

Cape Lookout National Seashore

Life on the Outer Banks

An Educator's Guide to Core and Shackelford Banks

Eighth Grade Edition



Prepared by the

Core Sound Waterfowl Museum and Heritage Center

Parks as Classrooms

The National Park Service's *Parks as Classrooms* program is a nationwide initiative to encourage utilization of the resources of America's national parks for teaching and learning. A visit to the National Park Service's homepage (<http://www.nps.gov>) reveals a myriad of learning opportunities available to our nation's students and teachers. Students will discover history and explore nature within the context of a changing world; and yet, within the boundaries of many parks, the hands of time are frozen to allow them a "snapshot" of the past. *Parks as Classrooms* focuses on bringing learning to life through hands-on, experiential opportunities that are student-friendly, field based, exciting and promote a sense of stewardship of park resources.

Cape Lookout's Classroom

Lying just east of the North Carolina mainland are the barrier islands that compose the famed Outer Banks. Cape Lookout National Seashore protects 56 miles of the southern-most sections of this barrier island chain. The park covers the long, narrow ribbon of sand running from Ocracoke Inlet in the northeast, to Beaufort Inlet in the southwest. These barrier islands are 56 miles long and consist mainly of three habitat zones: wide, bare beaches with low dunes covered by scattered grasses, flat grasslands bordered by dense vegetation, and large expanses of salt marsh alongside the sound.

Under the park's protective watch, habitats rich with a diversity of flora and fauna thrive. The waters surrounding the park are nurseries and feeding grounds for marine mammals and sea turtles, while spring and fall migrations bring many different species of birds. Shackleford Banks is home to a population of wild horses whose lineage can be traced back for hundreds of years to Spanish horses. No less diverse than the animal life are the plant species which have adapted to this harsh and constantly changing environment and flourish within the constant struggle against wind and sea.

Although Core Banks and Shackleford Banks are free of the intrusions of paved roads, resort facilities, and bridges to the mainland, vestiges of the Banks' rich human history are still clearly evident. From Portsmouth—one of the earliest trading ports in North Carolina—to the family graveyard on Shackleford Banks, students gain an understanding of the men and women who carved out a unique lifestyle along the shores of Core, Back, and Pamlico Sounds. Anchoring the entire story of human struggle along the Banks is the more than 150 year old Cape Lookout Lighthouse. Its presence denotes aspects of a lifestyle lived close to and in harmony with nature's elemental forces.

The Classroom Guide

This activity guide is one of a series to help teachers prepare their students for a visit to Cape Lookout National Seashore. Integrated within the science and social studies activities of the guide are selected narratives to give the teacher background information on this unique region of North Carolina. In addition to pre-visit, on-site and post-visit activities, the guide contains poems and songs of the region as well as alternate activities to spark a student's imagination and stimulate problem-solving skill development. Teachers are encouraged to contact the Cape Lookout National Seashore, Division of Interpretation, 131 Charles Street, Harkers Island, NC 28531 (252-728-2250) to schedule visits for their classes.

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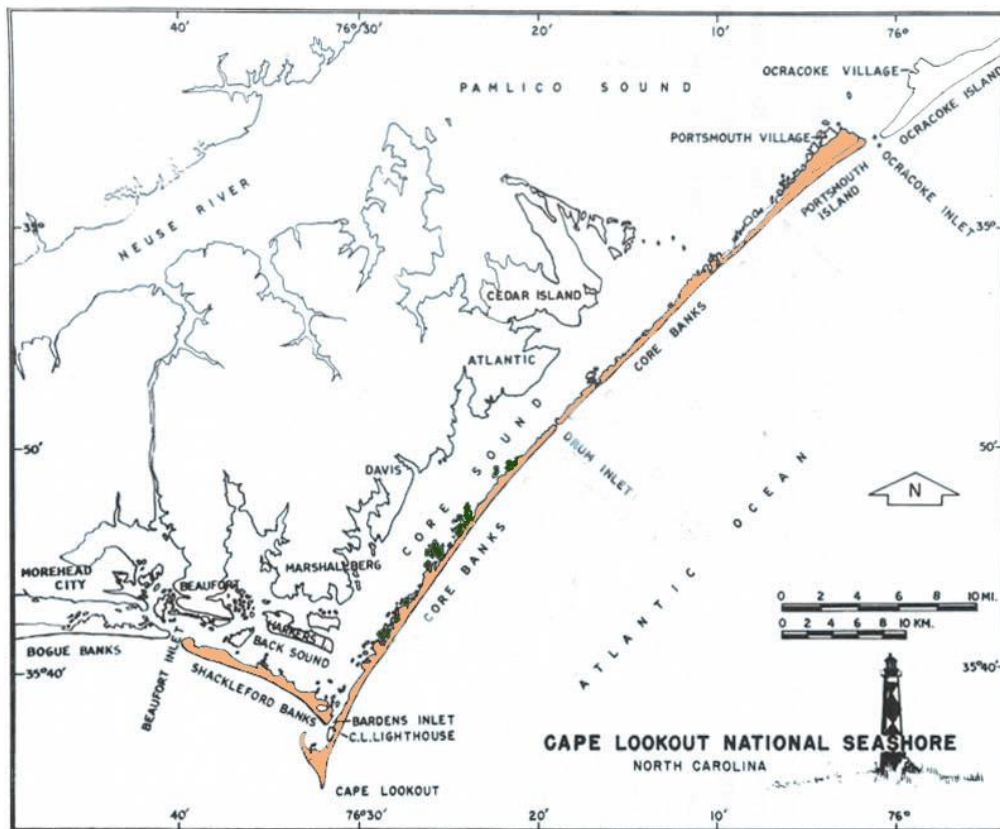
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Introduction

The barrier islands of Cape Lookout National Seashore—the southern stretch of the North Carolina Outer Banks—are some of the last remaining natural, undeveloped barrier islands in the world. While these islands are constantly changing, the National Seashore consists of three main islands that are relatively stable: North Core Banks, which includes Portsmouth Village at the northern end; South Core Banks, which includes the Cape Lookout Lighthouse and Cape Lookout Village Historic District at the southern end; and Shackleford Banks, the former site of Diamond City and Wades Shore, and the current home of the Shackleford horses.

Although uninhabited today, the Cape Lookout National Seashore was home to many people over the years. These islands, also called banks because they formed a border along the coast of North Carolina, were used as temporary fishing encampments by the Coree Indians, a tribe belonging to the Algonquian family. Later, they were used by maritime communities engaged in a variety of subsistence activities such as fishing, whaling, and trading. A series of storms in the early 1900s drove many residents, often called Bankers, to the mainland.

In the 1950s the state of North Carolina began purchasing land in the Core Banks area in order to establish a park, but realized by the early 1960s that they did not have the resources to maintain the park. The U.S. Congress authorized the establishment of a national park in this area in 1966. The North Carolina government transferred its property on Core Banks and Portsmouth Island to the federal government in 1974. Shackleford Banks was added in 1985, and is a proposed wilderness area. Today, the Cape Lookout National Seashore covers 56 miles of beach and over 29,000 acres of land and water—protecting the natural and cultural heritage of these islands for generations to come.

Life on the Outer Banks – 8th Grade Edition

Science Lesson – Water Quality and its Biological Impact

To best work with data you will collect while here on the barrier islands, you must first understand a little about the geography, history, migration and diversity of organisms that make up this fascinating microcosm we call Cape Lookout National Seashore!

Geography of Shackleford Banks

The island of Shackleford Banks is approximately 9 miles long and 1/4 to 1/2 of a mile wide. It is the southernmost island of Cape Lookout National Seashore and is two to five miles off the coast of the mainland, near Beaufort and Harkers Island, NC.

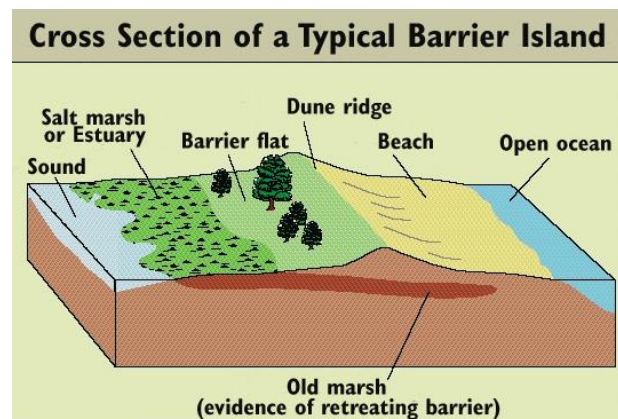
Shackleford Banks is a fairly typical barrier island, but has changed drastically since the turn of the 20th century. “It was formerly wooded in its entire length; this woodland, covering about 1250 acres, probably was composed chiefly of live oak, red cedar, yaupon holly and loblolly pine. The inner shore, on the eastward half of the island, was bordered by salt marshes” (Engles 1952). Today, the maritime forest (a forest near the ocean) is confined to the sound side of the island on the west end.

Although currently uninhabited, Shackleford Banks once supported fish camps and small communities of fishermen and whalers. It was also home to a relatively large number of cattle, horses, sheep, goats, and pigs. These animals were semi-feral, meaning that they were often owned, and may have been fed and watered, by people who lived on the island, but they were allowed to roam free. Today, only the horses remain as a wild population.

The location of Shackleford Banks makes it vulnerable to major weather events. Northeasterly storms (called Nor'easters) and hurricanes, which on average impact North Carolina once every four years, can be devastating to the island. Two of the most damaging hurricanes to hit Shackleford Banks struck in August of 1899 and September of 1933. The 1933 hurricane opened an inlet between Core Banks and Shackleford Banks which was the former location of North Carolina's only whaling community, Diamond City, which had been devastated by the 1899 hurricane. Survivors of that hurricane moved the remaining homes to the Promise Land region of Morehead City or to nearby Harkers Island. (Barnes 1995)

What is a Barrier Island?

Our barrier islands formed as a result of thousands of years of geological processes involving the uplifting of the Appalachian Mountains, erosion of mountain rock, transporting of the rock as sand to the ocean,



deposition of sand on the continental shelf, and the melting and formation of glaciers which result in the rise and fall of sea level.

Barrier islands are called such because they create a barrier between the open ocean and the mainland, protecting the mainland coastline from wind, waves, tides, currents, and storms such as hurricanes. They shelter estuaries that form behind the islands. They also allow marshes to build up in the quiet waters of the sound.

“Here at the water’s edge, where the land meets the sea with marsh and shoal, sandy beaches and muddy bottom, is where life begins for all coastal people.”

Karen Willis Amspacher, from *“The Spirit of the Tidewater Community”*

Inlets

The channel of water between adjacent barrier islands is known as an inlet. Inlets can be short-lived features created when water breaches across an island after a large storm such as a hurricane or a Nor'easter. They can also be longer lasting and provide a regular exchange between the sound or estuary and the open ocean: a gateway for a host of marine life and for boat traffic.

The boundaries of Shackleford Banks as a barrier island are currently defined by the Atlantic Ocean, Back Sound, and two inlets: Beaufort Inlet on the west end and Barden Inlet on the east end. Prior to the hurricane of 1933, Shackleford was connected to Core Banks by what was locally called “The Drain” or “The Ditch”. This was a low spot about 6 feet wide that during high tide, flooded with about a foot of water. This low spot did not stop human or animal traffic from crossing almost unhindered between Core and Shackleford Banks before 1933.



However, after the storm of September 1933, an inlet formed between Core and Shackleford Banks in the area of the ditch. This new inlet was found to be advantageous for the commercial and recreational fishing fleets, allowing them to access the ocean more quickly and readily. Locals successfully petitioned the state to keep the new channel open by dredging, the removal of sand from under the water's surface. Senator Barden led the project, and so the inlet was named for him in gratitude for his assistance.



The 1888 map shows Shackleford Banks without Barden Inlet. The 1966 map shows the inlet.

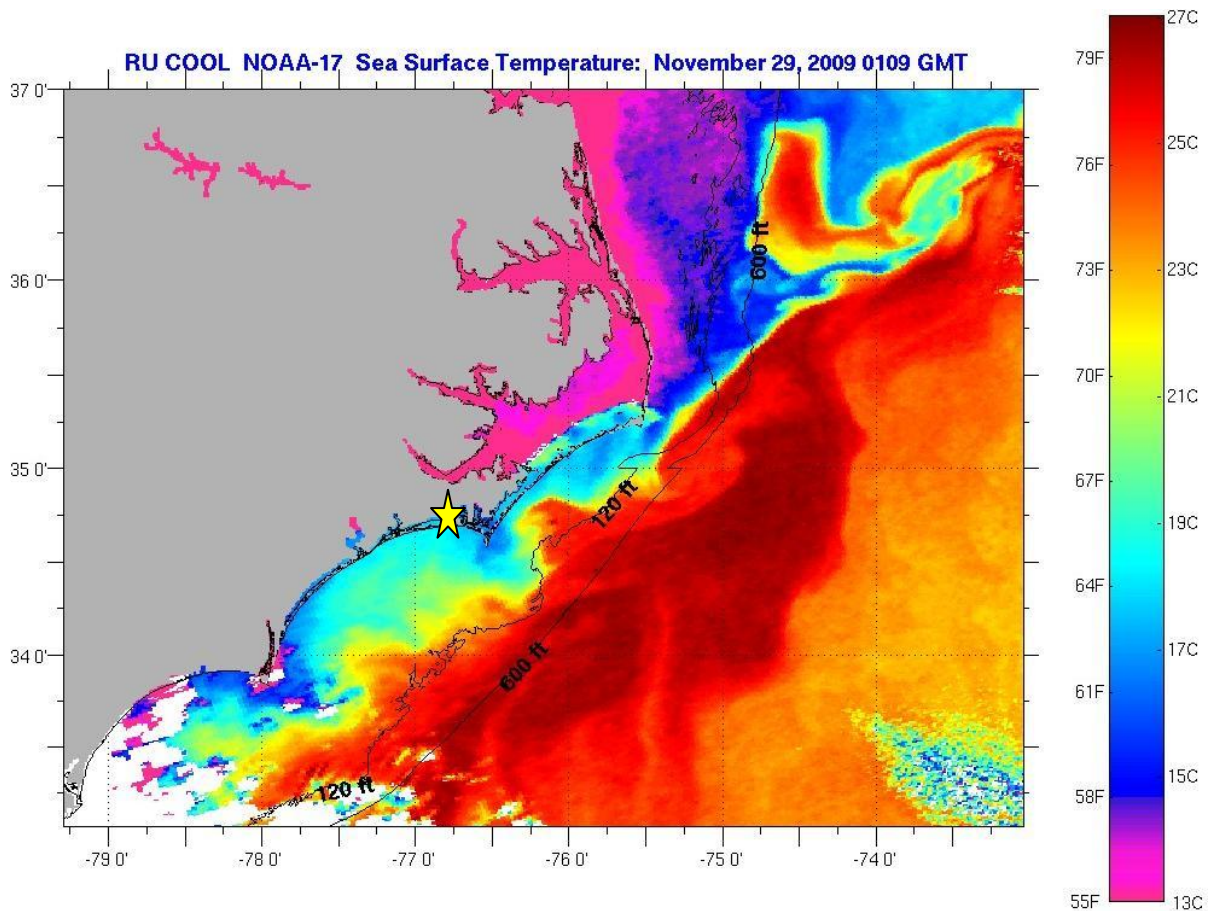
The Plants and Animals of Shackleford Banks

Cape Lookout is centrally located along the coast of North Carolina. It is home to a diverse array of animal and plant life due to the mild climate, the confluence of the Labrador Current and Gulf Stream, the geographic location along the North Atlantic flyway, and the intermingling of fresh and salt water in the vast estuary that forms behind the islands.

Ocean Currents

Near Cape Lookout warm water flowing north along the Gulf Stream meets cold water flowing south from the Labrador Current. The intersection of these two distinct masses of water creates a unique diversity of flora and fauna along the East Coast of the United States. Both northern and southern species of fish, invertebrates, plant life, marine mammals, and birds reside in the waters off Cape Lookout.

The map below shows the water temperature off the North Carolina coast during the month of November in 2009. Warmer water is shown in red or orange and cooler water is shown in blue and pink. Morehead City is marked with a star.



More sea surface temperature maps: http://marine.rutgers.edu/mrs/sat_data/?nothumbs=0

Hydrologic Information for Cape Lookout

Cape Lookout is bordered to the east and south by fully marine waters of the Atlantic Ocean. The waters to the east of Core Banks are called Raleigh Bay, and waters to the south of Shackleford Banks are considered to be in northern Onslow Bay (Mallin et al. 2000). To the north and west of the park are the waters of Ocracoke Inlet, Pamlico Sound, Core Sound, and Back Sound (Fig. 1), which are brackish water. Some of the coves and tidal creeks on the soundside of the park may be of variable estuarine salinities, depending on local rainfall. The east-west orientation of Shackleford Banks and its location eastward of Cape Lookout offers this island some protection from major storm events.

Hydrology affecting the Park - marine and freshwater

As mentioned, Core Banks consists of a series of long, narrow islands. All of the ocean side is sandy beach, with tidal flats behind the ocean beach on the northern three miles. In most of the other areas behind the sandy beach there is a dune field of variable width. The sound side of the islands is a mixture of shallow bays, tidal creeks, salt marshes, abbreviated beaches and sparse low lying forest. Shoreline salinities are marine, and tides are semidiurnal with an average range of 1.1 m (Dolan and Lins 1986). Freshwater rivers and lakes do not exist on Core Banks. However, numerous freshwater ponds exist on Core Banks, particularly in the northern section called Portsmouth Island (Schwartz 1982). These ponds vary widely in size, vegetation composition, pH, and water color (Schwartz 1982). A number of freshwater ponds are also found on Shackleford Banks, principally on the west end.

Groundwater resources

Barrier islands contain a lens of fresh water floating on salt water underneath the surface of the island (Leatherman 1988). Slacks are areas of low elevation between dunes, likely formed originally by wind blowouts, which are in contact with the water table (Leatherman 1988). Most of the ponds on Cape Lookout National Seashore appear to have this origination. Rainy periods expand the ponds and droughts reduce them. In contrast, Mullet Pond on the west end of Shackleford Banks was once part of Back Sound, and was formed by the closing of a former bay or lagoon (Schoenbaum 1982; Leatherman 1988).

The above information is important for teachers and students to understand so that while visiting the islands, they are aware that there will be no natural streams and that the lack of flowing fresh water adds to the adaptation needs of both flora and fauna that make Cape Lookout their home.

Diversity

The mixing of warm tropical currents and the colder Labrador Current brings a great deal of diversity to the Southern Atlantic coast, and accordingly, when studying the flora and fauna for this region, identification guides are needed for two regions: North Carolina to Brazil and North Carolina to Greenland. Some examples of the diversity of species in North Carolina can be found in the vegetation: bayberry plants and wax myrtles are present along our coast. Bayberry is a northern species and wax myrtle is a southern species. During the summer, it is not unusual for tropical fish, such as angelfish and sergeant majors, to visit the waters of Cape Lookout. Also, manatees—southern marine mammals—are occasionally seen in the summer and harbor seals—northern marine mammals—can be seen here at other times of the year. The diversity of plants and animals of Cape Lookout, in addition to its miles of undeveloped habitats, make Cape Lookout National Seashore a wonderful place to observe wildlife.

Another reason for the rich diversity of Cape Lookout is the wide variety of habitats that are present along this stretch of barrier islands. There are large stretches of beach, marsh, and sound, as well as upland habitats like maritime forest, dunes, and even freshwater ponds, that allow many organisms to survive here.



These butterflies were found on small red cedar trees on the backside of a dune at Cape Lookout. They were on their fall migration south to Mexico.



Loggerhead sea turtle hatchlings

Migration

Many animals use the Cape Lookout area habitats as migration layovers or destinations. Butterflies, hundreds of ducks, shorebirds, fish, loggerhead sea turtles, green sea turtles, and various species of whales are just some of the animals that visit during the year.

The waters surrounding Cape Lookout National Seashore are feeding grounds for marine mammals and sea turtles. Four sea turtle species—loggerhead, green, Kemp's Ridley, and leatherback—are sometimes seen feeding in area waters. Only the loggerhead sea turtle regularly nests on the park's beaches during the summer months. Sometimes, green sea turtles or leatherback sea turtles will nest here, too, but Kemp's Ridley sea turtles are only found in the water.



Common tern

Birds are the most easily observed animals at Cape Lookout. In addition to a large resident population of birds, spring and fall migrations bring a number of different species through the area. Stormy weather can also drive a few pelagic birds in from the open ocean for a visit.

The beaches and dunes of the Cape Lookout National Seashore are the nesting areas for many species of **birds**, including black skimmers, least terns, common terns, American oystercatchers, and piping plovers. Some of them are either threatened or endangered species. Other birds—such as willets, sanderlings, and ruddy

turnstones—are regularly seen feeding in the surf.

Mammals are common on the islands; rice rats, rabbits, river otters, and raccoons are some of the native species found here. On Shackleford Banks, there is a population of wild horses that have adapted to their environment over the past few hundred years.

Although salt and brackish water environments dominate the islands, a few fresh water habitats support tree frogs and Fowler's toads. Diamond-back terrapins prefer the salt marsh areas, and the grasslands are the ideal habitat for five-lined racerunner lizards and black racer snakes.



Rice rat

The Cape Lookout Bight area and Shackleford Banks have large dunes, and it is at Shackleford that you will find the most extensive maritime forest in the park. Vines are abundant and are often competing with the trees for sunlight. The changing geography of the island produces the strange and beautiful "ghost forests" on the ocean side of the groves: trees killed by advancing sand dunes and salt spray leave their sun-bleached "skeletons" protruding from the sand.



Maritime Forest on Shackleford Banks

The Salt Marsh



Teachers in the salt marsh adjacent to Barden Inlet at Cape Lookout

On the sound side of the island, whether it is along Core Sound, Back Sound, or Barden Inlet; the Cape Lookout Seashore has a marvelous marsh system that plays an important role in the life of the island. **There are nearly 200,000 acres of salt marsh along the North Carolina coast.** Salt marshes form in regions between the terrestrial and marine environments. Marshes serve as nurseries to a wide variety of organisms, some of which are notably threatened or marketed as important fisheries species.

The dominant plant in many of our coastal marshes is a tall, smooth grass-like cordgrass, scientifically named *Spartina alterniflora*. These grasses are adapted for harsh environmental conditions including flooding, desiccation and extreme temperature and salinity fluctuations. Additionally, the dense web of Cordgrass stems and roots holds the tiny grains of clay and silt in the marsh soil together helping to control erosion and grow the shoreline. The grasses absorb energy from waves and tides that hit the shore which also helps control erosion. Of the local marsh plants only smooth cordgrass is adapted to both the salinity and tidal fluctuations of the low tidal marsh. According to Teal and Teal (1983) the root membranes prevent the entry of much salt into the plant, and the cells within it absorb sodium chloride to maintain osmotic pressure. Special glands on the leaves excrete excess salt. Ducts in the stems carry oxygen to the roots of the plant where it is used to turn iron sulfides in the marsh mud into soluble iron compounds that can be used by the plant. The high iron requirement of smooth cordgrass is one of the factors that restricts it to the salt marsh (Adams 1993).



Glasswort (crustaforum.com)

A second plant common to the saltmarsh is known as Glasswort (*Salicornia spp.*). Glasswort is found throughout the marsh, mixed in with cordgrass or on the mud flats. Glasswort grows low to the ground (rarely over 2 feet tall) and has short fleshy green spikes that extend from a main stem. Three species are found in coastal marshes, one of which turns pink in the fall. Glasswort is also called sea pickle and is an edible water storing plant. Glasswort concentrates the toxic salt in its branch tips and then turns brown and falls off. (Witherington 2011)

An important, yet often overlooked animal in the salt marsh, is the ribbed mussel. The shell of a ribbed mussel is shaped like a long round corrugated triangle. Ribbed mussels are usually found partially buried in a muddy or sandy substrate. They anchor themselves with byssal threads, which are mucous strands attached from the mussel to the substrate. Gills aid a pair of siphons to bring water into the mussel. These gills are lined with cilia, which remove oxygen from the water, and trap plankton and organic matter. As the mussel processes the food, inorganic material is recycled back into the mud. This concentrated inorganic material helps to enrich the surrounding mud and contributes to salt marsh growth. Ribbed mussels play an important role in the salt marsh as filter feeders by removing bacteria, heavy metals, and toxins from the water column. More importantly, ribbed mussels exhibit a cooperative relationship with other plants and animals of the marsh. In particular, mussels establish habitat within the root structures of smooth cordgrass and provide essential nutrients that enhance the plants. Ribbed mussel beds also provide support and better stability for the root structures of smooth cordgrass allowing the plants to withstand harsh storm or ice conditions (De Flores 2008).

Experimental removal and addition of mussels in marsh habitats has demonstrated that mussels stimulate both aboveground and belowground *Spartina alterniflora* production. Mussel density is positively correlated with increased grass height, biomass, and flowering of the *Spartina* cordgrass. (Bertness 1984)

Biodiversity plays a role in the marsh environment. Biodiversity is defined as the quantity of plant and animal species found in a given environment. Biodiversity changes over both distance and time. Biodiversity that varies from place to place is called 'variation over distance'.

Variations between years or seasons are called 'variations over time'. ([eco-online/novascotia](#))

We must remember therefore, that any data collected creates a mere snapshot of the life in that salt marsh for a given set of conditions under which it was collected.

With this background information it is the hope of the Cape Lookout National Park Service and the Core Sound Waterfowl Museum and Heritage Center, that as teachers you will be able to come to Cape Lookout National Seashore and provide your students with meaningful interactions with the sound and beaches you find here.

Life on the Outer Banks – 8th Grade Edition
Water Quality and Its Biological Impact
Pre-Site Science Activity: Part 1
Teacher Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity and bio-indicators

Description

Using the Identification Key provided, students will learn to identify several common pond organisms by body appearance. This familiarity will aid in the activities with live specimens later.

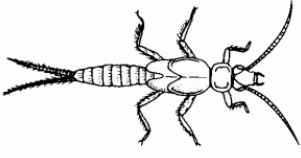


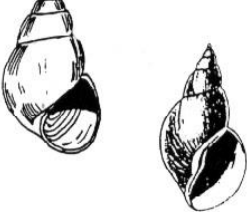
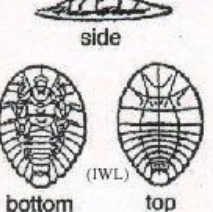
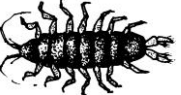
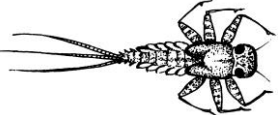

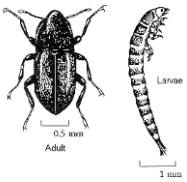

Materials:

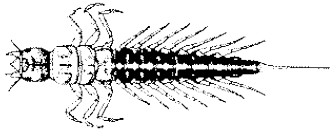
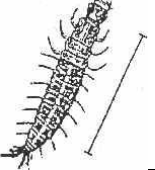
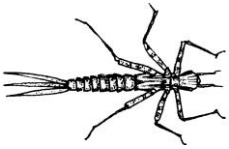
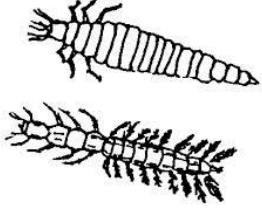

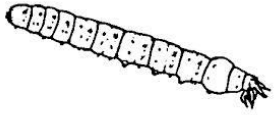
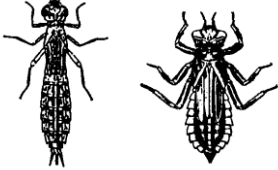


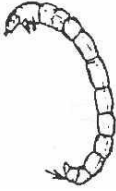

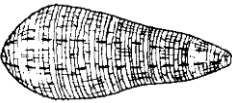

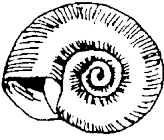
- Pencils
- Macro Invertebrate Identification Chart Worksheet (Handout 1) to use for identifying and recording organism information. ** As an FYI- using Handout 4 (from Part 2) can also be used if students will be continuing to find out how these organisms serve as indicators of water health.
- Paper versions of pond organisms
 - Enlarge and copy samples from the Macro Invertebrate Identification Chart Worksheet on to cardstock or glue paper versions to appropriate sized index cards.
 - Make a set of organism flash cards for each group you have in class. Laminate (if possible) for reuse. Place each set of cards in a Ziploc plastic bag for easy distribution and organization.
- Macro Invertebrate Key Activity sheet (Handout 2) to determine the organism's identification
- Samples of live pond organisms collected early (if possible) to use for comparison and reinforcement of the information shared in the Macro Invertebrate Key

Directions:

Students will be divided into small groups and given a Ziploc set of pond organism pictures. Using the flash card technique established by the teacher, students will view the cards and use the Macro Invertebrate Key to identify the species.

Handout 1: Macro Invertebrate Chart

Pond Organism	Identification	Pond Organism	Identification
			
			
			
			
			

Pond Organism	Identification	Pond Organism	Identification
			
			
			
			
			
			
			

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Water Quality and Its Biological Impact
Pre-Site Science Activity: Part 1
Student Edition

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Using the Identification Key provided, you will learn to identify several common pond organisms by body appearance. This familiarity will aid in the activities with live specimens later.

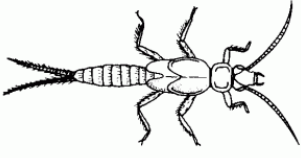


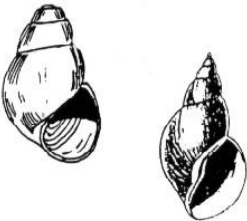
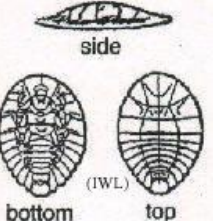
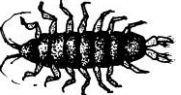
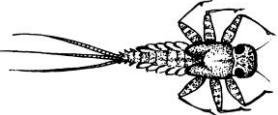

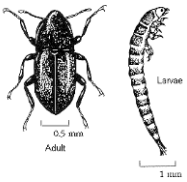

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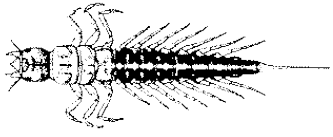
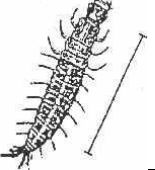
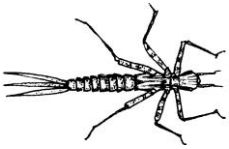
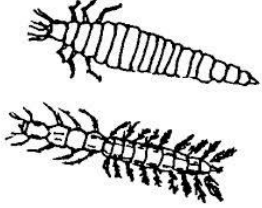

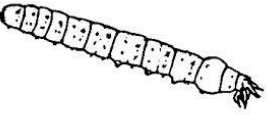
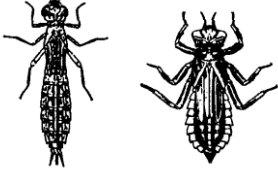


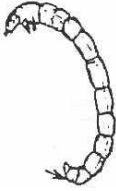

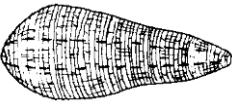

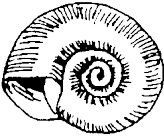
- Pencils
- Macro Invertebrate Identification Chart Worksheet (Handout 1) to use for identifying and recording organism information. ** As an FYI- using Handout 4 (from Part 2) can also be used if students will be continuing to find out how these organisms serve as indicators of water health.
- Paper versions of pond organisms provided by the teacher in a Ziploc bag.
- Macro Invertebrate Key Activity sheet (Handout 2) to determine the organism's identification
- Samples of live pond organisms collected early (if possible) to use for comparison and reinforcement of the information shared in the Macro Invertebrate Key

Directions:

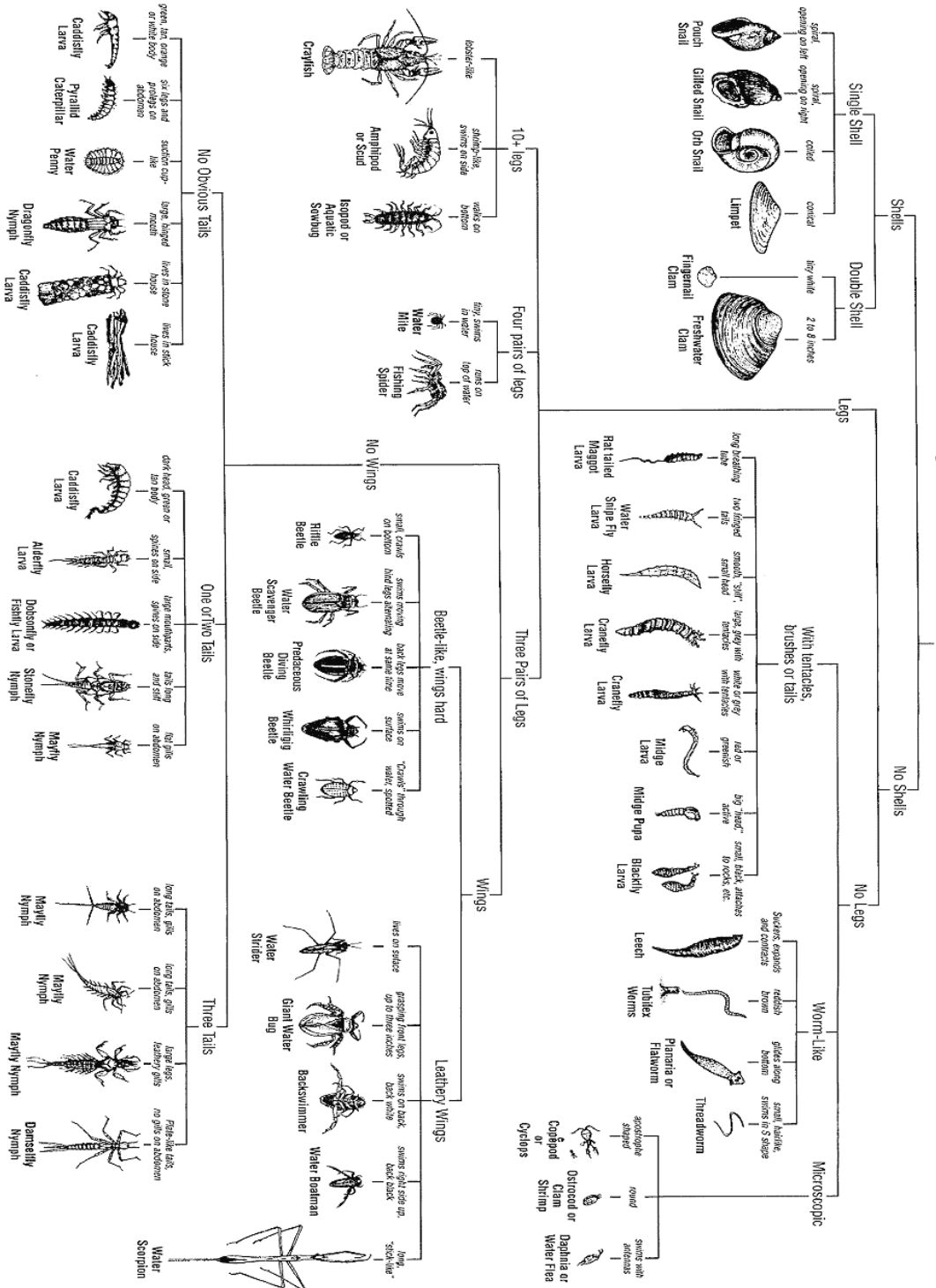
Following the teachers directions, you will divide into small groups and use a Ziploc set of pond organism pictures. Using the flash card technique established by the teacher, you will view the cards and use the Macro Invertebrate Key to identify the species found on Handout 1.

Student Handout 1: Macro Invertebrate Chart

Pond Organism	Identification	Pond Organism	Identification
			
			
			
			
			

Pond Organism	Identification	Pond Organism	Identification
			
			
			
			
			
			
			

Key to Macroinvertebrate Life in the River



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Student Handout 2: Macro Invertebrate Key

Life on the Outer Banks – 8th Grade Edition
Water Quality and Its Biological Impact
Pre-Site Science Activity- Part 2
Teacher Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.2 Summarize evidence that Earth’s oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems

8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity and bio-indicators

8. E.1.4 Conclude that the good health of humans requires: monitoring of the hydrosphere, water quality standards, methods of water treatment, maintaining safe water quality and stewardship

Description:

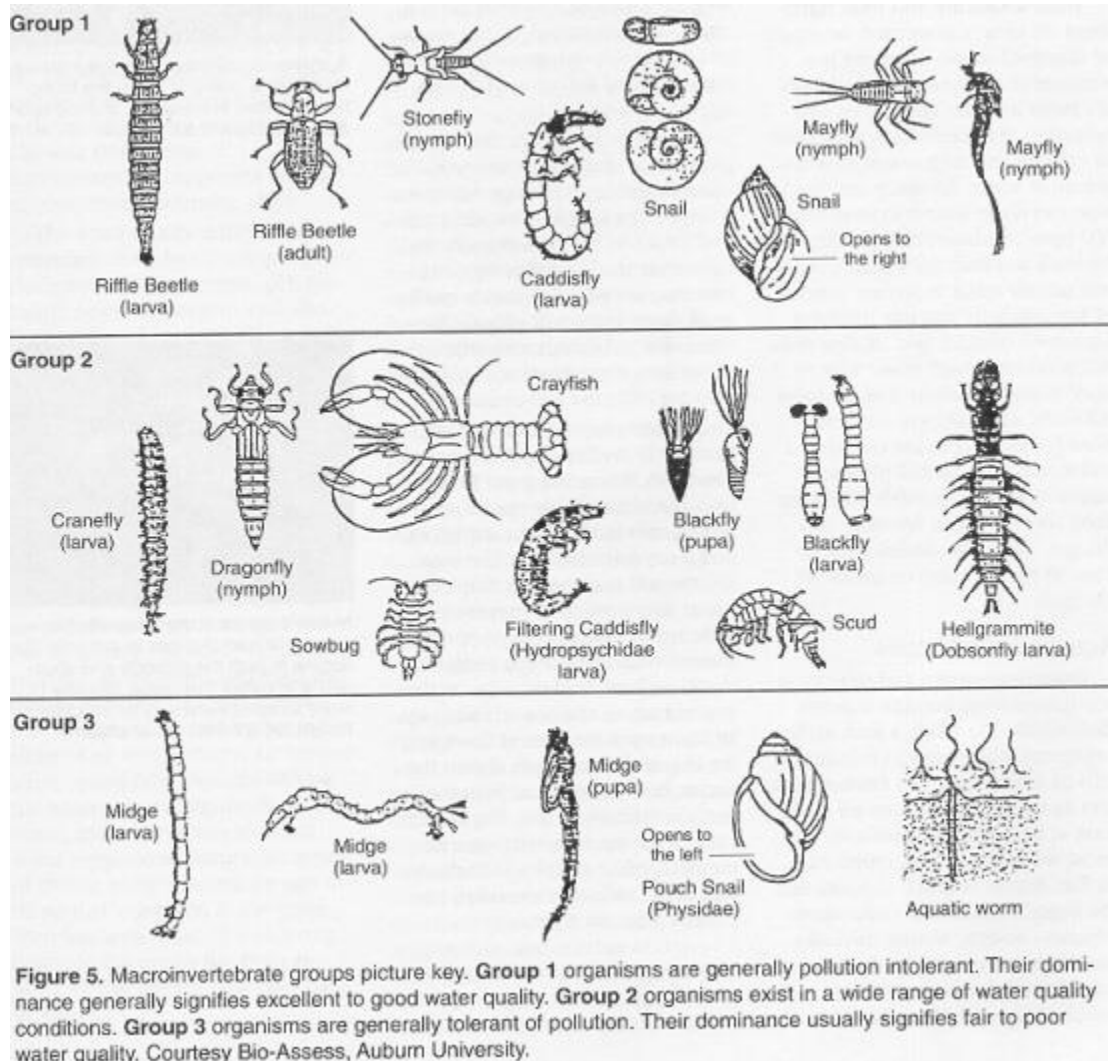
Having used the Identification Key provided, students learned to identify several common pond organisms by looking at body characteristics and behaviors. Now students will compare those organisms to the Freshwater Invertebrates and Water Quality Chart (Handout 3) to determine where each fits as an indicator of the “health” level of the water source and properly indicate that information on Handout 4. By completing this activity and those to follow- students will see that even without chemical tests- the creatures that occupy the water source show us the viability of those waters.

Materials:

- Pencils
- A completed Macro Invertebrate ID Sheet (Handout 1) of organisms from Part 1 Activity
- Freshwater Invertebrates and Water Quality Chart (Handout 3)
- Macro Invertebrate Chart with Water Quality Levels (Handout 4)

Handout 3: Freshwater Invertebrates and Water Quality

Freshwater Invertebrates and Water Quality



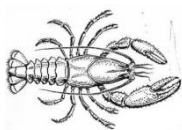
<http://www.aces.edu/pubs/docs/A/ANR-0911/>

Group 4: This group is the most highly tolerant of organisms for poor water quality.

Earthworms



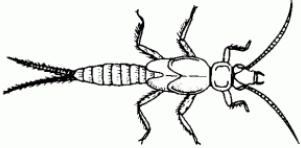
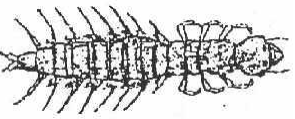

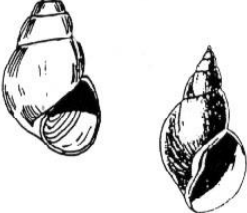
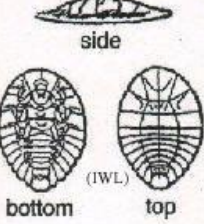
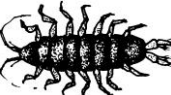
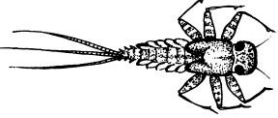

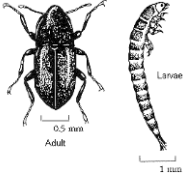
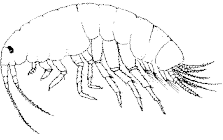
Crayfish

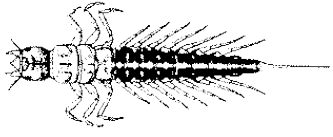
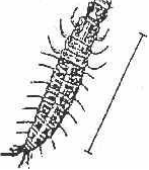
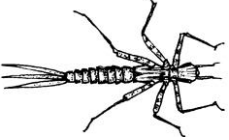



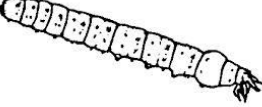
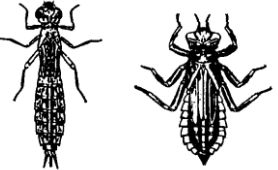


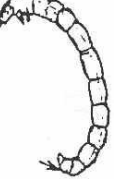



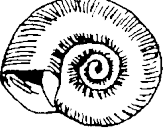


Snails



Handout 4: Macro Invertebrate Chart with Water Quality Levels (for Part 2)

Pond Organism	Identification	Pond Organism	Identification
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>

Pond Organism	Identification	Pond Organism	Identification
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level
			
	Water Quality Level		Water Quality Level

Life on the Outer Banks – 8th Grade Edition
Water Quality and Its Biological Impact
Pre-Site Science Activity- Part 2
Student Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.2 Summarize evidence that Earth’s oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems

8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity and bio-indicators

8. E.1.4 Conclude that the good health of humans requires: monitoring of the hydrosphere, water quality standards, methods of water treatment, maintaining safe water quality and stewardship

Description:

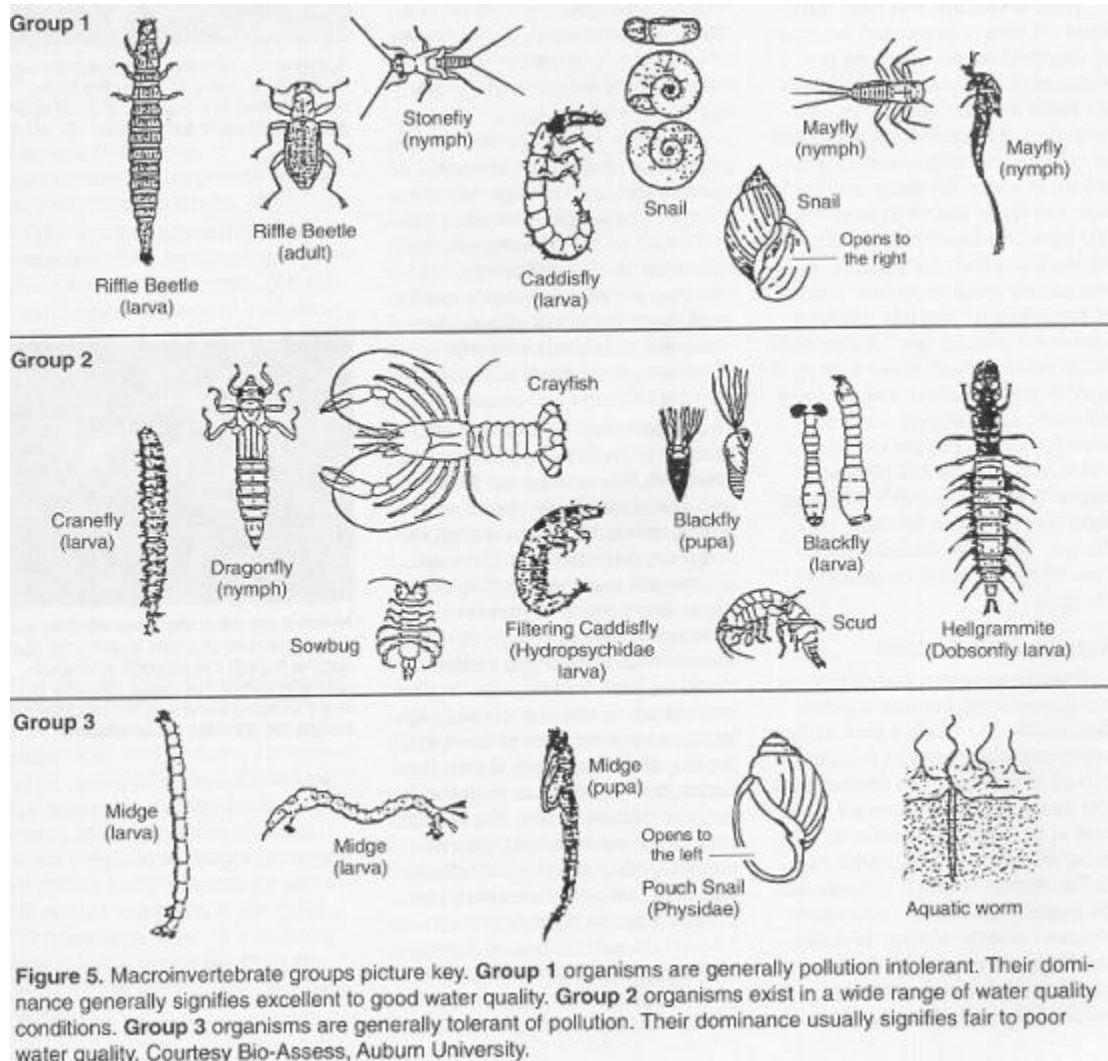
Having used the Identification Key provided, you can now identify several common pond organisms by looking at body characteristics and behaviors. You will now compare those organisms to the Freshwater Invertebrates and Water Quality Chart (Handout 3) to determine where each fits as an indicator of the “health” level of the water source and properly indicate that information on Handout 4.

Materials:

- Pencils
- A completed Macro Invertebrate ID Sheet (Handout 1) of organisms from Part 1 Activity
- Freshwater Invertebrates and Water Quality Chart (Handout 3)
- Macro Invertebrate Chart with Water Quality Levels (Handout 4)

Student Handout 3: Freshwater Invertebrates and Water Quality

Freshwater Invertebrates and Water Quality



<http://www.aces.edu/pubs/docs/A/ANR-0911/>

Group 4: This group is the most highly tolerant of organisms for poor water quality.

Earthworms



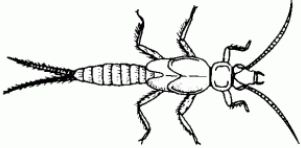
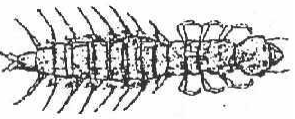

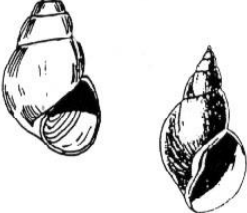
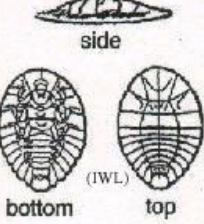
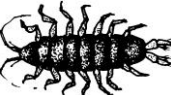
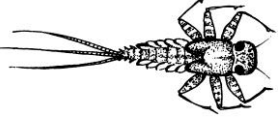

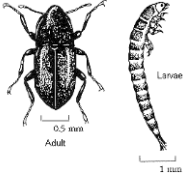
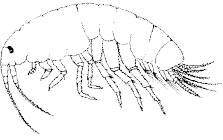
Crayfish



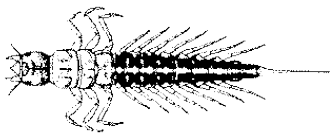
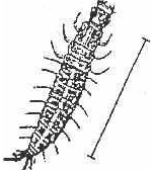
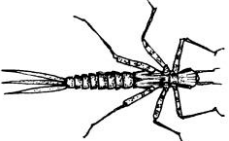
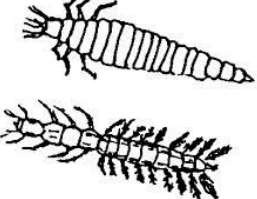

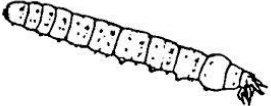
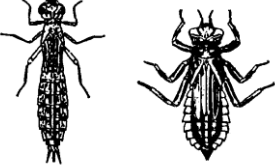


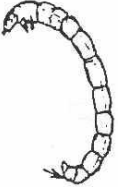

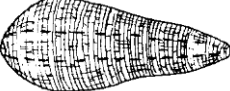

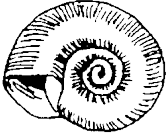
Snails



Student Handout 4: Macro Invertebrate Chart with Water Quality Levels

Pond Organism	Identification	Pond Organism	Identification
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>
	<p>Water Quality Level</p>		<p>Water Quality Level</p>

Student Handout 4 Continued....

Pond Organism	Identification	Pond Organism	Identification
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level
	Water Quality Level		Water Quality Level

Life on the Outer Banks – 8th Grade Edition
Water Quality and Its Biological Impact
On-Site Science Activity: Collect and Categorize
Teacher Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

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8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity and bio-indicators

8. E.1.4 Conclude that the good health of humans requires: monitoring of the hydrosphere, water quality standards, methods of water treatment, maintaining safe water quality and stewardship

Description:

Students will investigate the factors that determine the growth and survival of aquatic/marine life. After identifying several common pond/salt marsh organisms, students will use sampling techniques and indicators to assess the water quality of the Willow Pond.

Materials:

- Macro Invertebrate Identification Sheets (Handouts 1,2& 4)/Field Guides
- Pencils, Highlighters
- Clipboards
- dip nets/sieves
- Assorted collecting trays/containers (white is best)
- Magnifying lenses
- Eye droppers
- Forceps
- Thermometer

Directions: Collecting Samples

- 1) A dip net sweep is the primary method used to collect aquatic macro invertebrates.
- 2) Conduct this sweep in an area where the bottom has not yet been disturbed.
- 3) Using the dip net, sweep through the water column for a distance of one meter.
- 4) Bump the net against the bottom substrate three times (at the beginning, the middle, and the end of the one meter sweep) to dislodge and collect organisms from the sediment. Keep the net

submerged.

- 5) At the end of the sweep, turn the net so the opening is facing the surface of the water and lift the net out of the water, so no organisms escape.
- 6) If the net is clogged discard the sample and resample in another undisturbed location.
- 7) Perform the measured sweep as quickly as possible to prevent aquatic organisms from escaping out of the net. The sweep should be completed within 5 seconds.
- 8) Transfer all material collected in the net into a bucket by placing the bucket half way into the water and turning the net inside out inside the bucket. Place material in and on the net into the water in the bucket. Check the net and remove clinging creatures.
- 9) Collect three replicate samples in undisturbed location areas.
- 10) Place sample materials into jars, aquariums or on trays to examine and identify.

Identifying Organisms

Use the handouts and field guides provided to identify the types of organisms and thus help with identifying the health of the water resource used (Handout 5)

Life on the Outer Banks – 8th Grade Edition
Water Quality and Its Biological Impact
On-Site Science Activity: Collect and Categorize
Student Edition

North Carolina Essential Standards for 8th Grade Science

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Materials:

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- Pencils, Highlighters
- Clipboards
- dip nets/sieves
- Assorted collecting trays/containers (white is best)
- Magnifying lenses
- Eye droppers
- Forceps
- Thermometer

Directions:

Collecting Samples

- 1) Take a water and air temperature measurement and record on Handout 5 you will be using.
- 2) Use the dip net, to sweep through the water column for a distance of one meter.
- 3) Bump the net against the bottom substrate three times (at the beginning, the middle, and the end of the one meter sweep) to dislodge and collect organisms from the sediment. Keep the net submerged.

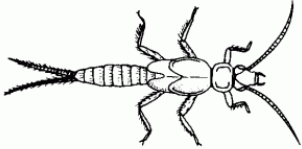
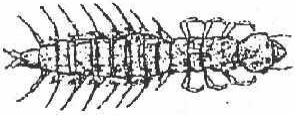

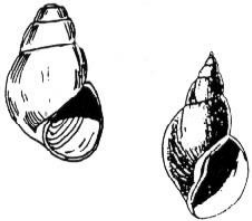
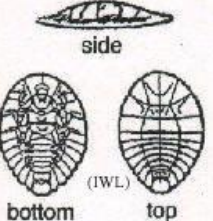
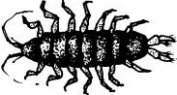
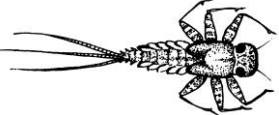

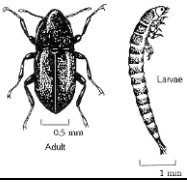

- 4) At the end of the sweep, turn the net so the opening is facing the surface of the water and lift the net out of the water, so no organisms escape.
- 5) If the net is clogged discard the sample and resample in another undisturbed location.
- 6) Do this sweep as quickly as possible to prevent aquatic organisms from escaping out of the net. The sweep should be completed within 5 seconds.
- 7) Transfer all material collected in the net into a bucket by placing the bucket half way into the water and turning the net inside out inside the bucket. Place material in and on the net into the water in the bucket. Check the net and remove clinging creatures.
- 8) Collect three replicate samples in undisturbed location areas.
- 9) Place sample materials into jars, aquariums or on trays to examine and identify with forceps.

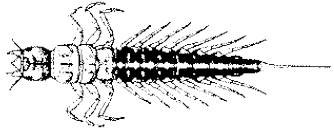
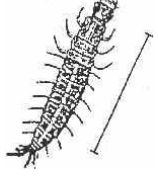
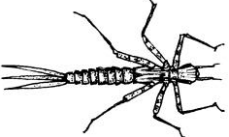



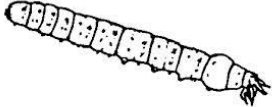





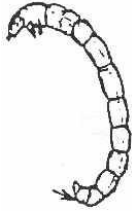

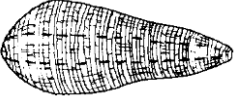


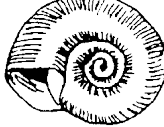
Identifying Organisms

Use the handouts and field guides provided to identify the types of organisms and thus help with identifying the health of the water resource used by completing Handout 5 (which follows)



Student Handout 5: Macro Invertebrate Chart with Water Quality Levels

Pond Organism	Identification	Pond Organism	Identification
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
Date: Water Temperature:		Time: Air Temperature:	

Pond Organism	Identification	Pond Organism	Identification
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)	 	Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
 	Number Collected (Tally)	 	Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level
 	Number Collected (Tally)		Number Collected (Tally)
	Water Quality Level		Water Quality Level

Life on the Outer Banks – 8th Grade Edition
Water Quality: Chemical Analysis
On-Site Science Activity
Teacher Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems

8.E.1.3 Predict the safety and potability of water supplies in North Carolina based on physical and biological factors, including: temperature, dissolved oxygen, pH, nitrates and phosphates, turbidity and bio-indicators

8. E.1.4 Conclude that the good health of humans requires: monitoring of the hydrosphere, water quality standards, methods of water treatment, maintaining safe water quality and stewardship

Description:

Students will investigate the factors that determine the growth and survival of aquatic/marine life. Students will use chemical indicators to assess the water quality of the Willow Pond and/or the salt marsh of Back Sound.

Materials:

- Pencils, Highlighters
- Clipboards with a Chemical Testing Sheet in Protective Sleeve
- Chemical Testing Worksheet
- LaMotte Low Cost Water Monitoring Kit
- Thermometer
- Refractometer

Directions:

- 1) Divide the class into smaller manageable groups of the teacher's choosing. Assign a group number or letter and record the results
- 2) Each group will go to an area of the marsh or the Willow pond and complete the analysis of the water following the directions noted in the manual for each test.
- 3) Within each group, members will need to divide up the work by having a recorder and then testers for each of the 5 tests needed. Tests provided in the kit will be run for Turbidity/ Dissolved Oxygen/ pH/ Nitrates/ and Phosphates.

Life on the Outer Banks – 8th Grade Edition
Water Quality: Chemical Analysis
On-Site Science Activity
Student Edition

North Carolina Essential Standards for 8th Grade Science

8.E.1 Understand the hydrosphere and the impact of humans on local systems and the effects of the hydrosphere on humans.

8.E.1.2 Summarize evidence that Earth's oceans are a reservoir of nutrients, minerals, dissolved gases, and life forms: • Estuaries • Marine ecosystems

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Description:

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Materials:

- Pencils, Highlighters
- Clipboards with a Chemical Testing Sheet in Protective Sleeve
- Chemical Testing Worksheet
- LaMotte Water Monitoring kit
- Thermometer
- Refractometer

Directions:

- 1) You teacher will divide you into groups and assign a group number or letter so your data can be listed in the proper area of the data chart.
- 2) Your group will go to an assigned area of the marsh or the Willow pond and complete the analysis of the water following the directions noted in the manual for each test.
- 3) You will want to divide up the work by having a recorder and then testers for each of the 5 tests needed. Tests provided in the kit will be run for Turbidity/ Dissolved Oxygen/ pH/ Nitrates/ and Phosphates.
- 4) The recorder can begin by taking an air temperature measurement, followed by a water temperature measurement and record that onto the chart provided.

Life on the Outer Banks – 8th Grade Edition
Mutual Admiration in the Salt Marsh
On-Site Science Activity
Teacher Edition

North Carolina Essential Standards 6th -8th Science

8.L.1 Understand how organisms interact with and respond to the biotic and abiotic components of their environment.

8.L.1.3 Summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including: coexistence and cooperation, competition (predator/prey), parasitism, mutualism

Description:

Introductory information has pointed out plants and animals that occupy the salt marshes along North Carolina's coast and in particular the salt marshes of Core Sound within the Cape Lookout National Seashore. Students will investigate the specific relationships between smooth Cordgrass, and ribbed mussels, and glasswort.



Materials:

1 Meter Quadrats – stored on site at Cape Lookout
Clipboard and pencil

Directions:

1. Students will get into groups of 2- 4 people. (Groups of 4 is most efficient- but divide up as class size dictates)
2. For a random sampling of data, groups should spread out throughout the marsh.
3. At each sampling site, a member of each group will randomly toss the one-meter quadrat onto the ground within the study area and adjust the strings to create four equal sampling sections (quadrants).

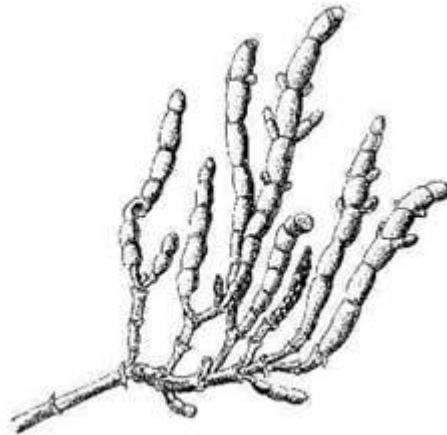
4. Using the data sheet provided herein, and beginning in the top left corner of each appropriate quadrant, each group member records the number of ribbed mussels, glasswort and cordgrass plants within their designated area. This data should be tally numbers as well as location placement within the quadrant.

Images of the 3 organisms students will observe:

Cordgrass:



Glasswort:



Ribbed Mussels:



Life on the Outer Banks – 8th Grade Edition
Mutual Admiration in the Salt Marsh
On-Site Science Activity
Student Edition

North Carolina Essential Standards 6th -8th Science

8.L.1 Understand how organisms interact with and respond to the biotic and abiotic components of their environment.

8.L.1.3 Summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including: coexistence and

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Introductory information has pointed out plants and animals that occupy the salt marshes along North Carolina's coast and in particular the salt marshes of Core Sound within the Cape Lookout National Seashore. Students will investigate the specific relationships between smooth Cordgrass, and ribbed mussels, and glasswort.



Materials:

1 Meter Quadrats – stored on site at Cape Lookout
Clipboard and pencil

Directions:

You will get into groups of 2- 4 people. (Groups of 4 is most efficient- but adjust to your class size)

For a random sampling of data, groups should spread out throughout the marsh.

At each sampling site, a member of your group will randomly toss the one-meter quadrat onto the ground within the study area and adjust the strings to create four equal sampling sections (quadrants).

Using the data sheets provided, Handouts 1 and 2, begin at the top left corner of each appropriate quadrant. Each group member will record the number of ribbed mussels, glasswort and cordgrass plants within their designated area by placing the letters R, C and G where found. Give this data as both tally numbers and letter symbols.

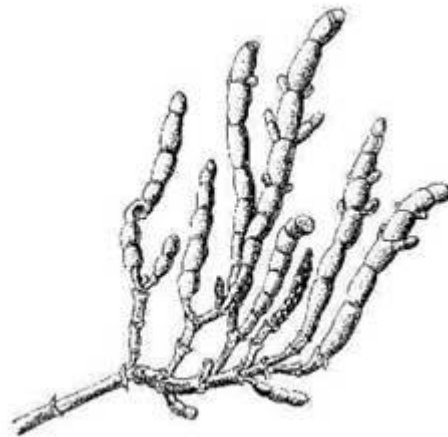
Life on the Outer Banks – 8th Grade Edition
Mutual Admiration in the Salt Marsh
On-Site Science Activity
Student Edition

Handout #1: Student Image Referral Sheet

Cordgrass:



Glasswort:



Ribbed Mussels:



Life on the Outer Banks – 8th Grade Edition
Mutual Admiration in the Salt Marsh
Post-Site Science Activity

North Carolina Essential Standards 6th -8th Science

8.L.1 Understand how organisms interact with and respond to the biotic and abiotic components of their environment.

8.L.1.3 Summarize the relationships among producers, consumers, and decomposers including the positive and negative consequences of such interactions including: coexistence and cooperation, competition (predator/prey), parasitism, mutualism

Description:

Introductory information in the curriculum guide pointed out plants and animals that occupy the salt marshes along North Carolina's coast and in particular the salt marshes of Core Sound within the Cape Lookout National Seashore. Students have gathered data regarding the proximity of smooth Cordgrass, ribbed mussels, and glasswort to one another in various random locations in the salt marsh. Students will now try to analyze the specific relationships between smooth Cordgrass, and ribbed mussels, and glasswort and see if the introductory information supports or contradicts their findings. This can be done in a large group format using the board for listing all feedback.

Does there appear to be a benefit between the proximity of these organisms?

What could be added to this lab activity that would help to draw conclusions? (any measuring that should have happened? Do you think time of year makes any difference?)

Life on the Outer Banks – 8th Grade Edition
In Seiner or Out Seiner: Saving Your Seining Sanity
On-Site Science Activity
Teacher Edition

North Carolina Essential Standards 6th -8th Science

Science as Inquiry

Traditional laboratory experiences provide opportunities to demonstrate how science is constant, historic, probabilistic, and replicable. Student engagement in scientific investigation provides background for understanding the nature of scientific inquiry. In addition, the science process skills necessary for inquiry are acquired through active experience. The process skills support development of reasoning and problem-solving ability and are the core of scientific methodologies.

Vocabulary to Remember:

Seine Net- a fishing net that hangs vertically in the water with floats at the top and weights at the bottom edge. The ends are usually affixed to poles and are kept angled back at about 45⁰ as the net moves along.

Outseiner- person who goes out farthest from shore

Inseiner- person who stays closest to shore



Description:

Steps for using a seine net:

- 1) To begin, the outseiner walks the net out into the water perpendicular to the shore until it is stretched out between the outseiner and inseiner. The net should be mostly submerged.
- 2) The outseiner and inseiner walk in synch in one direction keeping the net tilted back at about a 45⁰ angle with the bottom weights dragging on the bottom of the sound to keep creatures from slipping under the net.
- 3) When the net is ready to be brought to shore, the outseiner brings his end of the net around parallel with the shore.

Life on the Outer Banks – 8th Grade Edition
In Seiner or Out Seiner: Saving Your Seining Sanity
On-Site Science Activity
Student Edition

North Carolina Essential Standards 6th -8th Science

Science as Inquiry

Traditional laboratory experiences provide opportunities to demonstrate how science is constant, historic, probabilistic, and replicable. Student engagement in scientific investigation provides background for understanding the nature of scientific inquiry. In addition, the science process skills necessary for inquiry are acquired through active experience. The process skills support development of reasoning and problem-solving ability and are the core of scientific methodologies.

Materials:

Seine net with attached poles

Clipboard and pencil

Biological Sampling (Seine Net) Data Sheet

Fish and Sound Creature ID Guide Books such as *Living Beaches of Georgia and the Carolinas* by Blair and Dawn Witherington

Directions

You will follow the steps listed below to bring samples of organisms in to shore to identify. Tally marks will be used on the Seine Net Data Sheet provided.

Steps for using a seine net:

- 1) To begin, the outseiner walks the net out into the water perpendicular to the shore until it is stretched out between the outseiner and inseiner.
The net should be mostly submerged.
- 2) The outseiner and inseiner walk in synch in one direction keeping the net tilted back at about a 45⁰ angle with the bottom weights dragging on the bottom of the sound to keep creatures from slipping under the net.
- 3) When the net is ready to be brought to shore, the outseiner brings his end of the net around parallel with the shore.
- 4) Keeping the net angled and the weights dragging on the sediment, the outseiner and inseiner move in to shore and the sorting can begin.

Life on the Outer Banks - 8th Grade Edition
Man versus the Ocean – Saving Lives, Then and Now
Pre-Site Visit Social Studies and Language Arts Activity

North Carolina Essential Standards and Clarifying Objectives

8 English/Language Arts

ELA-Literacy.RI.8.2: Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.

ELA-Literacy.W.8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

ELA-Literacy.W.8.2.b: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

ELA-Literacy.W.8.2.c: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

8 Social Studies

8.H.3: Understand the factors that contribute to change and continuity in North Carolina and the United States

8.H.3.2: Explain how changes brought about by technology and other innovations affected individuals and groups in North Carolina and the United States (e.g. advancements in transportation, communication networks and business practices).

8.H.3.4: Compare historical and contemporary issues to understand continuity and change in the development of North Carolina and the United States.

Description of Language Arts Lesson:

This activity will take 2 to 3 class periods of approximately 50 minutes.

Students will read and learn about the Surfmen of the Cape Lookout Life-Saving Station. They will compare and contrast the lives of these men to those serving in the U. S. Coast Guard today. Students will research various categories of the two groups and complete a chart that will help them organize the information to be used in a directed writing assignment or a short expository essay (or both, as time and the teacher's pacing guide allow). In the assignment or essay, students will use transitional words (often, subordinating conjunctions or conjunctive adverbs) to clearly convey relationships between and within the categories researched (comparing, contrasting).

Vocabulary:

U. S. Life-Saving Service
Revenue Cutter Service
U. S. Coast Guard
breeches buoy

Lyle Gun
tally board
faking box
coordinating conjunctions

subordinating conjunction
conjunctive adverbs
coherence

Materials:

computers with internet access and/or other research materials

Four good websites are listed below. The first two are about Cape Lookout.

<http://www.nps.gov/calohistoryculture/surfm.htm>

<http://www.friendsofcapelookout.com/lifesavingstation1887.php>

<http://www.gocoastguard.com/about-the-coast-guard/discover-our-roles-missions>

<http://beachbum.homestead.com/life-savingstations/equipment/breechesbuoyrescue.html>

“Life-Saving Then and Now” worksheet

“Comparing and Contrasting” worksheet

paper and pencils

Directions for the Language Arts Lesson:

Day 1: Begin with a large group discussion about the Coast Guard, especially its life-saving responsibilities. (KLW?) Direct the discussion toward the students’ knowledge of the Life-Saving Service Station that was built at Cape Lookout in 1888. How was the station manned? Who manned the station? How did they go about rescuing people on endangered ships? What equipment did they use? Etc.

1. Pass out the “Life-Saving Then and Now” worksheet. Share your final product expectations for them. (Will their final product be the completion of the Comparing and Contrasting worksheet or a short expository essay?)
2. Assign students to study groups of 3 to 5 students. Have groups research to complete as much of the worksheet as possible in the remaining class time. Ask students to give special attention to the areas of communication (a possible future lesson) and rescue equipment (this will be reinforced during the on-site visit).

Day 2: Review the students’ present use of transition words such as “and,” “but” (conjunctions), “because”(subordinating conjunction), etc. Using “but” gives the reader the expectation that the “direction” of the writing or conversation is going to change. Using “because” generally gives the reader/listener the expectation that the direction will not change, as he/she is expecting a “cause and effect” relationship between the dependent and independent clauses of the sentence. The direction that “and” sends the reader/listener is often, unpredictable when used to join clauses.

1. Pass out the “Comparing and Contrasting” worksheet.
2. Discuss the students’ understanding of how the “transition words” on the worksheet create a “change in direction” (contrasting) or “stay the course” (comparing) expectation for the reader/listener. Use some unambiguous examples to help cement the concept.
3. Using the research (“Life-Saving Then and Now” worksheet) from the previous day, have students compare and contrast the life-saving techniques used by the Life-Saving Service and the present-day Coast Guard by using transition words to correctly form complex sentences.
4. Allow students to share good uses of the transition words.

Day 3 (if students are writing an essay): Talk to the students about the two strategies or techniques that good writers use to organize/write a comparing/contrasting essay. In either case, an introductory paragraph or two should begin the essay. The first strategy would be to give an overview of each of the two topics/subjects independently. In the present case, several paragraphs about the Life-Saving Service to be followed by (often, an equal number of) paragraphs about the life saving responsibilities of the Coast Guard. Then, in subsequent paragraphs, show the comparisons and the contrasting points. The second strategy is to (again, after the introductory paragraphs) compare or contrast the particulars of the topics/subjects. That is, to explain the broader topics (in our case, the Life-Saving Service and the Coast Guard) by immediately showing the similarities and differences between the two subjects and thereby, the subjects are presented side by side. A few closing/concluding paragraphs should be added, regardless of the strategy used.

1. Let students choose the strategy they prefer to organize their essay. Or, assign half the class to use the subject by subject strategy and the other half to use the side by side strategy.
2. Encourage/Require the students to use the transition words and, where appropriate, the sentences written for the previous assignment.
3. Complete the essay.

Description of the Social Studies Lesson:

This activity will take 2 class periods of approximately 50 minutes. (Unless this is added on to the Language Arts lesson—in which case, skip “day 1” and go directly to “day 2.) Students will read and learn about the Surfmen of the Cape Lookout Life-Saving Station. They will compare and contrast the lives of these men to those serving in the U. S. Coast Guard today. Students will research various categories of the two groups and complete a chart that will help them organize the information to be used to help students better understand the work of these two government entities and how governmental branches make decisions about public security and preparedness for events that endanger people’s lives.

Vocabulary:	U. S. Department of the Treasury	breeches buoy
U. S. Life-Saving Service	U. S. Department of Commerce	Lyle Gun
Revenue Cutter Service		Tally board
U. S. Coast Guard	U. S. Department of Homeland Security	faking box

Materials:

computers with internet access and/or other research materials

Four good websites are listed below. The first two are about Cape Lookout.

<http://www.nps.gov/calohistoryculture/surfmen.htm>

<http://www.friendsofcapelookout.com/lifesavingstation1887.php>

<http://www.gocoastguard.com/about-the-coast-guard/discover-our-roles-missions>

<http://beachbum.homestead.com/life-savingstations/equipment/breechesbuoyrescue.html>

“Life-Saving Then and Now” worksheet

“Deciphering Puzzle based on Semaphore” worksheet

Semaphore Alphabet Chart based on the “circle system”

paper and pencils

Directions for the Social Studies Lesson:

Day 1: Begin with a large group discussion about the Coast Guard, especially its life-saving responsibilities. (KLW?) Direct the discussion toward the students’ knowledge of the Life-Saving Service Station that was built at Cape Lookout in 1888. How was the station manned? Who manned the station? How did they go about rescuing people on endangered ships? What equipment did they use? Etc.

1. Pass out the “Life-Saving Then and Now” worksheet. Instruct students that they should all complete as much of the worksheet as possible, but that they will be working throughout this activity in groups, sharing research that they have found.
2. Assign students to study groups of 3 to 5 students. Have groups research to complete as much of the worksheet as possible in the remaining class time. Ask students to give special attention to the areas of communication and rescue equipment. (These will be the major focus of “day 2” and will be reinforced during the on-site visit).

Day 2: Begin by reviewing the different life-saving techniques that the Life-Saving Service employed due to the lack of advanced (motorized, electric) technology. Brainstorm some other ideas students may have (non-motor, non-electric) that could have made a difference for the Life-Saving Service. (inflatable tires, steel cable, etc.) Studying the exploits of the surfmen and the coast guard in saving lives is extraordinarily satisfying, but unfortunately, very few of the drills can be practiced by students. This leads to the issue of communication. Discuss the problems in the communication process between the Service and the boat. The students may remember that a telegraphic communication system was used by the surfmen before radios became omnipresent. Telegraphy is communication across a distance without the exchange of physical material. Thus, the pony express and pigeon posting would not be considered telegraphy. In 1888, telegraphy in the form of the telegraph and the telephone were being used, but not wirelessly between a ship and the shore. Today, digital communication has given us myriad examples of telegraphy—from television to text messaging to sharing video and photos

in e-mails. But in the nineteenth century, flaghoist signaling was a common form of telegraphy, but when in a hurry, semaphore using two flags was the solution. Semaphore was invented in the early 1800s and by the mid-1800s, the International Code was adopted using patterned flags (flaghoist signaling) to spell out words or combinations of specific flags designated specific emergencies or contingencies. As you read about the daily lives of the surfmen, it was stated that they were required to spend time each Tuesday learning or reviewing the signaling flag systems. The circle system of learning the semaphore alphabet is shared below. An interesting adaptation of semaphore has become a standard symbol all of us know and understand. In the late 1950's the Peace Symbol was designed by overlapping the semaphore N and D (Nuclear Disarmament).

1. Pass out one "Deciphering Puzzle based on Semaphore" worksheet and a Semaphore study sheet to each group.
2. Have the groups attempt to decipher the messages using the Semaphore Alphabet Chart. (answer for deciphering puzzle: The breeches buoy could be a zip wire for a low ropes course.)
3. Using sheets of paper as flags, have the groups try sending one word messages to each other telegraphically across the room or outdoor area, if you have access nearby.

Cape Lookout Social Studies
 Life-Saving Then and Now

Historian: _____
 Date: _____

Use the chart below to help organize information that you will be finding in your reading and research. Use the prior knowledge or insights members of your group may have to help complete the chart. Although you may share research information in your group, each member of the group will need her/his own completed chart.

	Then: U. S. Life-Saving Service circa, 1890	Now: U. S. Coast Guard 2014
Who can join? What is the Service/Guard looking for in a recruit?		
What training and practice is required of Surfmen/Guardsmen? What skills must they acquire?		
When is the rescue initiated? How does the Service/Guard become informed that rescue is needed?		
How does the Service/Guard communicate with the distressed boat/ship?		
What types of rescue equipment may be employed in the rescue?		

Cape Lookout Language Arts
 Comparing and Contrasting Words

Writer: _____
 Date: _____

The list below shows words and phrases that are often used as transitional words to compare and contrast. Using these words usually adds coherence to a writer’s work. Other conjunctions, adverbs, and prepositional phrases can be used to add coherence in a written piece by creating smooth connections between ideas and to make for a better read. Moreover, therefore, and meanwhile are such words that can also compare and contrast depending on the author’s intent.

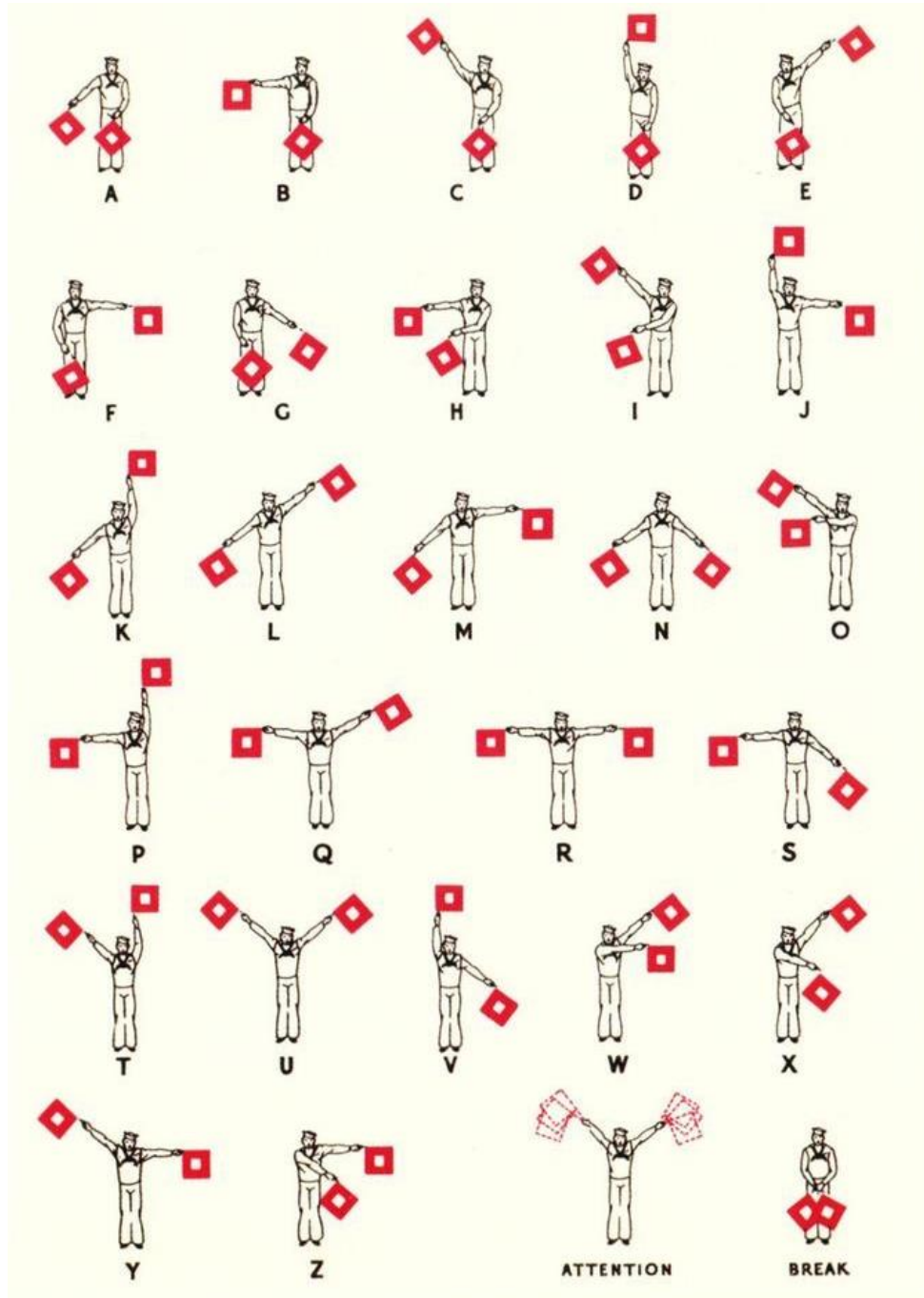
Study the words in the chart below. On the back of this page, chose different transition words from the chart to write six good transitions using the research you did earlier. Three of the transitions should show comparisons and three should contrast ideas. Some of the transition words may join clauses into one sentence (forming a complex sentence), but others work better transitioning from one complete sentence to another.

Example: Today’s U. S. Coast Guard has many roles including searching for rescue opportunities far and wide. Conversely, the Life Saving Service of the 1800s waited for rescue situations to come to them.

	Comparing Words	Contrasting Words
Coordinating conjunctions		But Yet
Subordinating conjunctions, Conjunctive adverbs, Prepositional phrases	Also By the same token In like manner In the same way In similar fashion Likewise Similarly	A clear difference Although Conflicting viewpoint Conversely Despite Differs from Even so Even though For all that However In another way In contrast In spite of Instead Nevertheless On one hand On the other hand On the contrary Rather Regardless Still Still another While

Semaphore Alphabet Chart

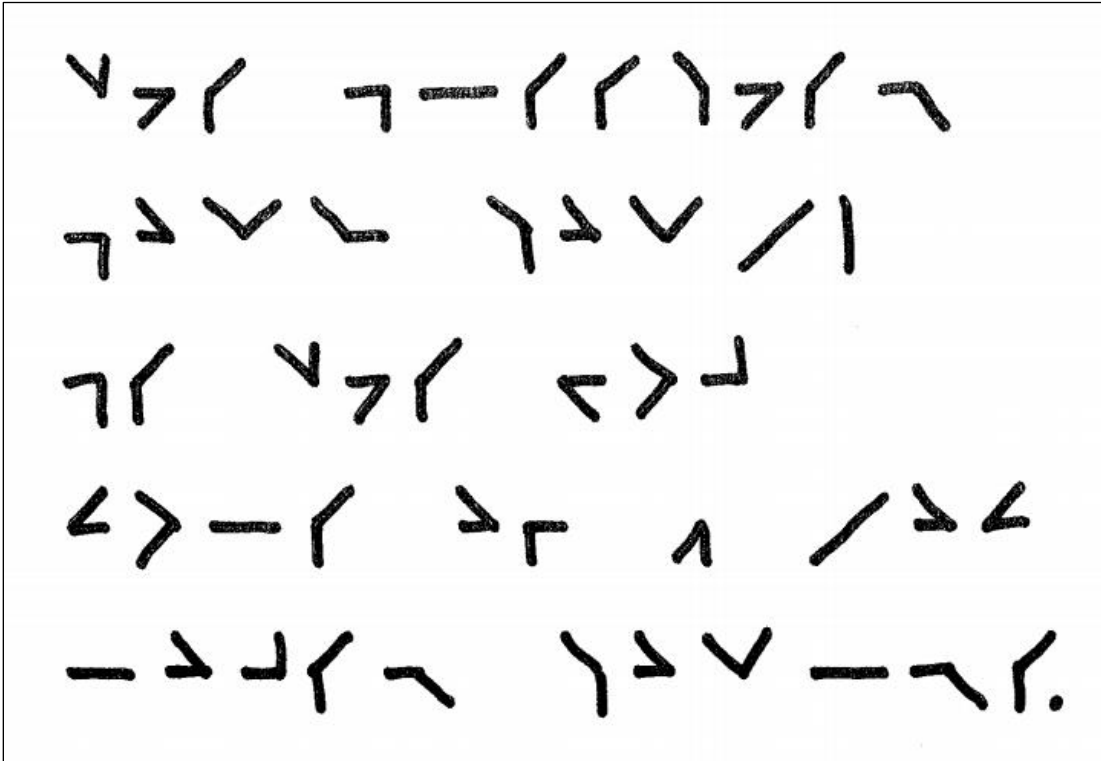
A way to learn the bulk of the alphabet in semaphore is to think of a circle (the signaler's chest being the center of the circle and her/his feet at 0°) or clock (with the signaler's head at 12:00 and her/his feet at 6:00). The 1st circle (A – G) starts with one flag always at 0° (6:00). The 2nd circle (H – N, J is an exception) starts with one flag always at 45° (7:30). The 3rd circle (O – S) starts with one flag always at 90° (9:00). The other letters do not fit well into the circle system and must be learned individually.



Cape Lookout Social Studies
Deciphering Semaphore

Cryptographer: _____
Date: _____

The message below is written in Semaphore. Try translating it to our alphabet. Then write a short message in Semaphore at the bottom of this page and trade messages with a classmate.



Write a message in Semaphore to a classmate. Leave spaces between words. Use standard punctuation or leave extra spaces between sentences.

Life on the Outer Banks - 8th Grade Edition
Man versus the Ocean – Communicating to Save Lives
On-Site Visit Social Studies and Language Arts Activity

North Carolina Essential Standards and Clarifying Objectives
8 English/Language Arts

ELA-Literacy.RI.8.2: Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.

ELA-Literacy.W.8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

ELA-Literacy.W.8.2.b: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

ELA-Literacy.W.8.2.c: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

8 Social Studies

8.H.3: Understand the factors that contribute to change and continuity in North Carolina and the United States

8.H.3.2: Explain how changes brought about by technology and other innovations affected individuals and groups in North Carolina and the United States (e.g. advancements in transportation, communication networks and business practices).

8.H.3.4: Compare historical and contemporary issues to understand continuity and change in the development of North Carolina and the United States.

Description:

Students will visit Cape Lookout National Seashore and tour the Harkers Island Visitors' Center and the Keeper's Quarters Museum. In the museum, students will recognize and review equipment and materials used by the U. S. Life-Saving Service in their rescue procedures. Students will complete the scavenger hunt which is available at the Light Station Visitor's Center. If the visit can be scheduled during the climbing season (May through September), students will climb the Lighthouse. Semaphore flags will be available upon request for class reenactments of surfmen telegraphic communication practice (even if you don't come on a Tuesday). When scheduling your trip, you may request access to the "rescue wagon" which contains models of the equipment used by the Surfmen.

Pre-visit reservations should be made by visiting the Cape Lookout National Seashore website. <http://www.nps.gov/caloi/index.htm>

An academic fee waiver can be requested for student groups wishing to climb the Lighthouse. This waiver was specifically designated for 4th and 8th grade students because the curriculum is so closely tied to North Carolina history, geography, and economics.

Life on the Outer Banks - 8th Grade Edition
Man versus the Ocean – Everyday Heroes
Pre-Site Visit Social Studies and Language Arts Activity

North Carolina Essential Standards and Clarifying Objectives

8 English/Language Arts

ELA-Literacy.RI.8.2: Determine a central idea of a text and analyze its development over the course of the text, including its relationship to supporting ideas; provide an objective summary of the text.

ELA-Literacy.W.8.2: Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

ELA-Literacy.W.8.2.b: Develop the topic with relevant, well-chosen facts, definitions, concrete details, quotations, or other information and examples.

ELA-Literacy.W.8.2.c: Use appropriate and varied transitions to create cohesion and clarify the relationships among ideas and concepts.

8 Social Studies

8.H.3: Understand the factors that contribute to change and continuity in North Carolina and the United States

8.H.3.2: Explain how changes brought about by technology and other innovations affected individuals and groups in North Carolina and the United States (e.g. advancements in transportation, communication networks and business practices).

8.H.3.4: Compare historical and contemporary issues to understand continuity and change in the development of North Carolina and the United States.

Description:

Students will read one of two articles (or both) written about people who make a difference in the lives of others and are called heroes by the authors of the articles. They will then examine the lives of the surfmen from that perspective and write a rough draft argument for surfmen being “everyday heroes” similar to the ones praised in the articles.

Materials:

articles: *Heroes with Solid Feet* by Kirk Douglas; *Where I Find My Heroes* by Oliver Stone
notes and worksheets from previous lessons.

paper and pencils

Directions:

After reading the article(s) individually or aloud, discuss the characteristics of the heroes in the article. On the whiteboard write some shared short responses to the following questions: What makes them a hero? How do we distinguish a hero from non-hero? Can everyone be a hero? Why or why not? Then consider the situation of surfmen. Do surfmen generally have the characteristics that we have established for heroes? Are all surfmen heroes? Would a surfman need to have risked his life at some point to be considered a hero? Would a surfman be a hero if he had never had to participate in a rescue?

1. Have students write a short rough draft argument for when a surfman would be a hero from their perspective.
2. Share some different arguments with the class

Heroes with Solid Feet

By Kirk Douglas; Published by *The New York Times*, April 23, 2001

BEVERLY HILLS, Calif.:

Recently, I journeyed to Berlin to accept the Golden Bear, a lifetime achievement award, from the Berlin Film Festival. Those awards make me smile — lifetime achievement? Is this the end? Not long ago my son Michael received a lifetime achievement award. If you last long enough, you may get dozens.

I accepted the Golden Bear because I was curious to see Berlin again. During my earlier visits there, the city had been divided by a wall.

In a press conference at the film festival, one journalist asked loudly, "As a Jew, how does it affect you to be in Berlin?" A montage of pictures we have all seen raced through my mind. Shattering glass windows, Hitler salutes, Jews being herded into freight cars, piles of emaciated Jews, ovens, dark smoke coming out of chimneys.

"The last century has been a disaster," I said. "My generation did not do a good job — so many wars, so much killing and of course, here in Germany, the Holocaust, perhaps the worst crime of all, the attempt to annihilate a people as a final solution."

They were all listening.

"But I don't think children should be punished for the sins of their fathers. We should do all we can to give our children that chance."

The questioner persisted. "So why did you come back to Berlin?" I ignored him. But the question bothered me. I didn't know a proper reason for a Jew to be in Berlin.

The audience at the awards ceremony gave me a standing ovation when I gave my speech in German, a language I learned when I made two movies in Germany. The papers were filled with my smiling face. The television reports were very complimentary. That night my wife and I had a wonderful Wiener schnitzel with some friends and a Jewish friend of theirs, Inge Borck, who lived in Berlin throughout the war. She was such a happy person, smiling and laughing. But when I was told that her parents and grandparents had all been killed in the concentration camps, I blurted out, "So why do you stay in Berlin?"

Smiling, she gave me this answer: "I owe that to the little heroes."

"I don't understand," I said. With a sigh, she came over and sat closer.

"When the Gestapo came to get them, my parents sent me to a small hotel to save my life. The owner was the first little hero. She kept me safe for a couple of nights. When it became dangerous, I met my second little hero. Or should I say heroine? She was our former housekeeper. She hid me for a while and endangered her own life. Then I lived in a cloister. My little heroes were the nuns who took care of me when I was very sick. They never asked questions. When the situation became dangerous, my next little hero was a policeman who didn't agree with the Nazis. All through the war, I was lucky to find little heroes who helped me till the Russians came in."

"So, why do you stay here?" I asked again. She looked at my perplexed face and said, "I thought about it, but I feel I owe it to the little heroes who helped me. Not everyone here was wicked."

Her story had a great impact on me. Of course, we are always looking for a big hero to emulate, and very often we see them topple from clay feet. How much better to reach for the little heroes in life — and to try to be one. It's not always as hard as it was for the people in wartime Berlin. You aren't obligated to save a life — you only need to try to help other people.

And if everyone tried — well, just think of the lifetime achievements.

Where I Find My Heroes

By Oliver Stone; Published by *McCall's Magazine*, November 1992

It's not true that there are no heroes anymore—but it is true that my own concept of heroism has changed radically over time. When I was young and I read the Random House biographies, my heroes were always people like George Washington and General Custer and Abraham Lincoln and Teddy Roosevelt. Men, generally, and doers. Women—with the exception of Clara Barton, Florence Nightingale, and Joan of Arc—got short shrift. Most history was oriented toward male heroes.

But as I've gotten older, and since I've been to war, I've been forced to reexamine the nature of life and of heroism. What is true? Where are the myths?

The simple acts of heroism are often overlooked—that's very clear to me not only in war but in peace. I'm not debunking all of history: Crossing the Delaware was a magnificent action. But I am saying that I think the meaning of heroism has a lot to do with evolving into a higher human being. I came into contact with it when I worked with Ron Kovic, the paraplegic Vietnam vet, on Born on the Fourth of July. I was impressed by his life change, from a patriotic and strong-willed athlete to someone who had to deal with the total surrender of his body, who grew into a nonviolent and peaceful advocate of change in the Martin Luther King, Jr., and Gandhi tradition. So heroism is tied to an evolution of consciousness....

Since the war, I've had children, and I'm wrestling now with the everyday problems of trying to share my knowledge with them without overwhelming them. It's difficult to be a father, to be a mother, and I think that to be a kind and loving parent is an act of heroism. So there you go—heroes are everyday, common people. Most of what they do goes unheralded, unappreciated. And that, ironically, is heroism: not to be recognized.

Who is heroic? Scientists who spend years of their lives trying to find cures for diseases. The teenager who says no to crack. The inner-city kid who works at McDonald's instead of selling drugs. The kid who stands alone instead of joining a gang, which would give him an instant identity. The celebrity who remains modest and treats others with respect, or who uses his position to help society. The student who defers the immediate pleasure of making money and finishes college or high school. People who take risks despite fears. People in wheelchairs who don't give up....

We have a lot of corruption in our society. But we mustn't assume that everything is always basely motivated. We should allow for the heroic impulse—which is to be greater than oneself, to try to find another version of oneself, to grow. That's where virtue comes from. And we must allow our young generation to strive for virtue, instead of ridiculing it.

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