



Virtual Field Trip To SoundWaters Coastal Education Center Teachers Guide and Supporting Materials

Welcome to the SoundWaters Virtual Field Trip to SoundWaters Coastal Education Center.

This Virtual Field Trip focuses on the coastal habitats of the Long Island Sound. The adventure begins with SoundWaters Educator Jess Castoro on the shore of Holly Pond, and Jess narrates the experience for students. Throughout the Field Trip other SoundWaters Educators present compelling videos about topics such as the coastal habitats, animal adaptations, ecosystem components, marine plants, tidal factors, and freshwater bioindicators. To help you organize your lesson plan the order of the presentation and the start and end time of each section, along with the relevant NGSS standards, are listed below.

Also below are resources that you may choose to use with your students. Specifically you will find:

- Video Link: <https://bit.ly/3nURSB7>
- Worksheets to reinforce the material presented in the Field Trip.
- A sample quiz.
- A quiz answer key.
- Links to online resources that students can use to enhance their knowledge.
- Links to additional articles and readings to help your students learn more about the coastal ecosystem of Long Island Sound.

We trust you will find this Virtual Field Trip to be a valuable learning tool for your students and a terrific way to connect them with the natural world. If you would like to pursue this subject matter in a more significant way please reach out to us to discuss bringing a SoundWaters Educator into your classroom via videoconference. We can customize a program that will support your desired learning outcomes for your students. For more information please contact Olena Czebiniak at olena@soundwaters.org or 203-406-3319.

Content, Timing and NGSS Standards

Coastal Habitats Video

- Start – 0:59
- End – 5:08
- NGSS – Interdependent Relationships in Ecosystems: 3-LS4-3; Inheritance and Variation of Traits: 3-LS3-2

Intro to Adaptations Video

- Start – 7:38
- End – 13:39
- NGSS – Inheritance and Variation of Traits: 3-LS3-2, 3-LS4-4, 3-LS3-1; Interdependent Relationships in Ecosystems: 3-LS2-1

Biotic and Abiotic Factors Video

- Start – 14:09
- End – 20:22
- NGSS – Structure, Function and Information Processing: 4-LS1-1

Coastal and Marine Plants Video

- Start – 20:42
- End – 25:22
- NGSS – Inheritance and Variation of Traits: 3-LS3-2; Matter and Energy in Organisms and Ecosystems: 5-LS1-1; Structure, Function and Information Processing: 4-LS1-1

Tides Video

- Start – 25:52
- End – 30:54
- NGSS – Earth's Place in the Universe: 5-ESS1-2; Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms: 3-LS4-3

Freshwater Bioindicators Video

- Start – 31:17
- End – 36:26
- NGSS – Interdependent Relationships in Ecosystems: Environmental Impacts on Organisms: 3-LS4-3; Earth's Systems: 5-ESS2-2

COASTAL HABITATS OF LONG ISLAND SOUND



During the virtual field trip, you learned about three coastal habitats of Long Island Sound. *Label the habitats pictured below and give specific examples of how the animals of Long Island Sound use them.*

Habitat Name:



What animals would you find in this habitat and how do they use this habitat?

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ADAPTATION OVERVIEW



SoundWaters
Protecting Long Island Sound through Education

Adaptation is defined as the change in structure or function of an organism to make it better suited to survive in its habitat or environment.

Create a short phrase or sentence that begins with each letter of the word "adaptation". Each phrase or sentence should include important information or key characteristics about the concept of adaptations. You may also give examples of animals and their physical or behavioral adaptations for some of your sentences.

A _____

D _____

A _____

P _____

T _____

A _____

T _____

I _____

O _____

N _____

ANIMAL ADAPTATIONS



Name of Animal:

Identify a behavioral adaptation of this animal:

Identify a physical adaptation of this animal:

Picture or drawing of the animal

Directions: Take a walk outside of your house and observe an animal or plant to help you complete this worksheet

BIOTIC AND ABIOTIC COMPONENTS OF AN ECOSYSTEM

Define ABIOTIC:

Define BIOTIC:

What are the abiotic and biotic factors of your home?

List them in the table below and include a picture of one abiotic and one biotic factor.

ABIOTIC	BIOTIC
FACTORS	FACTORS
PICTURE	PICTURE

COASTAL AND MARINE PLANTS

For each of the plants below:

- 1) Does this plant live out of the water, partially in the water, or completely in the water?
- 2) Choose the adaptation that BEST matches each plant below and explain how each plant uses that adaptation. Choices: *thickened plant body, air bladder, salt gland*

Cordgrass



Glasswort (sea pickle)



Rockweed



TIDES

Why is it important for the fisherman who owns this boat to understand what a tide is and how the tides affect him?



FRESHWATER BIOINDICATORS

Many different rivers lead to Long Island Sound. Why are rivers important to animals and humans?

Insects are bioindicators, which means they can be used to determine if a river is healthy or polluted because some insects are more sensitive to pollution than others. **Using the insect guide, give THREE examples of insects you would expect to find in each of these rivers and why you picked those.**



River A

- 1) _____
- 2) _____
- 3) _____

WHY?

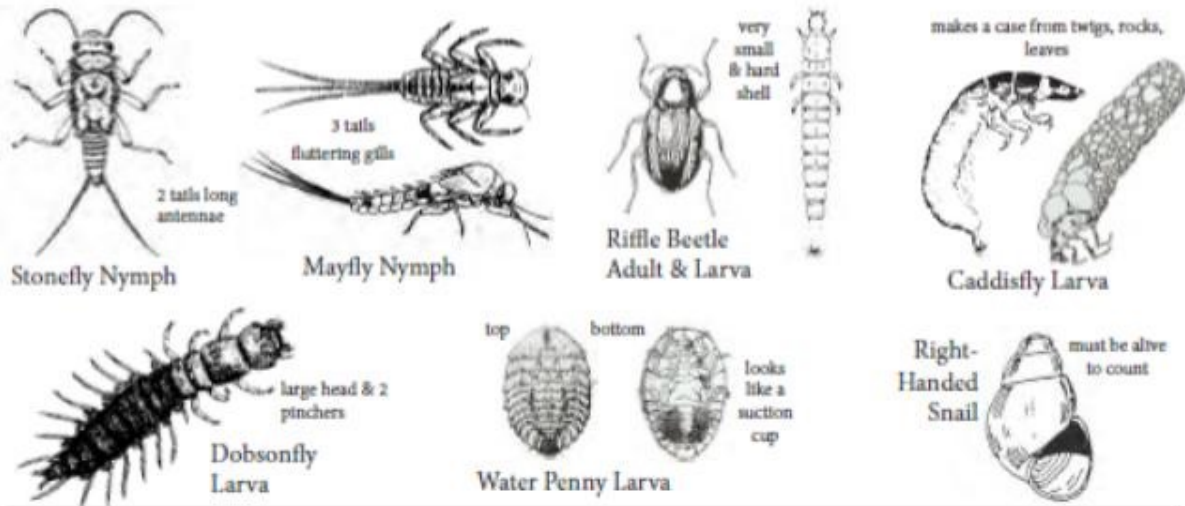
River B

- 1) _____
- 2) _____
- 3) _____

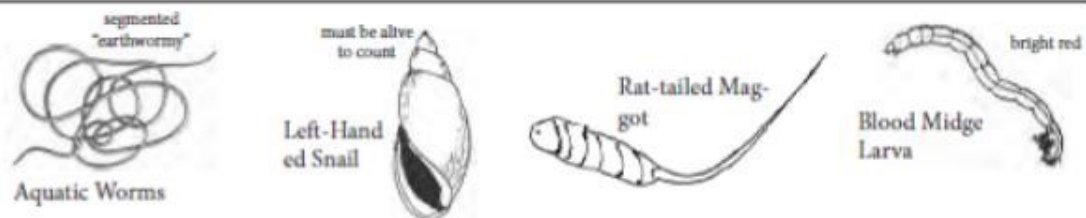
WHY?

FRESHWATER BIOINDICATORS INSECT GUIDE

GROUP 1: DOES NOT LIKE TO LIVE IN POLLUTED WATER



GROUP 4: IS ABLE TO LIVE IN POLLUTED WATER






COASTAL HABITATS OF LONG ISLAND SOUND

ANSWER KEY



During the virtual field trip, you learned about three coastal habitats of Long Island Sound. *Label the habitats pictured below and give specific examples of how the animals of Long Island Sound use them.*

<p>Habitat Name: <u>Salt marsh</u></p> 	<p>What animals would you find in this habitat and how do they use this habitat?</p> <p>Reasons include:</p> <ul style="list-style-type: none"> • Nursery habitat, fish and other animals live in between the blades of grass • Shorebirds use the salt marsh for nesting and feeding
<p>Habitat Name: <u>Rocky intertidal zone</u></p> 	<p>What animals would you find in this habitat and how do they use this habitat?</p> <p>Reasons include:</p> <ul style="list-style-type: none"> • Rocks provide habitat for animals when the tide goes out • Rocks also provide spaces for animals to attach to and grow • Sediment is soft and allows animals to burrow into it and stay wet
<p>Habitat Name: <u>Sandy beach</u></p> 	<p>What animals would you find in this habitat and how do they use this habitat?</p> <p>Reasons include:</p> <ul style="list-style-type: none"> • Breeding ground for animals like turtles and horseshoe crabs • Water can move down into sand allowing animals to live under the sand and stay wet

ADAPTATION OVERVIEW INSTRUCTIONS/ EXAMPLES



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Adaptation is defined as the change in structure or function of an organism to make it better suited to survive in its habitat or environment.

Create a short phrase or sentence that begins with each letter of the word “adaptation”. Each phrase or sentence **MUST** include important information or key characteristics about the concept of adaptations.

You may also give examples of animals or plants and their adaptations for some of the sentences.

Some examples would be:

A: Able to survive in the environment.

D: Developing a body part to help it move.

A: Allows animal to hide from predators.

P: Porcupines have quills which is a physical adaptation to protect them from predators.

Here are some key words from the video that could be used to make the sentences:

- Adaptation
- Physical
- Body
- Camouflage
- Behavior
- Act
- Habitat
- Change
- Environment
- Long period of time
- Survive
- Migrate
- Hibernate
- Predator
- Shell
- Blend in
- Decomposer

BIOTIC AND ABIOTIC COMPONENTS OF AN ECOSYSTEM

ANSWER KEY

Define ABIOTIC: Non-living factors in an ecosystem/area (wind, water, sun)

Define BIOTIC: Living factors in an ecosystem/area (animals, plants)

What are the abiotic and biotic factors of your home?


List them in the table below and include a picture of one abiotic and one biotic factor.

ABIOTIC	BIOTIC
<p>FACTORS</p> <p>Answers will vary</p> <ul style="list-style-type: none"> ● Furniture ● Water ● Heat ● Food ● Floors ● Lights ● Oxygen 	<p>FACTORS</p> <p>Answers will vary</p> <ul style="list-style-type: none"> ● People ● Pets ● House plants
<p>PICTURE</p>	<p>PICTURE</p>

COASTAL AND MARINE PLANTS ANSWER KEY

For each of the plants below:

- 1) Does this plant live out of the water, partially in the water, or completely in the water?
- 2) Choose the adaptation that **BEST** matches each plant below and explain how each plant uses that adaptation. Choices: thickened plant body, air bladder, salt gland

<p><u>Cordgrass</u></p>  <ol style="list-style-type: none"> 1) Partially in the water - when the tide rises 2) A salt gland to excrete the salt onto their leaves instead of keep it inside the leaves 	<p><u>Glasswort (sea pickle)</u></p>  <ol style="list-style-type: none"> 1) Out of the water, but in the salt panne where the soil is extra salty 2) Their thickened plant body helps them keep more water inside because they also absorb salt. 	<p><u>Rockweed</u></p>  <ol style="list-style-type: none"> 1) Completely in the water all the time 2) Air bladders to keep them at the surface of the water to have access to sunlight,
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TIDES ANSWER KEY

Why is it important for the fisherman who owns this boat to understand what a tide is and how the tides affect him?



Answers may vary, but some common themes

- The fisherman should understand that the tide causes the water levels to rise and fall throughout the day as the earth turns
- High tide and low tide are several hours apart, so the boat could get stuck and the fisherman can't get to it
- If the fisherman is trying to catch certain types of animals, they may only be available during certain times of the day

FRESHWATER BIOINDICATORS

ANSWER KEY

Many different rivers lead to Long Island Sound. Why are rivers important to animals and humans?

Rivers provide drinking water for people, a habitat for animals, breeding ground for Long Island Sound animals, and carry nutrients to different areas of the river and Long Island Sound

Insects are bioindicators, which means they can be used to determine if a river is healthy or polluted because some insects are more sensitive to pollution than others. **Using the insect guide, give THREE examples of insects you would expect to find in each of these rivers and why you picked those.**



River A

Any insects in group 1 such as: Dobsonfly larvae, Stonefly larvae, Mayfly nymph, Riffle Beetle, Right handed snail, Caddisfly larvae

WHY?

The insects in group 1 do not like to live in polluted water and this river does not have any pollution going into it.



River B

Any insects in group 4 such as: Aquatic worm, Left handed snail, Rat-tailed maggot, Blood midge larvae

WHY?

The insects in group 4 are able to live in polluted water and this river has a factory pipe dumping something (maybe chemicals) into the river.

TEST YOUR KNOWLEDGE

1. What is an estuary?
 - a. A coastal habitat that is only found in Long Island Sound.
 - b. An area where salt water and fresh water meet in a body of water.
 - c. All the oceans of the world.
 - d. A type of plant found in brackish water.
2. What makes the coastal grasslands different from the salt marsh?
 - a. The coastal grasslands are always covered by the water and the salt marsh never has water in it.
 - b. The coastal grasslands have a dense layer of peat to anchor them into the sand.
 - c. The coastal grasslands are home to birds, but not fish and crabs because it is not usually covered by water.
 - d. None of the above.
3. Which of these habitats means, “between the tides?”
 - a. Sandy beach
 - b. Coastal grasslands
 - c. Rocky intertidal zone
 - d. Salt marsh
4. Which of these is NOT a way that animals use the sandy beach?
 - a. Horseshoe crabs lay their eggs in the sand.
 - b. Birds eat the small invertebrates living in the sand.
 - c. Animals use the layers of sand differently because some layers are wet and some are dry.
 - d. Small invertebrates live in the upper dry sand layer where there are a lot of nutrients.
5. Which of these is the correct pairing of a type of adaptation with an example of that adaptation?
 - a. Migration is a behavioral adaptation because it is triggered by the changing of season.
 - b. Hibernation is a physical adaptation because the animal slows its body down.
 - c. Webbed feet are a behavioral adaptation because they help an animal swim faster.
 - d. All of these are correct.
6. Why is the mud snail’s shell an important adaptation in the rocky shore?
 - a. The shell camouflages with the dark background so it can hide from prey and surprise them.
 - b. The shell camouflages with the dark background to hide from predators.
 - c. The snail grows food on its shell that it can eat when it has no food to eat.
 - d. The shell collects water during high tide so they can close their shell during low tide.
7. What adaptation do fish have to help them get oxygen in the water?
 - a. Flabellum
 - b. Gills
 - c. Lungs
 - d. Mouth

8. Which of the following correctly describes how the crabs have adapted differently to live in either the rocky intertidal zone or the salt marsh?
- Fiddler crabs play dead from all the birds that try to eat them in the salt marsh and chocolate fingered mud crabs have extra-large claws to scare away predators because there are not a lot of places to hide in the rocky intertidal zone.
 - Fiddler crabs can only live on the blades of grass to get their food and chocolate fingered mud crabs can only break down the dead animals in the rocky intertidal zone.
 - Fiddler crabs in the salt marsh can make burrows under the ground, but in the rocky shore the chocolate fingered mud crabs have to hide under rocks because they can't go underground.
 - Fiddle crabs in the salt marsh can make burrows under the ground to hide, but in the rocky shore the chocolate fingered mud crabs have special legs to help them swim to move when the tide changes.
9. A(n) _____ is the combination of all living and non-living things in an area.
- Biotic
 - Abiotic
 - Ecosystem
 - Estuary
10. Which of these is NOT an example of a biotic factor in Long Island Sound?
- The sunlight that is used by producers to make food.
 - A producer that makes food from the sun.
 - A consumer that eats producers.
 - A decomposer that breaks down dead consumers.
11. Which of these is a way that biotic factors rely on or need abiotic factors?
- The salt marsh grass needs animals called mussels to hold the grass roots together.
 - Small crabs use the rocks to hide under during low tide.
 - The rocks hold down the sand so it does not wash away when the tide changes.
 - None of the above.
12. Why is it important for polychaete worms to live in the muddy bottom?
- They stir up the mud, pulling oxygen into the mud.
 - They are food for animals higher up on the food chain.
 - They are able to move around between the layers of mud to find food.
 - All of the above.
13. True or False. Abiotic factors never have a negative effect on the biotic factors of an ecosystem.
14. Which of these is an adaptation that beach grass uses to prevent water loss?
- Ribs on their leaves help them roll up the leaf to prevent water loss.
 - They spit out the salt on their leaves to prevent the salt from drying them out.
 - They have extra wide, thick leaves to hold more water.
 - Their leaves are able to share water from other plants around them.

15. Which of these statements is FALSE about coastal plants?
- a. Their root systems help to stabilize the ground.
 - b. They are able to live in areas with less nutrients.
 - c. Coastal plants never come into contact with the water in Long Island Sound.
 - d. Coastal plants have to release seeds just like inland plants.
16. Which of these statements is TRUE about marine plants?
- a. Marine plants have extra-large leaves to help them anchor onto rocks.
 - b. Marine plants have holdfasts, which act like roots to take in nutrients.
 - c. Marine plants have salt glands to get rid of the salt in their body.
 - d. Marine plants have air bladders to keep them at the surface to get sunlight.
17. The tides are controlled by
- a. The sun
 - b. The moon
 - c. The stars
 - d. Mars
18. True or False. A tidal bulge means that an area of the earth is experiencing low tide.
19. Why are tides important to areas like Long Island Sound?
- a. The tides bring in nutrients from other areas of Long Island Sound and the Atlantic Ocean.
 - b. The tides move animals around so predators can hunt smaller animals.
 - c. The tides help prey animals hide from large predators.
 - d. All of the above.
20. How do boaters know if an area is safe to drive in during high and low tide?
- a. They should only drive in areas they are used to because there is no way to know how deep the water will be at high or low tide.
 - b. Boaters can use a bathymetric chart or an app on their smartphone, which tells them the height of the water at high and low tide.
 - c. Boaters must have a depth sounder instrument on their boat so they know if the area is safe to drive in.
 - d. Boaters must use a special kind of anchor to measure the depth of the water as they are driving in a body of water.
21. Why are freshwater rivers important?
- a. They provide nutrients to bodies of water like Long Island Sound.
 - b. They provide drinking water to people living around them.
 - c. They provide habitat to plenty of invertebrates and other animals.
 - d. All of the above.

22. How can insects be used to determine the health of a river?
- a. Scientists can collect insects and use a guide to determine how tolerant they are to pollution.
 - b. Scientists can measure the oxygen level of the river to make sure there is enough oxygen for insects to survive.
 - c. Scientists can survey the river for the food that insects eat and if there is enough food, the river is healthy.
 - d. Scientists can test the water chemistry inside the insects to make sure their water is healthy.
23. Which of these statements is true about monitoring the health of a river?
- a. Scientists should never monitor the health of rivers.
 - b. Scientists should only measure the insects once because the health of the river will not change.
 - c. Scientists should monitor the river regularly because pollution can get into the river in a lot of different ways.
 - d. Scientists should only measure the insects when adding new buildings directly along the river.

TEST YOUR KNOWLEDGE ANSWERS

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- c. Scientists can survey the river for the food that insects eat and if there is enough food, the river is healthy.
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23. Which of these statements is true about monitoring the health of a river?

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ONLINE RESOURCES (Click on the title below to find out more!)

- [What's the Story with Sand?](#)
- [What is a Salt Marsh?](#)
- [What is a Kelp Forest?](#)
- [Tides and Water Levels](#)
- [NOAA Teacher at Sea – Sargassum Unit](#)
- [Cooking Kelp with an Ocean Farmer](#)
- [A Bioindication of Water Quality](#)
- [NOAA Education Resource Collection: Freshwater](#)
- [BrainPOP: Ecosystems](#)
- [BrainPOP: Land Biomes](#)

BOOKS

- *A Beach for the Birds* by Bruce McMillan
- *My Water Comes from the Mountains* by Tiffany Fourment
- *The Relationship of the Moon and the Tides* by Baby Professor
- *Waiting for High Tide* by Nikki McClure
- *Wetlands Inside Out* by James Bow
- *Life in the Ocean* by Claire Nivola
- *The Tale of the Swamp Rat* by Carter Crocker

ARTICLES

- [Marine plants](#) (Lexile level adjustable)
- [Freshwater insect indicators](#)
- [Exploring The Wrack Line: Uncover a World Most People Miss](#)
- [Long Island Sound's Ecosystem Engineers](#)
- [Even in good weather, king tides increasingly flood coastal communities](#)