

# ECO-Logical: A Coastal Logic Problem

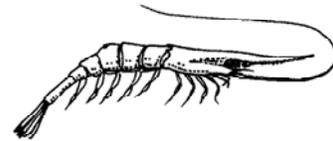


## Overview:

In North Carolina, six types of habitats have been identified as playing a crucial role in the production of North Carolina's coastal fisheries resources. The North Carolina Department of Environment and Natural Resources have deemed these habitats important for protection and enhancement. In this activity students will examine these six habitats along with three additional ones by learning about their location in the estuary, their function and how they differ from the other habitats.

## Materials:

- Coastal habitats page
- Clue cards
- Habitat cards



## Background:

North Carolina has approximately 2.9 million acres of estuarine and marine habitats. These waters and habitats are vital for many of the state's important marine fish and shellfish species, such as flounder, blue crab, shrimp and oysters. It is also significant for many fish species that migrate along the east coast including spot and speckled trout. It is important to protect these habitats for our enjoyment as well as for the vast amount of fish and shellfish that depend on them.

North Carolina has nine different coastal habitats, six of which are aquatic habitats the state has targeted for enhancement and protection. The protected aquatic habitats include: **water column, shell bottom, submerged aquatic vegetation (SAV), wetlands, soft bottom and hard bottom**. In addition, there are three other important upland coastal habitats including **beaches, dunes and maritime forests**.

All of these habitats are interconnected in many ways and provide the basic needs of fish and shellfish including food, shelter and a place to reproduce and grow. Estuaries, what we refer to as sounds and bays, are often called nursery areas, where small fish and shellfish can grow while having protected places to hide from predators.

## Grade Level

4<sup>th</sup>-8<sup>th</sup>

## Objectives

\* To be able to describe and compare common coastal habitats.

\* To be able to discuss an ecosystem's capacity to support life and the inter-connectedness of habitats.

## N.C. Standard Course of Study

Grade 4  
(4.L.1.1, 4.L.1.4)

Grade 5  
(5.L.2.1, 5.L.2.2)

Grade 6  
(6.L.2.2)

Grade 8  
(8.E.1.2, 8.L.3.2)

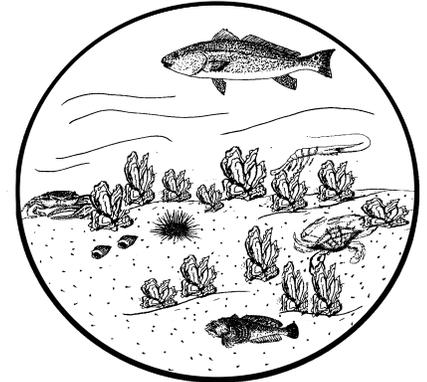
## Description of habitats

### Water column

- Connects the aquatic habitats, which allows animals to move between them.
- Transports eggs, larvae and oxygen to the organisms in other habitats.

### Shell bottom

- Includes oyster reefs which help filter water.
- Located in the intertidal or shallow subtidal zone.
- Slows waves before they get to shore and cause erosion.
- Used as nursery area for small animals that hide and find food in the crevices made by the shells.
- Habitat to blue crabs, stone crabs, drum, flounder, toadfish, shrimp and anchovy.

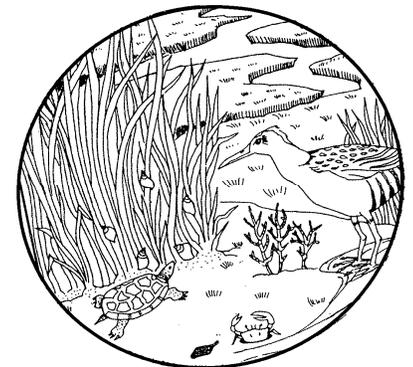


### Submerged Aquatic Vegetation (SAV)

- Important fish habitat that has aquatic plants, such as eelgrass or shoalgrass.
- Great for animals to hide and find food.
- Produces lots of oxygen through photosynthesis.
- Nursery area for animals such as shrimp and red drum.
- Animals found here include speckled trout, bay scallops, quahog clams, and flounder.

### Wetland or marsh habitat

- Is always muddy! This habitat is at the edge of the water, so plants here must adapt to being covered with salt water during high tide.
- Most common plant is salt marsh cordgrass, which is salt tolerant.
- Traps sand and dirt, filters and absorbs pollution and helps slow down big storm waves that can cause erosion.
- Animals that use this habitat as a nursery area include blue crabs, shrimp and flounder.
- Birds and small mammals are commonly found in the high marsh.
- Other animals that use the marsh include trout, red drum, killifish, and many snails including whelks and periwinkles.

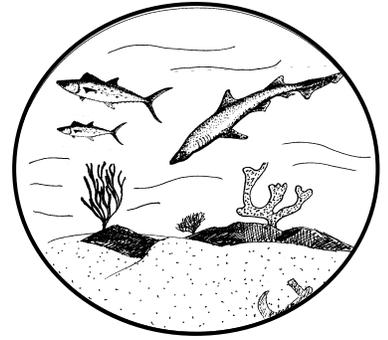


### Soft bottom

- Includes sand flats, sand bars, mud flats, the surf zone on the beach, and shoals.
- Does not have plants because of strong currents/ water flow.
- May or may not be exposed during low tide.
- Home to many animals that burrow, such as clams, worms, and fiddler crabs.
- Other animals found here include flounder, blue crabs, croaker, red drum, shrimp, sting rays and skates.

### **Hard bottom**

- Includes rocky areas or other hard structures on the bottom of the near-shore ocean
- Includes artificial habitats such as old military ships, train cars and even Blackbeard's ship!
- Provides animals such as coral, sponges and barnacles a place to attach.
- Contains hiding places in the crevices of rocks and between the coral for reef fish such as snapper and grouper.
- Animals found here include sharks, goby, black sea bass, king mackerel, and damselfish.



### **Beach**

- Sandy and shelly with lots of wave action.
- Desert-like habitat with no freshwater.
- Few plants and animals are able to live here. Some inhabitants include ghost crabs, mole crabs, polychaete worm, coquina clams and a few insects on the upper beach.
- Many birds visit here to feed.
- Water levels change with the tides.

### **Dune**

- Very dry and sandy.
- Some plants can grow here including sea oats, American beach grass, pennywort and seaside goldenrod.
- A few animals are found in the dunes including ghost crabs and insects.
- Waves may erode this habitat during large storms.

### **Maritime Forest**

- Located behind protective dunes.
- Small trees and shrubs live here that can tolerate lots of salt spray from the nearby ocean.
- Many animals from inland forests can live here such as raccoons, deer, squirrels, foxes and opossum.
- Often adjacent to salt marshes on barrier islands.
- Mostly made up of live oak trees.



### **Activity:**

After reading and discussing the information above with the class, students should work in groups of 3-4. All groups should have a set of habitat cards, a set of ecological clue cards and a Coastal Habitat page.

- Have students work together in their group to read each clue card and match it with the habitat card. Some clue cards may not apply to a specific habitat.
- After all of the clues have been read, students should then identify where each habitat is located on the Coastal Habitat page. The clues on the cards will help.
- Keep in mind that some habitats may be in more than one place.

After labeling the Coastal Habitat page have the students answer the discussion questions below.

The Habitats are:

1. **Dune**
2. **Saltmarsh**
3. **Hard Bottom**
4. **Maritime Forest**
5. **Shell bottom**
6. **Soft Bottom**
7. **Submerged Aquatic Vegetation**
8. **Beach**
9. **Water column**

Discussion Questions:

1. Which habitat is the driest?
2. Which habitat(s) are not affected by the ocean?
3. Give one example of a terrestrial animal and one example of an aquatic animal that uses more than one habitat and explain how they use both areas.
4. What are some disadvantages of having the marsh habitat disappeared?
5. Name 5 different kinds of seafood that comes from coastal North Carolina. What habitats would they mostly likely be harvested or caught in?
6. What are some negative impacts that humans have on these habitats?
7. One of the clues said that bay scallops are counter-shaded for camouflage. What other animals are counter-shaded for camouflage?
8. Some fish feed by sight (think about fishing bait) and some feed by other senses. Pompano fish live in the surf zone just off the beach and like to eat coquina clams that live in the sediment, so what sense might they use to eat?
9. There are rules about what seafood you can harvest to eat. The NC Division of Marine Fisheries recreational guidelines that can be found at <http://www.ncfisheries.net/recreational/recguide.htm> indicate that flounder have to be a certain size (usually over 14.5 inches) to be able to keep them to eat. Why?

Discussion questions: Teacher page

1. Which habitat is the driest?

*The dune habitat is the driest. There is very little organic material in the soil to retain moisture.*

2. Which habitat(s) are not affected by the ocean?

*All habitats are affected in some way by the ocean, even the maritime forest. The trees in the maritime forest tend to be shorter than those inland and they also tend to lean away from the ocean due to the influence of salt spray and the prevailing winds.*

3. Give one example of a terrestrial animal and one example of an aquatic animal that uses more than one habitat and explain how they use both areas.

*There are many examples such as raccoons, opossum, blue crabs, red drum, pelicans, and menhaden fish. Raccoons use the maritime forest as a den site but will forage in the nearby dunes and saltmarshes for crabs, snail and clams. Blue crabs are generally found in soft bottom habitats but since they are highly mobile predators they will forage in other habitats. They also use the submerged aquatic vegetation as a shelter from predators after they molt.*

4. What are some disadvantages of having the marsh habitat disappeared?

*Most of our seafood such as shrimp, fish and crabs will no longer have a habitat to hide from predators and a place to feed and grow. No more protection from storm surges. We would likely see a decrease in water quality because the marsh is no longer there to filter the runoff.*

5. Name 5 different kinds of seafood that comes from coastal North Carolina. What habitats would they mostly likely be harvested or caught in?

*Some examples are:*

*Shrimp in the sound or near the marsh grass.*

*Flounder in the open water or on the soft bottom at high tide.*

*Oyster in shell bottom.*

*Grouper and snapper from hard bottom.*

*Clams in soft bottom.*

*Blue crabs in soft bottom and the bottom of the water column.*

6. What are some negative impacts that humans have on these habitats?

*Boating in shallow SAV beds kills the plants and fragments the habitat.*

*Dredging for beach or waterway restoration removes plants and animals from the affected habitats.*

*Harvesting too much of one species of seafood can alter the community composition in a habitat.*

*Polluting the water.*

7. One of the clues said that bay scallops are counter-shaded for camouflaged. What other animals are counter-shaded for camouflage?

*Flounder, rays and skates are some examples.*

8. Some fish feed by sight (think about fishing bait) and some feed by other senses. Pompano fish live in the surf zone just off the beach and like to eat coquina clams that live in the sediment, so what sense might they use to eat?

*Touch / feel*

9. There are rules about what seafood you can harvest to eat. The NC Division of Marine Fisheries recreational guidelines that can be found at <http://www.ncfisheries.net/recreational/recguide.htm> indicate that flounder have to be a certain size (usually over 14.5 inches) to be able to keep them to eat. Why?

*So that the fish can become mature and reproduce before they are harvested to eat.*

### **Extension:**

1. Ask each student in the group to become an expert on one of the communities. After researching the characteristics of the community, each expert makes a report to the team.
2. Have a list or examples/photos of organisms and have students place them in their habitats.
3. Build a large mural and illustrate it with pictures of the animals and plants that are found in each community.
4. Create food webs for the habitats, note where some food webs cross into more than one habitat.
5. Make up your own game using the habitats that occur at the edge of a forest and a pond.

### **Vocabulary:**

- barrier island
- beach
- communities
- dense
- detritus
- dune
- estuary
- habitat
- maritime forest
- marsh
- salty
- salinity
- tides
- hard bottom habitat
- shell bottom habitat
- water column
- submerged aquatic vegetation habitat (SAV)
- soft bottom habitat
- bivalves
- camouflage
- adaptation

### **References:**

*An introduction to the Coastal habitat Protection Plan* a publication of the North Carolina Department of Environment and Natural Resources. North Carolina Division of Marine Fisheries <http://www.ncfisheries.net/>

## National Science Standards:

*Content Standards*            *Life Science. [K-4] [5-8]*

*Science in personal and social perspectives. [K-4] [5-8]*

## Ocean Literacy Principles:

*Essential Principle #1.        The Earth has one big ocean with many features.  
(Fundamental Concepts – g)*

*Essential Principle #5.        The ocean supports a great diversity of life and ecosystems.  
(Fundamental Concept – a, d, e, f, h, i)*

*Essential Principle #6.        The ocean and humans are inextricably interconnected.  
(Fundamental Concept – e, f)*

The North Carolina National Estuarine Research Reserve is a cooperative program between the North Carolina Department of Environment and Natural Resources, Division of Coastal Management and the National Oceanic and Atmospheric Administration.



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[www.nccoastalreserve.net](http://www.nccoastalreserve.net)



Coastal Habitat blank page



Habitat cards

**Dune**

**Saltmarsh**

**Hard Bottom**

**Maritime  
Forest**

**Shell Bottom**

**Soft Bottom**

Habitat cards

**Submerged-  
Aquatic  
Vegetation**

**Beach**

**Water  
Column**

## Ecological clue cards

Many of the animals that make up this habitat filter the water for food and oxygen which helps clean the water.

Sea spray causes the trees and vegetation on the ocean side of this habitat to grow landward.

Scallops in this grassy habitat are countershaded: One valve is light colored and the other is dark colored. This helps them hide from predators.

Red drum, North Carolina's state fish, search for small crabs and fish between the shells in this habitat.

Dolphins can often be seen in this habitat chasing fish. The water is deep enough for them to swim.

Large fish, such as grouper and snapper, live in this habitat because there are rocky crevices to hide in.

## Ecological clue cards

This habitat has lots of grasses that have special glands that extrude salt from water taken up at the roots.

Flounder, skates, and stingrays camouflage themselves in this habitat by blending into the mud or sand.

Tiny fiddler crabs live in the salt marsh. They occasionally wander into the edge of the maritime forest.

Ghost crabs live on the beach and occasionally move into the dunes.

No plants can grow in this habitat because of fast water currents, moving sand and mud.

This habitat is in deep water where sponges and sea whip coral grow on the hard rocks and old shipwrecks.

## Ecological clue cards

The maritime forest is made up of small trees and thick bushes.

Small fish, including seahorses and needlefish use this grassy habitat for hiding. It is subtidal which means it is usually underwater near shell bottom and saltmarsh.

The plants in this habitat have very long roots to reach water which is deep below them through the sand. This habitat is not usually wet unless it rains.

The sand from the beach is blown onto the dunes by the wind.

The sand on the dunes is constantly shifting, creeping into the maritime forest.

This sandy habitat, often underwater, only has a few burrowing animals that live here because the currents keep anything else from staying. It is often found near shores and marshes.

## Ecological clue cards

Baby oysters (plankton) find empty shells in shallow water near marshes to attach and grow when they become sessile. Lots of them together form a reef.

Birds nest in trees in this habitat next to the salt marsh.

There are nine coastal habitats. The hard bottom habitat is in the deepest water.

The water in the marsh is much less salty than the ocean.

The level of water in the marsh changes with the tides.

Waves erode sand in this upland habitat only during large storms.

## Ecological clue cards

Oyster reefs help filter the water next to the marsh.

Small fish like to hide in submerged grasses not far from the oyster reefs.

Phytoplankton is carried through the inlets by the tide in this habitat. It connects many of the other habitats.

This grassy habitat, sometimes near oyster reefs, flows in the slow water currents. Pipefish are camouflaged next to the blades of grass.

Flounder like to lay still and watch for small shrimp only at high tide, when there is water covering this habitat. At low tide the mud has lots of dry mud puddles left where the flounders swam off.

This habitat helps to move fish and larva snails and crabs around so that they don't all grow in the same space.