

Learning About the Littoral Zone

Stage 1: Desired Results

Established Goals:	
<p><u>Littoral Zone</u>: The student will investigate and understand the littoral zone of the ocean and the organisms within the zone. Key concepts include a) how the organisms use the zone and b) various divisions of the zone. (<i>from Prince William County Oceanography Standards</i>)</p> <p>Virginia Biology Standard of Learning 8: The student will investigate and understand dynamic equilibria within populations, communities, and ecosystem; Abiotic factors are the nonliving elements in an ecosystem, such as temperature, moisture, air, salinity, and pH. Biotic factors are all the living organisms that inhabit the environment, including predators, food sources, and competitors.</p>	
Meaning	
Essential Understandings: <i>Students will understand that ...</i>	Essential Questions:
<ul style="list-style-type: none">• The littoral, or intertidal zone, is the area between neap low tide and spring high Tide.• The littoral zone can be divided into the upper littoral zone, upper mid-littoral zone, lower mid-littoral zone, and the lower littoral zone.• Organisms in the littoral zone are usually small and relatively uncomplicated because the water supply is intermittent, wave action can wash away or dislodge poorly suited or adapted organisms, temperature ranges can be extreme, and salinity can change from higher than average due to evaporation in tidal pools to lower than average due to rain.• When exposed, organisms must be able to withstand desiccation. Some animals burrow into the sand, others close their operculum, while still others move to areas that are still covered with water, and algae secrete a gelatinous substance that prevents it from drying out.	<ul style="list-style-type: none">• How can the littoral zone be divided?• How and why must life in the littoral zone adapt? <p>Prerequisite Skills:</p> <p>Prince William County Oceanography Unit on Coastal Habitats: The student will investigate and understand how the diversity of life changes from different coastal habitats.</p> <p>Virginia Standard of Learning Biology 8: As any population of organisms grows, it is held in check by interactions among a variety of biotic and abiotic factors.</p>

<p>Possible Misconceptions</p> <p>That animals and plants cannot exist in areas where there is no continuous water supply.</p>	
<p>Acquisition</p>	
<p><i>Students will ...</i></p> <ul style="list-style-type: none"> • Illustrate and design an intertidal community • Name benefits and challenges of animals living along the intertidal zone 	<p><i>Students will be skilled at ...</i></p> <ul style="list-style-type: none"> • Determining the tidal range from the high and neap tide • Illustrating the community of animals in the various habitats along a vertical intertidal zone. • Identify abiotic and biotic factors as well as adaptations of animals living along the intertidal zone.

Stage 2: Assessment Evidence

Formative Assessments

- During the class a KWL chart will be documented on what students Know-Want-Learn about the animals and plants living along the intertidal zone. The teacher will collect at the end of the day and address any of the “W” that were not addressed during the lesson the previous day.
- In their science notebooks, students will be responsible for six key terms for this lesson: intertidal zone, abiotic factors, biotic factors, desiccation, physical factors, and tidal range.
- As a conclusion to their group work, students will be asked to explain some benefits and challenges to animals living along the intertidal zone.
- As an exit ticket the students will be asked to list two abiotic and biotic factors affecting animals and plants in the intertidal zone.

Summative Assessments

- As an extension to the “L” for the KWL chart, students will be asked to list two biotic and abiotic factors affecting animals along the intertidal zone. This will be a part of the exit ticket.
- Students will work cooperatively together to create a mural of the vertical piling community as well as determine the tidal range of their given area.
- An end of unit exam will assess student’s understanding of the six key terms. The abiotic and biotic will be assessed through a visual diagram.

Stage 3: Summary of Learning Plan

This lesson is designed for one 90-minute class period.

This activity is predicated by the fact that students have read the section of their textbook that covers adaptations of animals in the intertidal zone.

1. Bell Work: Displayed on the board via PowerPoint show the slide with the Bay of Fundy and Chiswick Eyot. Have students list at least 3 differences they might observe while visiting those beaches during high tide vs. low tide.

Anticipatory Set **5 minutes**

2. Multimedia (<http://www.thewildclassroom.com/biomes/intertidal.html>): Students will watch the seven minutes film from The Wild Classroom which provides an analogy of organisms that live along the intertidal zone to those that might live in a washing machine (i.e., no movement and then fills up with water rapidly). The film also explains zonation which is the focus of the lesson today. The teacher will ask essential questions such as “how do animals survive in these transition zones?” and “Why do animals live in this harsh transition zone?”.

Anticipatory Set **10 minutes**

3. Transition: When the film is over the teacher can explain that the activity for the day will be to design a zone ecosystem found on pilings. The students will use butcher’s block paper to design their vertical murals. The drawing of the piling will be provided as well as “critter” cards (attached). Before the activity starts the teacher will review the six vocabulary words in the PowerPoint (intertidal zone, abiotic factors, biotic factors, desiccation, physical factors, tidal range). Students are told to take notes in their biology notebooks. The teacher will explain that these words will be on an end of unit exam. In the PowerPoint “salinity”, “currents”, and “predation” are also circled to access and assess student’s previous knowledge.

Standards/Objectives **10 minutes**

4. Classroom Discussion/Lecture: Before starting the activity, the teacher brainstorms with students to identify animals and plants commonly found on pilings at marinas, dock, etc. (e.g., barnacles, oysters, mussels, crabs, seaweed). The teacher asks students if they think all of these creatures live on the same area of the piling. After discussion have students write their experiences near the littoral (or intertidal) zone in the K column on a sheet of paper. Use the PowerPoint image to focus students in the creation of a KWL chart. Tell students this completed page will be handed in at the end of class.

Teaching (Input, Modeling, Checking for Understanding) **10 minutes**

5. Warm Up Activity: The teacher will show students the infographic of the piling in the PowerPoint. The important detail is to illustrate how a piling is a vibrant community and changes as one moves along vertically. Also, to illustrate the different areas of the piling (e.g., subtidal, intertidal, high tide zone, spray zone). The students should have their notebooks out

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and generate an outline of the four areas as well as the level of water each may receive as well some of the animals that are frequent to that region.

Next the teacher will present via PowerPoint the ten animals found on the critter cards (acorn barnacle, sponge, mud crab, sheepshead, mussel, oyster, sea squirt, anemone, sea whip, goby; attached). The teacher can also pass out the items from the classroom artifacts tray (e.g., sea whip, mussels, barnacles, oysters) that are available for students to touch. As each item is being introduced the students are asked to consider the habitat of each animal. Some questions to frame an answer might be: What/how does it eat? Does it stay submerged? How could it prevent desiccation? Does it require much space?

Students are asked to complete the W column of their KWL chart.

Teaching (Input, Modeling, Checking for Understanding) **15 minutes**

6. Activity: Students are grouped into teams of three or four students. Cooperative learning groups will be formed with a mixture of high level and low level students¹. These groups will be pre-determined at the beginning of each marking period to make the transition into getting into groups easier and the students know what to expect when they hear “group work” for the day.

Each group will take a large piece of butcher’s block paper with an outline of a piling on it. They will be asked to determine the tidal range for their assigned area. The teacher will determine a spot for each group and students will use a handheld tide chart to identify the high and low tide for that particular region. The teacher will walk around the class and check for understanding of that the tidal range is the difference in height between the high and low tides.

Students will also be asked to label the four zones along the piling (i.e., spray zone, high tide zone, intertidal zone, and subtidal). Students will be asked to determine where their creature cards should live. To make the determination students will have access to the “Factors affecting where an animal might live on a piling” which is a part of the PowerPoint and will be reviewed with the teacher before the students get started on the activity. As the students are placing their animals and designing their vertical ecosystems the teacher is asking questions that would help the students determine the habitat of each animal. The chart for the abiotic vs. biotic will be displayed as well which is a part of the PowerPoint. These questions overview abiotic/biotic factors and physical forces facing these animals.

For example:

- Will storms with wind and rain that affect changes in salinity?
- What happens as daily and seasonal temperature changes may freeze or overheat animals?
- What happens as waves and currents can remove animals from the piling?

¹ “When all students in a group are low ability and their placement in the group extends for more than a few days, these low ability students have almost twice as much off-task time as students assigned to long-term high ability groups.”

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- Boats can rub against dock piling. What happens as sediment or chemicals pollute habitat waters?
- How do tides expose animals to high salinity or exposure animals to sun?
- Are some animals prone to predation by land or sea animals? How would that affect the habitat?

Guided practice/Monitoring 20 minutes

7. As a final part of the group activity students are asked to brainstorm and then present to the class some of the benefits from living in the intertidal zone and what are some of the difficulties?

Closure 5 minutes

8. Exit Ticket: Students are asked to complete the L in their KWL chart and also write on the back of their paper two biotic and abiotic factors affecting one of the animals living along the piling community.

Independent Practice 10 minutes

Extension: *Naturalist Journal Writing Prompts* (as a homework assignment)

- Have you ever collected flora or fauna in the intertidal zone? Or do you know someone who does? What is your (or their) favorite part of collecting?
- What observations do (or would) you make as you enter the intertidal zone? How would these observations affect your actions?

References

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