

Read the following article and answer the questions.

## Adapting to Estuaries

Imagine living in a **habitat** that is under water for half the day, and out in the air for the other half. Sometimes the water in this habitat is salty like the sea, and sometimes it is fresh like water from a drinking fountain. In summer, this habitat is hot under the bright sun; in winter, it is ice-cold. Most animals and plants would find it difficult to survive in a habitat that changes so much.

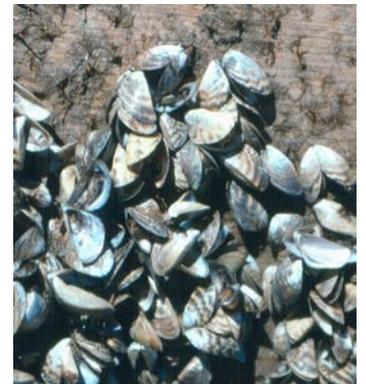


There are habitats like this in the Hudson River **estuary**. Estuaries are places where **fresh water** mixes with salty **seawater**. They are partly enclosed by land, but open to the ocean and its **tides**.



*oysters*

Few plants and animals can live everywhere in the estuary. Most are **adapted** to survive in a limited range of conditions. For example, many animals live only where the water is salty. Others live only where the water is fresh. In the Hudson estuary, oysters and seahorses live near New York City, where the water is almost as salty as ocean water. Zebra mussels and yellow perch live in fresh water **upstream**, farther away from the sea.



*zebra mussels*



*seahorse*



*yellow perch*



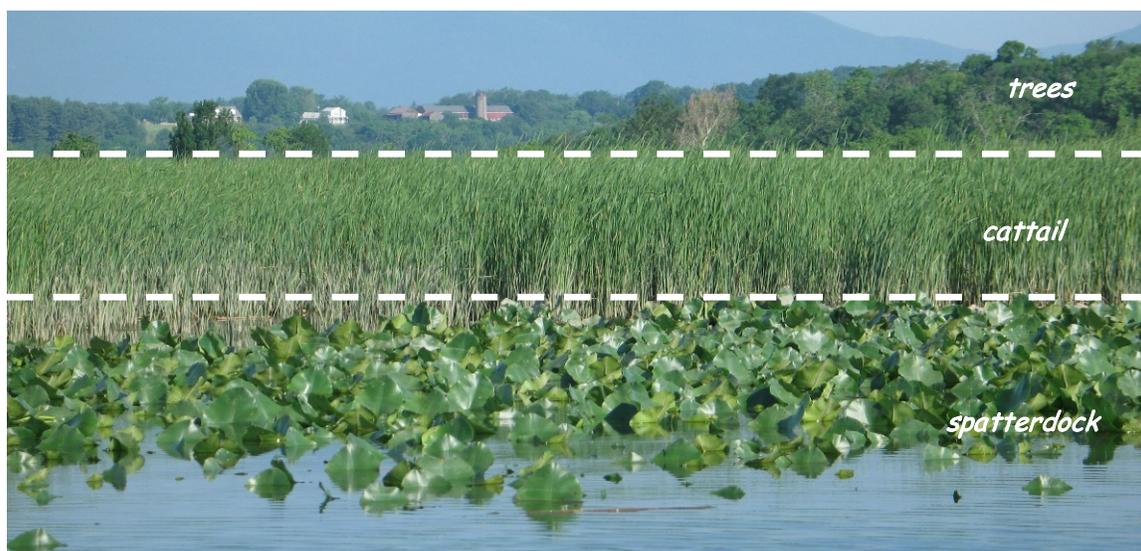
A few Hudson River fish are found in both salt and fresh water. Some hogchokers live close to the sea near New York City; others live far upstream near Albany. Other fish, like American shad, adapt to living in both salt and fresh water as they **migrate** between the Atlantic Ocean and the Hudson.



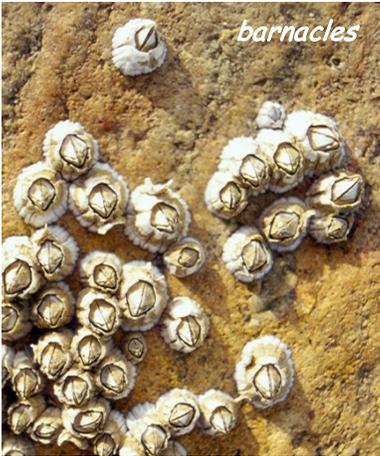
When it comes to dealing with the Hudson's tides, plants have special challenges. A plant is rooted in one place, after all. At high tide, it may be completely underwater. At low tide it might be completely exposed to the air. Where a plant grows along the Hudson depends on how well it can survive being flooded at high tide or being out in the air at low tide.



Spatterdock plants, for instance, can survive being covered with water at high tide and exposed to the air at low tide. Cattail plants live where the high tide comes partway up their stems but does not flood their leaves. Most trees live on land that is rarely covered with water.



The part of the estuary that is flooded at high tide and uncovered at low tide is called the **intertidal zone**. Like the plants described above, animals living here must adapt to the tides.



Barnacles feed and breathe underwater. At low tide, they shut their shells to keep water inside.

The fiddler crab breathes air and lives in a **burrow** in the mud. The crab enters the burrow and plugs the entrance with mud as the tide rises. This traps air in the burrow, allowing the crab to breathe during high tide.



Habitats in the Hudson estuary change with the seasons, and plants and animals have adaptations to survive winter's cold and ice. The leaves and stems of most plants that live in the Hudson turn brown and break off, but the roots survive, buried in the mud. Some animals burrow deep into the mud too. Others migrate to avoid the harsh conditions of winter.



Adult blue crabs migrate down the Hudson to New York Harbor, where ice seldom forms in winter. The osprey also migrates south in fall so that it can dive to catch fish without hitting ice.



Conditions in estuary habitats change a lot, but also allow many kinds of plants and animals to find homes in the Hudson. When exploring the Hudson, you never know what unusual fish you might catch or what rare bird might fly by.

1. This article is **mostly about**
  - a. plants of the Hudson River
  - b. how animals and plants adapt to habitats in the Hudson estuary
  - c. the tides in the Hudson River
  - d. fish migration
  
2. Which of the following cause conditions in Hudson River **habitats** to change?
  - a. tides
  - b. seasons
  - c. salty seawater entering the estuary
  - d. all of the above
  
3. Fill in the blank to complete the following sentences.
  - a. Barnacles close their shells to keep water inside when the tide is \_\_\_\_\_.
  - b. Yellow perch live in \_\_\_\_\_ water.
  - c. The osprey \_\_\_\_\_ south when winter comes to the Hudson.
  - d. \_\_\_\_\_ plants can survive being covered with water at high tide and exposed to the air at low tide.
  
4. According to the article, why do plants grow where they do in the Hudson?

5. **Challenge questions.** Extend what you learned from the article to answer questions about the Hudson River animals pictured below. Explain your answers.



a. Where does the map turtle spend the winter?



b. The pearly mussel breathes underwater. How does it survive being exposed to the air at low tide?



c. The green heron eats fish and frogs. When winter comes, what does it do to survive?