



MARINE ECOSYSTEMS UNIT

LESSON PLAN 6rd-8th grade

Topics

Living and Non-Living Components (Biotic vs Abiotic)
Coastal Habitats
Freshwater Bioindicators
Population Dynamics
Coastal and Marine Plants

Objectives

Students will be able to:

- Discuss how biotic and abiotic components of an ecosystem interact.
- Identify the habitats of Long Island Sound and explain their importance to the marine ecosystem.
- Discuss how freshwater insects can be used to predict freshwater stream health.
- Explain the factors that affect animal population growth.
- Compare the adaptations of coastal and marine plants to inland plants.

Instructional Materials

Topic Video
Vocabulary Flash Cards

Assessment Materials

Video Reflection Worksheet
Video Quiz
Living and Non-Living Components Worksheet (answer PDF available)
Coastal Habitats Worksheet (answer PDF available)
Freshwater Bioindicators Worksheet (answer PDF available)
Population Dynamics Worksheet (answer PDF available)
Coastal and Marine Plants Worksheet (answer PDF available)

Related Materials

Links to videos and reading material that provides additional information on topics.

Topic articles (Lexile levels adjustable)

- Carrying capacity https://newsela.com/read/lib-biological-carrying-capacity/id/53812/?collection_id=339&search_id=6274c92d-2618-4b62-beee-14a83f0f0203
- Marine plants https://newsela.com/read/lib-kelp-forest/id/52700/?collection_id=2000000553&search_id=2eefdcf0-7052-4dc2-91f0-c619870c2d58

****see page 2 for more resources****



- Freshwater insect indicators <https://theconversation.com/how-healthy-is-your-river-ask-a-waterbug-43842>

NOAA Resources

The National Oceanic and Atmospheric Administration (NOAA) is a partner of SoundWaters. These are additional resources you may use in addition to the other materials included above.

Coastal Habitats

<https://oceanservice.noaa.gov/facts/saltmarsh.html>

https://oceanservice.noaa.gov/education/kits/estuaries/media/supp_estuar06a_saltmarsh.html

Biotic vs Abiotic

<https://oceanservice.noaa.gov/education/pd/corals/welcome.html>

https://www.nwfsc.noaa.gov/news/features/food_chain/index.cfm

Coastal and Marine Plants

<https://oceanservice.noaa.gov/facts/kelp.html>

<https://videos.fisheries.noaa.gov/detail/videos/aquaculture/video/5625015342001/cooking-kelp-with-an-ocean-farmer?autoStart=true>

Freshwater bioindicators

<https://coast.noaa.gov/data/estuaries/pdf/a-biodindication-of-water-quality-resources.pdf>

(link in page 2 for macroinvertebrates)

<https://www.noaa.gov/education/resource-collections/freshwater>

NGSS Standards

Matter and Energy in Organisms and Ecosystems: MS-LS2-1; MS-LS2-3; MS-LS2-4

Independent Relationships in Ecosystems: MS-LS2-2; MS-LS2-5

Growth, Development, and Reproduction of Organisms: MS-LS1-5

BIOTIC AND ABIOTIC COMPONENTS OF AN ECOSYSTEM ANSWER KEY

Define BIOTIC:

Anything living in an ecosystem (plants, animals)

Define ABIOTIC:

Anything non-living in an ecosystem (sediment, wind, rocks)



Image credit NOAA:
<https://www.integratedecosystemassessment.noaa.gov/national/EBM>

List the abiotic and biotic factors from the picture.
Be as specific as possible

ABIOTIC	BIOTIC
Sun Wind Buildings (houses, factory) Roads Cars, Bus Boats Water Dirt Sand (if you interpret that as a beach)	People Plants (trees, plants in garden) Fish Shark Turtle Corals

What is one way that one of the abiotic factors interacts with one of the biotic factors from your lists above?

Answers vary

COASTAL HABITATS OF LONG ISLAND SOUND

ANSWER KEY

In the video, you learned about three coastal habitats of Long Island Sound. *Label the habitats and give specific examples of how they are important to the whole Long Island Sound marine ecosystem.*

Habitat Name Salt Marsh



Why is this habitat important?

- Nursery habitat to animals
- Feeding & nesting for coastal birds
- Peat absorbs pollution from the land

Habitat Name Rocky intertidal Zone



Why is this habitat important?

- Rocks are a hiding place for animals when the tide changes
- Rocks keep soft sediments and mud in place from eroding
- Soft areas allow animals to burrow in and stay damp when the tide changes

Habitat Name Sandy Beach



Why is this habitat important?

- Foraging grounds for migrating birds
- Wrack line - deposits of seaweed that micro-organisms can live in to stay damp
- Absorbs water, so animals can burrow into the sand and live underground

FRESHWATER BIOINDICATORS ANSWER KEY



Many different rivers lead to Long Island Sound. Why is the river 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

A group of scientists monitoring a river decided to look for insects because they are indicators of pollution. If an insect is considered sensitive, it means the insect cannot exist in polluted areas. The scientists studied the river for 2 years and found the following insects during each survey.

Year 1: Body Builder Mayfly, Common Stonefly, Dragonfly, Brush Legged Mayfly, Water Penny Beetle

Year 2: Scud, Black Fly, Aquatic Sow Bug, Non-Biting Midge, Snail

<u>Most sensitive</u>	<u>Moderately sensitive</u>	<u>Least sensitive</u>
Body-Builder Mayfly Free-Living Caddisfly Brush Legged Mayfly Common Stonefly Saddlecase Maker Caddisfly	Fingernet Caddisfly Dragonfly Water Penny Beetle Dobsonfly Damselfly	Scud Aquatic Sow Bug Non-Biting Midge Black Fly Snail

What do the survey results tell us about the health of the river from year 1 to year 2? What should they do after year 2?

Use the survey results and the insect sensitivity guide above.

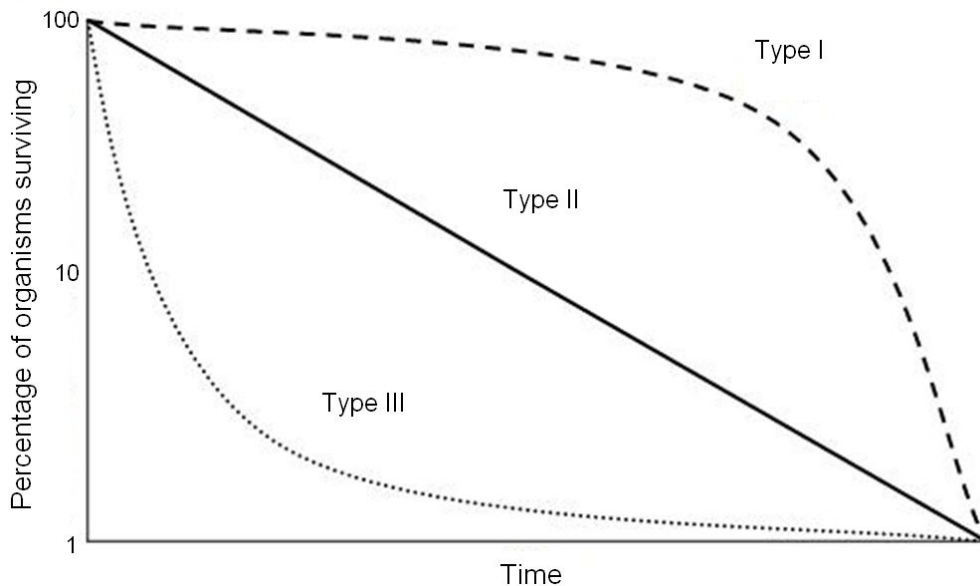
In year 1, the insects that were found are mostly in the sensitive category which means the river is healthy. There are 2 species that are moderately sensitive, so it could mean that a source of pollution is possibly entering the river.

In year 2, all the insects are least sensitive to pollution, which means the scientists should do further testing on the water to figure out what could be polluting the water.

POPULATION DYNAMICS ANSWER KEY

What is a population?

The number of one specific organism/species in an area



This is a survivorship curve.

It explains how many animals of a species (vertical axis) survive to a certain age (horizontal axis).

Animals are classified as either Type 1, Type 2, or Type 3 survivors.

Read about the animals below and determine which type of survivor they are. Make sure to explain your answer.

Fish species X lays 500 eggs at a time. The eggs hatch after one week and the fish begin their life as tiny plankton floating around in the water along with all the other animals that live there.

Type 1 survivor, which means that they produce many offspring since most of them will not survive to be adults. The fish is less likely to survive because they are plankton which will most likely get eaten before they can become full grown fish

Rabbit species Y has 7 babies at a time and can reproduce several times during the year. The baby rabbits remain in the family burrow for 1-2 months and then leave to survive on their own.

Type 2 survivor because they do not produce a really small or large number of offspring. The offspring remain with the parents for some time after birth which increases their chance of surviving. Once they leave the burrow, they could get eaten at different stages of their life.

COASTAL AND MARINE PLANTS

ANSWER KEY

Coastal and marine plants have different anatomical structures to help them survive in an environment like Long Island Sound.

For each of the structures below:

- Explain how it is important to coastal or marine plants.
- Compare it to the structures of an inland plant



SALT GLAND

- Found in coastal grasses like cordgrass (salt marsh)
- The marsh grass brings in brackish water but only uses fresh water so the salt gland allows it to expel the salt onto the leaves.
- Most inland plants do not have to deal with salt and do not need this structure

HOLDFAST

- Found in marine plants like kelp
- They can't have roots like a land plant because they do not grow in the ground. Instead, they have a holdfast that allows them to attach to a rock or other hard surface.

TILLERING ROOT

- Found in coastal grasses like cordgrass (salt marsh)
- This type of root allows the plant to grow new grasses from underground instead of just seeds. Also, if any damage happens to the blades of grass, the plant is not dead. These roots also make the ground very stable since the tide comes in and out throughout the day. Inland plants do not have the same risk of erosion so they do not need this type of root system

AIR BLADDER

- Found in marine plants like kelp.
- They do not have rigid stems like inland plants so the air bladder holds them up in the water so they can get the sunlight to their "leaves".