animals that you observe.
Current Date:

Using the T-Chart below, compare your observations of the marsh before the living shoreline to the observations that you made of the marsh today. Think about factors such as the steepness of the shoreline, level of erosion, and the diversity of organisms (plants and animals). *What do you see? What don't you see?*

What I observe before the living shoreline was installed.	What I observe today.

Based on this observational data, how do you think that the living shoreline is impacting the health of the marsh? Why do you think this is?

TASK TWO. Teams of scientists and volunteers have been monitoring the living shoreline at Cannon's Point over time. Specifically, they have collected data on the densities of oysters (*Crassistrea virginica*) and the densities of cordgrass (*Spartina alterniflora*) in the intertidal zones. In general, they do this by counting the number of oysters measuring at least 10mm or the number of stems of *Spartina* in a .25m^2 quadrat, or square of PVC pipe at 8 transects placed perpendicular to Lawrence Creek

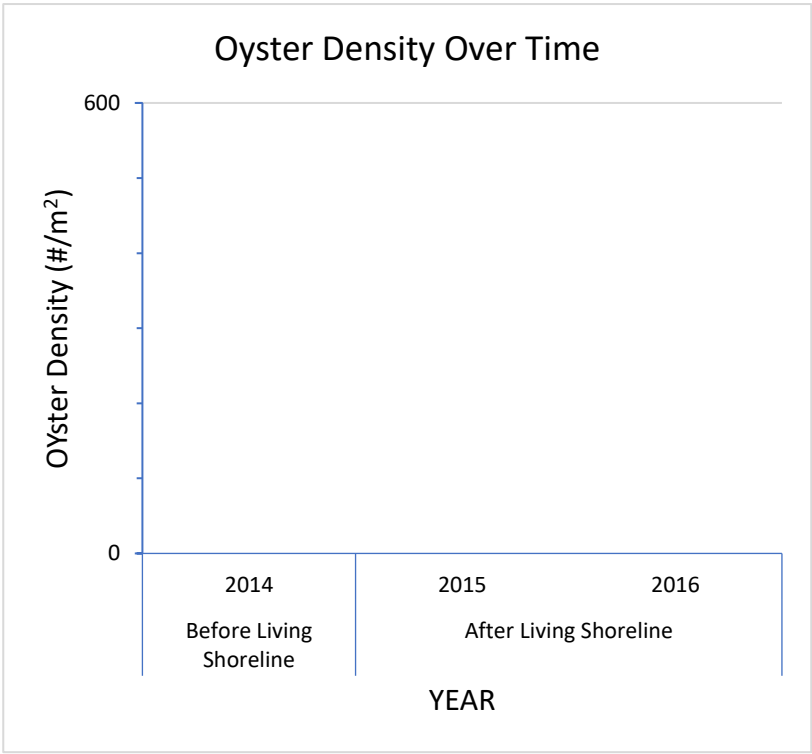
In this next task, your job is to analyze and interpret data from 2014 -2106 on these animals and plant densities by (a) calculating and graphing the average number of oysters (#/m^2) per year, (b) calculating and graphing the average number of *Spartina* (# of stems/m^2) per year, and (c) interpreting your findings.

Oyster Density from 2014-2016

Oyster density (#/m^2) from 2014-2016. Oysters measuring at least 10mm were sampled along 8 transects in the lower intertidal zone on Lawrence Creek.

LS=Living Shoreline	Before the LS	After the LS	
Transect	**2014**	**2015**	**2016**
1	308	72	1024
2	20	96	496
3	0	384	392
4	0	4	416
5	0	20	360
6	0	56	660
7	0	216	416
8	0	28	972
Average			

Please graph the average oyster density per year.



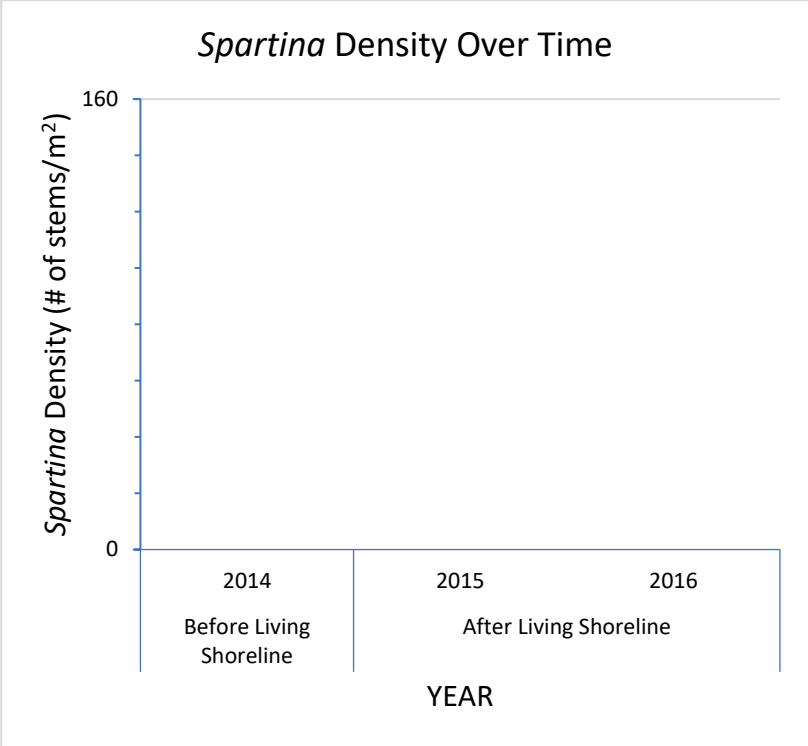
What is happening to the oyster densities over time? What might this suggest about the impact of the living shoreline on the marsh?

Spartina Density from 2014-2016

Spartina density (# stems/m²) from 2014-2016. Plants were sampled along 8 transects in the upper intertidal zone on Lawrence Creek			
	Before the LS	After the LS	
Transect	**2014**	**2015**	**2016**
1	96	108	136
2	60	72	160
3	36	0	80
4	0	4	92
5	0	0	124
6	0	20	136
7	0	28	72
8	0	8	164
Average			

Data retrieved from C.T. Holbrook & CCGA BIOL 4020 students (personal communication, September 19, 2018) and may not to be used beyond this lesson.

Please graph the average *Spartina* density per year.



What is happening to the Spartina densities over time? What might this suggest about the impact of the living shoreline on the marsh?

What did you notice about both the oyster and *Spartina* densities over time?

TASK THREE. Using your observations and data analysis as evidence, prepare a communication (e.g., letter, infographic/illustration, speech) to leadership team at Cannon's Point informing them of how the living shoreline is impacting the health of the marsh.

IDEA STARTERS

How have the plant and animal densities changed over time?

Why is this happening?

To what extent has the living shoreline stabilized the shoreline?

What are the benefits of the living shoreline to the marsh?

Lawrence Creek Before the Living Shoreline

Student Reflection

We love visitors at Cannon's Point! Thank you for spending time learning and exploring our area. Please take the time tell us about your time at Cannon's Point. Thank You!

Tell us about what you learned	Tell us about your favorite activity and why	If you were coming back again what would you not want to do?	If you were coming back again what would you want to do more of?
Today I learned…	My favorite Activity was___, because…	Next time I would not want to…	Next time I would like to spend more time…

Rate Your Overall Experience

On a Scale from 1(terrible) -5(wonderful) how would you rate your time at Cannon's Point and Why?

1 2 3 4 5

I rate my time at Cannon's Point as a _____, because…