South Carolina
Our Amazing Coast

(South Carolina Map, South Carolina Aquarium's Standards-based Curriculum, http://scaquarium.org)

Teacher Resources and Lesson Plans
Grades 3-5

Revised for South Carolina Teachers
By Carmelina Livingston, M.Ed.
Adapted from *GA Amazing Coast* by Becci Curry

*Lesson plans are generated to use the resources of *Georgia's Amazing Coast* and the *COASTeam Aquatic* Curriculum. Lessons are aligned to the SOUTH CAROLINA SCIENCE CURRICULUM STANDARDS and are written in the "Learning Focused" format.

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Our Amazing Coast

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Grade 3

Big Idea – Habitats & Adaptations

3rd Grade
Enduring understanding:
Students will understand that there is a relationship between habitats and the organisms within those habitats in South Carolina.

South Carolina Science Academic Standards
Scientific Inquiry
3-1.1 Classify objects by two of their properties (attributes).
3-1.4 Predict the outcome of a simple investigation and compare the result with the prediction.

Life Science: Habitats and Adaptations
3-2.3 Recall the characteristics of an organism's habitat that allow the organism to survive there.
3-2.4 Explain how changes in the habitats of plants and animals affect their survival.

Earth Science: Earth's Materials and Changes
3-3.5 Illustrate Earth's saltwater and freshwater features (including oceans, seas, rivers, lakes, ponds, streams, and glaciers).

Activating Strategy:

Play "Our Amazing Coast" BINGO Game (in pairs or groups). Teacher will use either reference word cards (cut out pictures to call out) or reference chart (check off words as you call out) when playing BINGO.

Acquisition Lessons

Lesson 1

- How are the habitats (marsh, swamp, coast, and Atlantic Ocean) different?

    1. Students will work in cooperative groups to research and report attributes of one of the following habitats: marsh, swamp, coast, and Atlantic Ocean using the "What's that Habitat?" graphic organizer.
    2. Students will present their research to classmates.
    3. Class will complete the graphic organizer "Every Habitat is Valuable!" listing the attributes of each habitat.

Lesson 2

- How do green plants live and thrive in different habitats of SC?
- How do animals live and thrive in different habitats of SC?

    1. Each group of students will be assigned several different pages from "Coastal Connections Fact Sheets".
    2. Students will work collaboratively to list ways that animals and plants thrive in a habitat, creating a "Four Flap Book" for selected species. ***The front flaps will include (illustrate) the species name, and its requirements for food, water, shelter, and space. The student will list examples of each under each flap.
    3. Class will complete a mural to represent each habitat.

Lesson 3

- How do changes in a habitat affect organisms within that habitat?
- How does pollution affect the habitats of plants and animals?
- How does conserving resources protect the environment?
- How does recycling materials protect the environment?

    Play the Our Coastal Marsh Survivor Game.

    1. Students will role play organisms within a habitat.
    2. Students will react to various scenarios affecting the plants and animals of the habitat, including pollution, conservation, and recycling.

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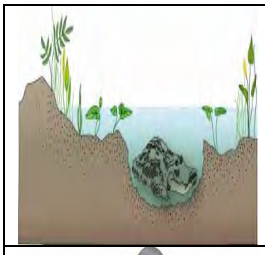
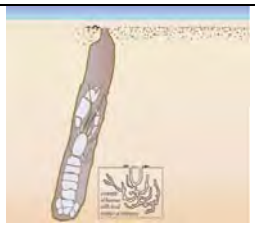
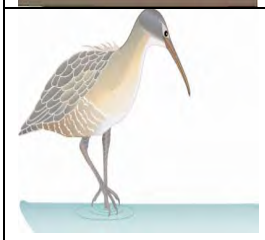
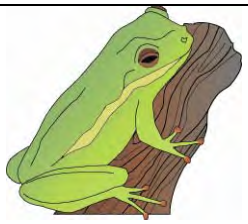
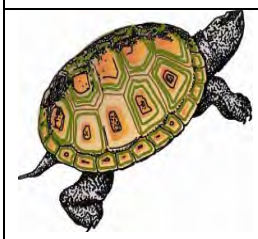
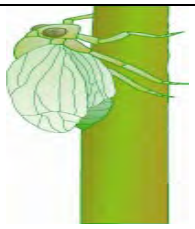
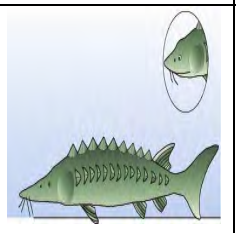
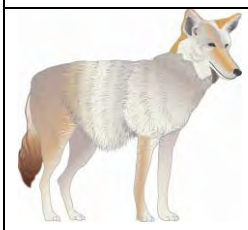
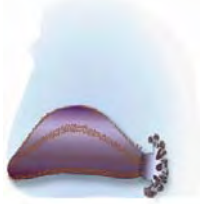
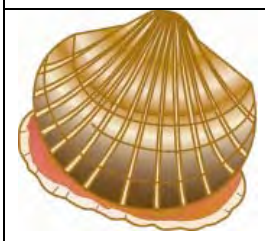
				
				
		Free Space		
				
				

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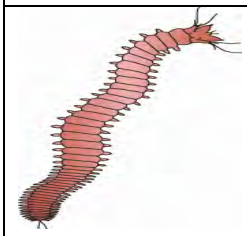
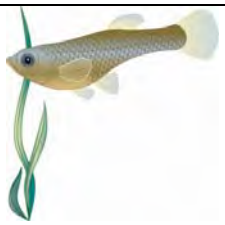
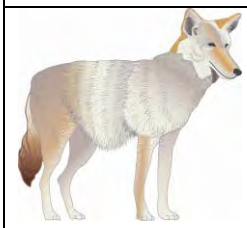
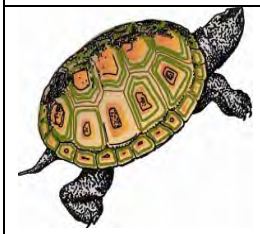
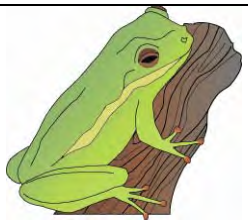
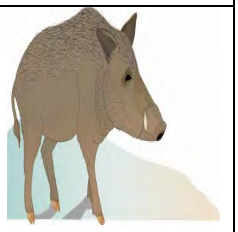
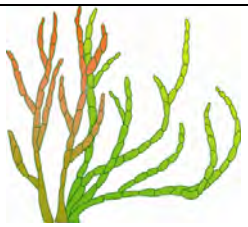
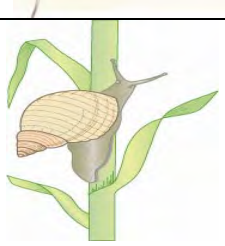
				
		Free Space		
				
				

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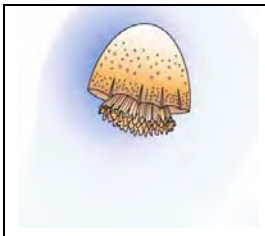
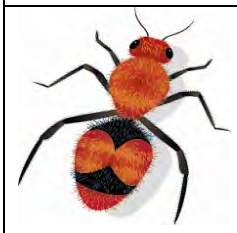
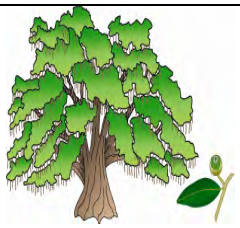
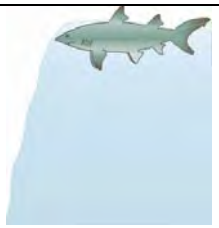
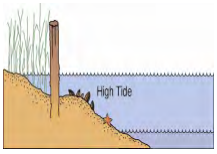
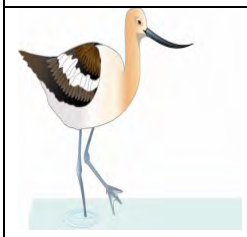
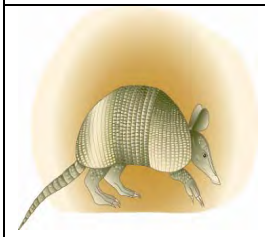
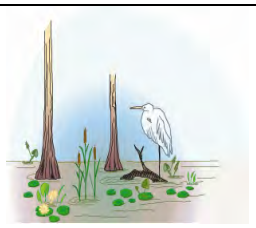
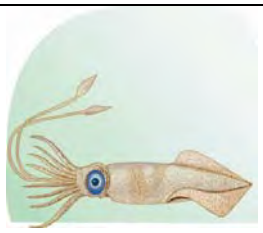
				
				
		Free Space		
				
				

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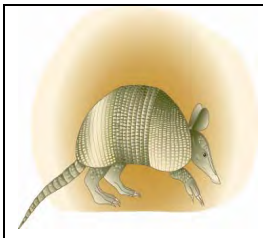
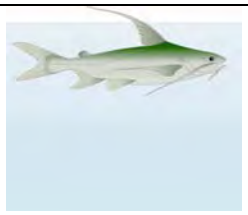
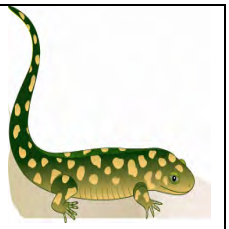
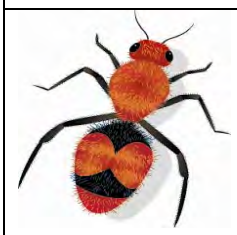
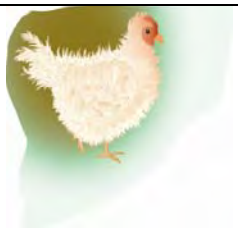
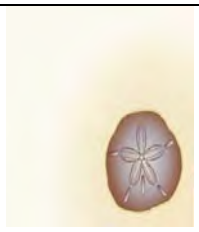
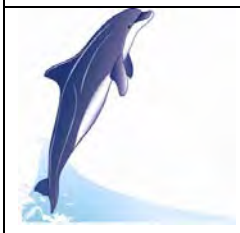
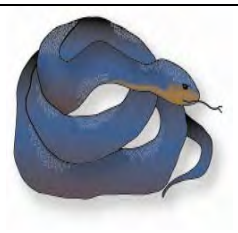
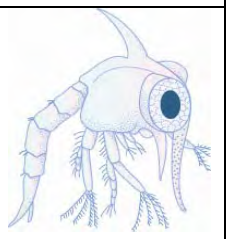
				
				
		Free Space		
				
				

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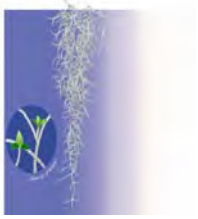
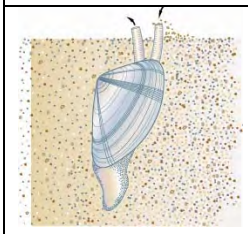
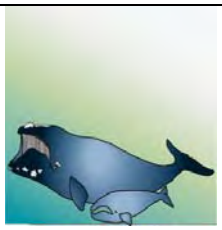
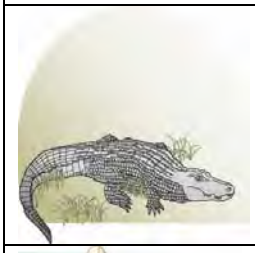
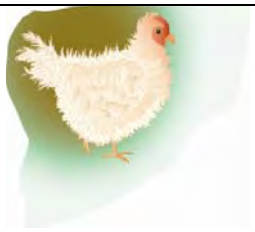
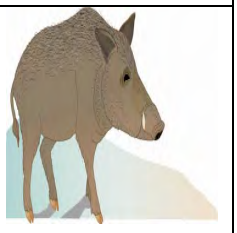
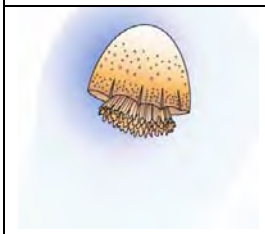
				
				
		Free Space		
				
				

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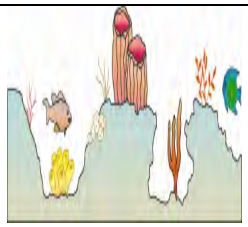
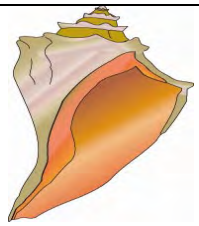
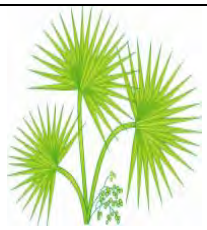
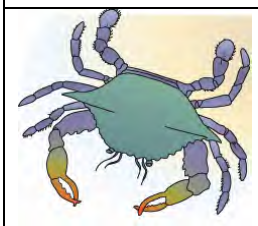
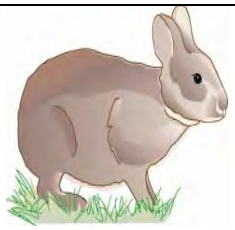
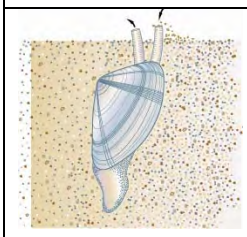
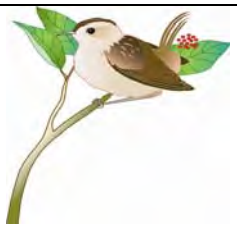
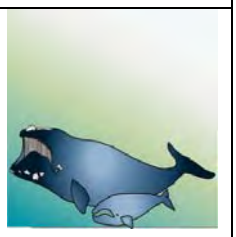
				
				
		Free Space		
				
				

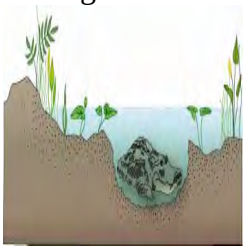
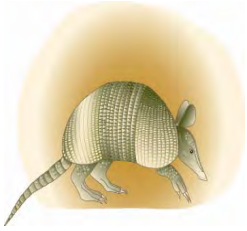
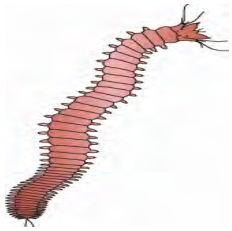
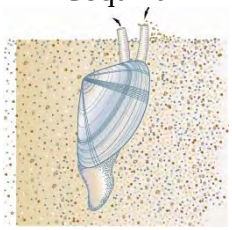
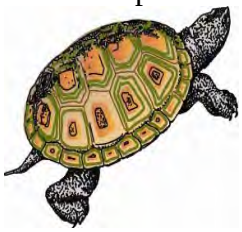
Our Amazing Coast

Reference Chart

Alligator	**Alligator Hole**	**Armadillo**	**Avocet**	**Blood Ark**
Blood Worm	**Blue Crab**	**Bottlenose Dolphin**	**Cabbage Head Jelly**	**Chachalaca**
Clapper Rail	**Coquina**	**Cow Killer**	**Coyote**	**Deer Fly**
Diamondback Rattlesnake	**Diamondback Terrapin**	**Eastern Indigo Snake**	**Fiddler Crab**	**Flying Squirrel**
Fossilized Shark tooth	**Franklinia Altamaha**	**Free-Tailed Bat**	**Freshwater Slough**	**Frizzle Chicken**
Gafftopsail Catfish	**Ghost Crab**	**Ghost Shrimp**	**Glasswort**	**Golden Silk spider**
Gopher Tortoise	**Gray's Reef**	**Great Blue Heron**	**Green Tree Frog**	**Hognose Snake**
Hooded Pitcher Plant	**Horse Conch**	**Horseshoe Crab**	**Island Glass Lizard**	**Kingfisher**
Knobbed Whelk	**Laughing Gull**	**Leatherback Sea Turtle**	**Live Oak Tree**	**Longfin Inshore Squid**
Longleaf Pine Forest	**Manatee**	**Marine Bacteria**	**Marsh Hammock**	**Marsh Mud**
Marsh Periwinkle	**Marsh Rabbit**	**Marsh Rice Rat**	**Marsh Wren**	**Moon Snail**
Morning Glory	**Mosquito Fish**	**Octopus**	**Opossum**	**Osprey**
Oyster	**Painted Bunting**	**Pawpaw**	**Pig Frog**	**Pipefish**
Plankton	**Plant Hopper**	**Pocket Gopher**	**Portuguese Man-o-War**	**Resurrection Fern**
Right Whale	**River Otter**	**Sand Dollar**	**Sand Tiger Shark**	**Sand Gnat**
Sargassum	**Saw Palmetto**	**Sea Cucumber**	**Sea Island Cotton**	**Sea Oats**
Sea Squirt	**Sea Anemone**	**Sea Horse**	**Sherman's Fox Squirrel**	**Shifting Shore: South Carolina**
Short-Eared Owl	**Shrimp Life Cycle**	**Smooth Cordgrass**	**Southern Stingray**	**Spanish Moss**
Sturgeon	**Swallow Tail Kite**	**Sweetgrass**	**Tides**	**Tiger Salamander**
Whelk Egg Casing	**Wild Pig**	**Wood Stork**	**Yaupon Holly**	**Zoea**

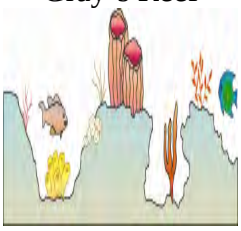
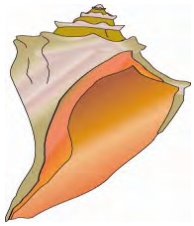
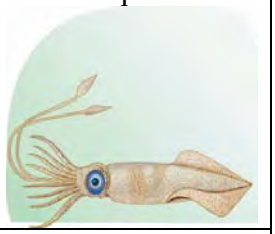
Our Amazing Coast BINGO

Reference Cards

Alligator 	Alligator Hole 	Armadillo 	Avocet 	Blood Ark 
Blood Worm 	Blue Crab 	Bottlenose Dolphin 	Cabbagehead Jelly 	Chachalaca 
Clapper Rail 	Coquina 	Cow Killer 	Coyote 	Deer Fly 
Diamondback Rattlesnake 	Diamondback Terrapin 	Eastern Indigo Snake 	Fiddler Crab 	Flying Squirrel 
Fossilized Shark Tooth 	Franklinia Altamaha 	Free-Tailed Bat 	Freshwater Slough 	Frizzle Chicken 

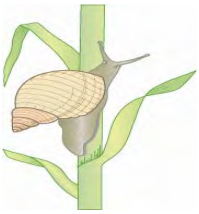
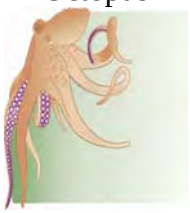
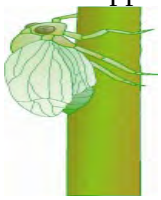
Our Amazing Coast BINGO

Reference Cards

Gafftopsail Catfish 	Ghost Crab 	Ghost Shrimp 	Glasswort 	Golden Silk Spider 
Gopher Tortoise 	Gray's Reef 	Great Blue Heron 	Green Tree Frog 	Hognose Snake 
Hooded Pitcher Plant 	Horse Conch 	Horseshoe Crab 	Island Glass Lizard 	Kingfisher 
Knobbed Whelk 	Laughing Gull 	Leatherback Sea Turtle 	Live Oak Tree 	Longfin Inshore Squid 
Longleaf Pine Forest 	Manatee 	Marine Bacteria 	Marsh Hammock 	Marsh Mud 

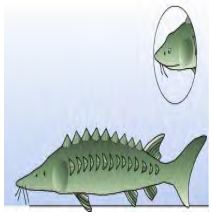
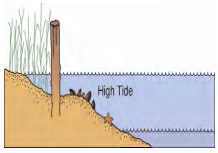
Our Amazing Coast BINGO

Reference Cards

Marsh Periwinkle 	Marsh Rabbit 	Marsh Rice Rat 	Marsh Wren 	Moon Snail 
Morning Glory 	Mosquito Fish 	Octopus 	Opossum 	Osprey 
Oyster 	Painted Bunting 	Pawpaw 	Pig Frog 	Pipefish 
Plankton 	Plant Hopper 	Pocket Gopher 	Portuguese Man-o-war 	Resurrection Fern 
Right Whale 	River Otter 	Sand Dollar 	Sand Tiger Shark 	Sand Gnat 

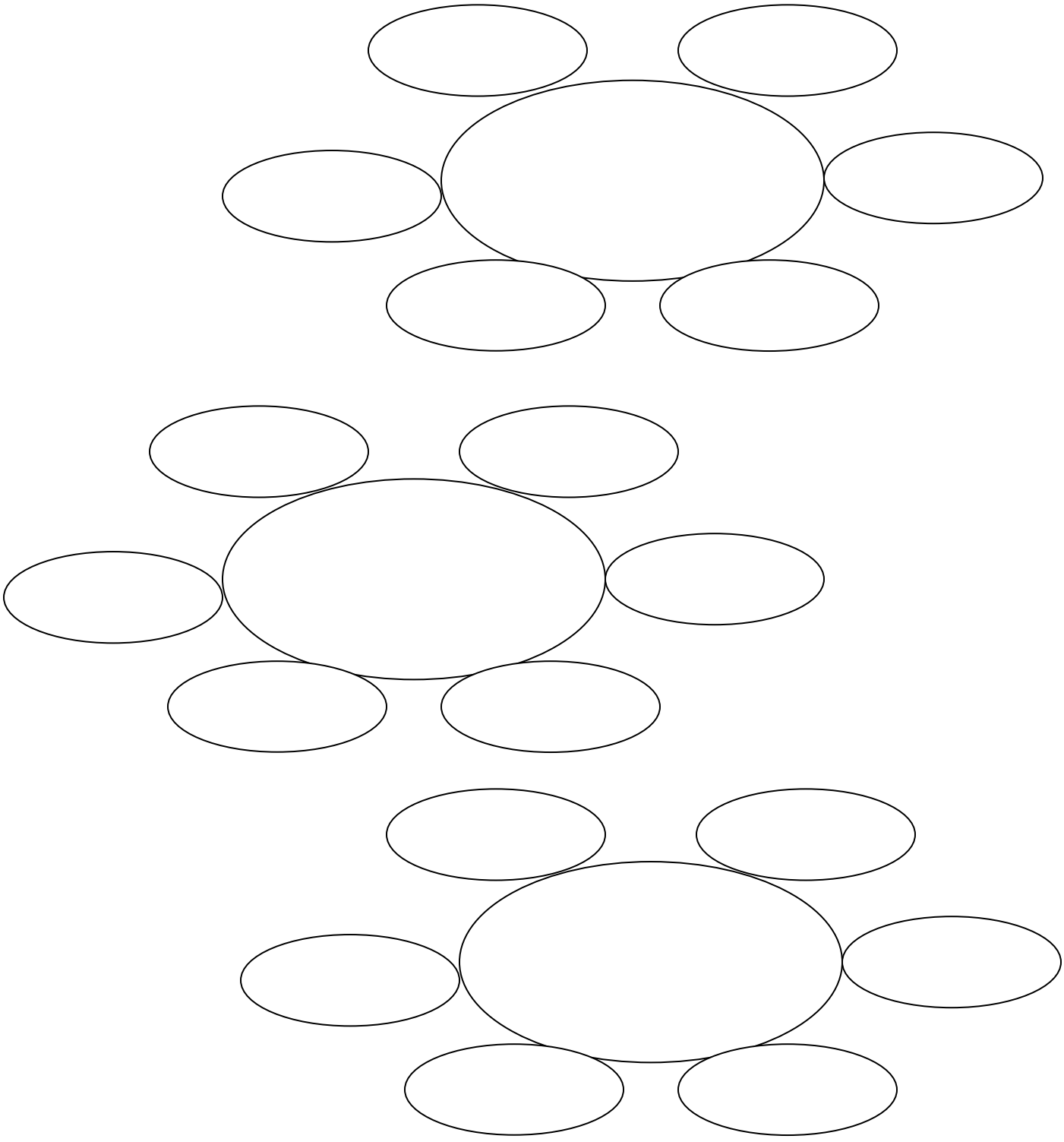
Our Amazing Coast BINGO

Reference Cards

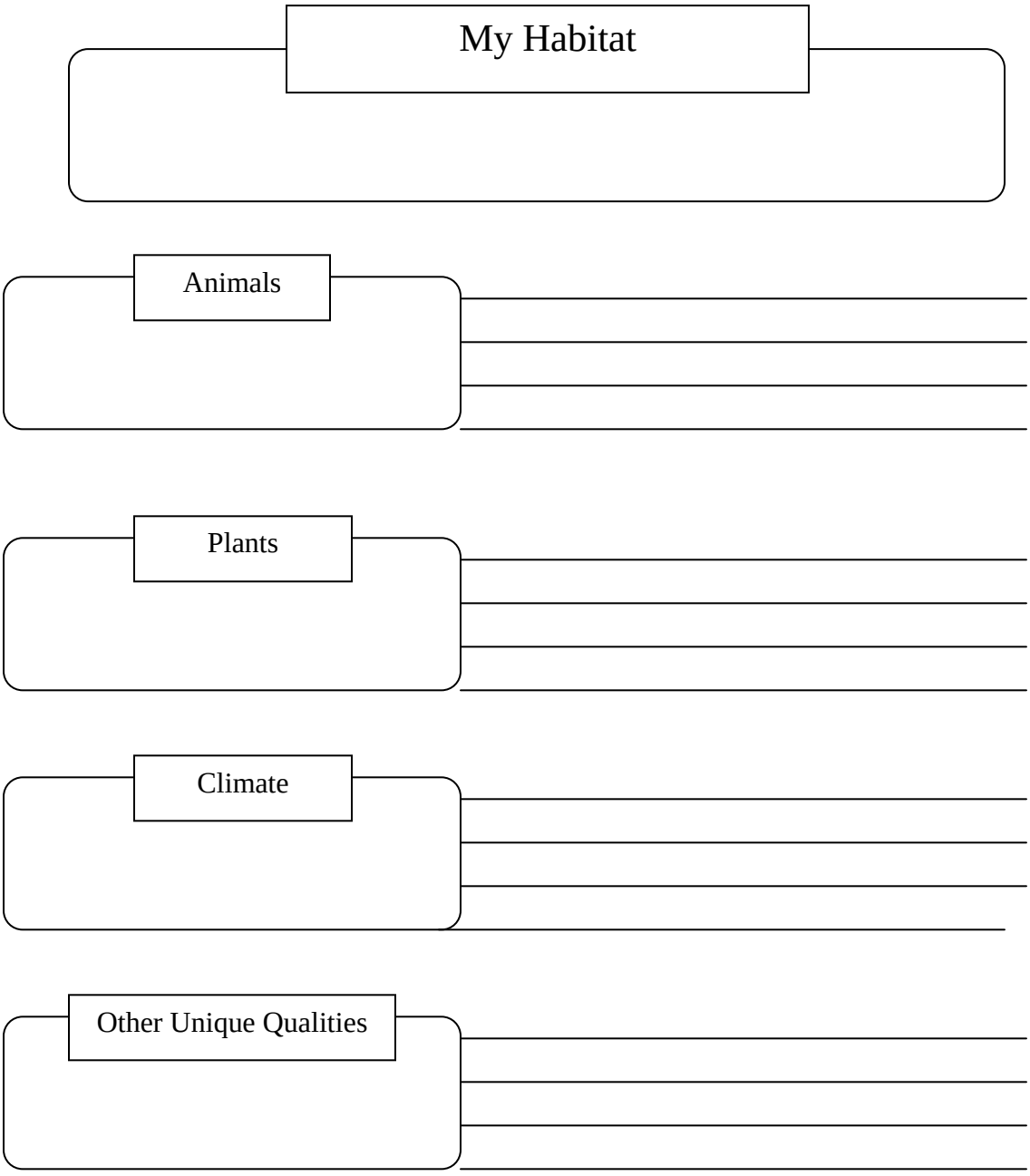
Sargassum 	Saw Palmetto 	Sea Cucumber 	Sea Island Cotton 	Sea Oats 
Sea Squirt 	Sea Anemone 	Sea Horse 	Sherman's Fox Squirrel 	Shifting Shore 
Short-Eared Owl 	Shrimp Life Cycle 	Smooth Cordgrass 	Southern Stingray 	Spanish Moss 
Sturgeon 	Swallow Tail Kite 	Sweetgrass 	Tides 	Tiger Salamander 
Whelk Egg Casing 	Wild Pig 	Wood Stork 	Yaupon Holly 	Zoea 

Every Habitat is Valuable!

*Large oval: Name of Habitat
*Small Ovals: Things that are valuable within that habitat



What's That Habitat?



Space

Shelter

Food/Water

Species

Our Coastal Marsh Survivor Game

Objectives:
Students will consider, analyze, and discuss the following:

- What are the roles of producers and consumers in the salt marsh?
- How do changes in a habitat affect organisms within that habitat?
- How does pollution affect the habitats of plants and animals?
- How does conserving resources protect the environment?
- How does recycling materials protect the environment?
- What would happen to a population if some of the plants or animals in the community became scarce, or if there were too many?
- How do organisms become extinct?

***Preparation:** Print cards and cut each row apart. Fold each row in half on vertical line, so that each card consists of the name and picture of species on one side and descriptor on the other. If possible, laminate cards and lace onto cords to be worn by students as nametags.

Directions:

1. Explain to students that each plant or animal has a specific role in the marsh ecosystem (stated on cards). *Note: the diet and range stated on cards is not meant to be an exclusive list for each species, both have been simplified for this activity.
2. Distribute cards to students (one per student). *Additional cards may be made and distributed of producers, as needed for larger class sizes.
3. Ask students to imagine themselves as the species listed on their card.
4. Divide classroom or playing field into three sections: high marsh (above high tide line), mid-marsh (intertidal zone), and low marsh (under water most of the time).
5. Direct students to go to the place in the marsh where the species they represent would be found.
6. Ask students to look around and see if they have everything they would need to survive in this habitat. Students are to pantomime the movements of their plant or animal as they move around within their range of the marsh. Discuss the availability of food, water, shelter, and space.
7. Read one scenario from list below. Discuss impacts. Students leave or come back to "the marsh" as species die off or are saved. Remember: species that depend on the affected species will also be impacted and should act accordingly.

Scenarios that bring about change:

- NOTE: The following list consists of possible actions that could bring about positive or negative changes within the marsh ecosystem. Each scenario is meant to promote discussion among the students, relating to cause/effect.
- The list below is not meant to be all-inclusive of events causing change in the marsh. Please feel free to add to the list, or alter existing scenarios to bring about the changes you wish to illustrate and discuss with your students.
- This list is no particular order. It simply contains some natural occurrences and some that would be caused by humans. Some will bring about positive change; some will have negative impacts on the marsh.
- After each "change" occurs, stop and discuss how organisms will be directly (and indirectly) affected.

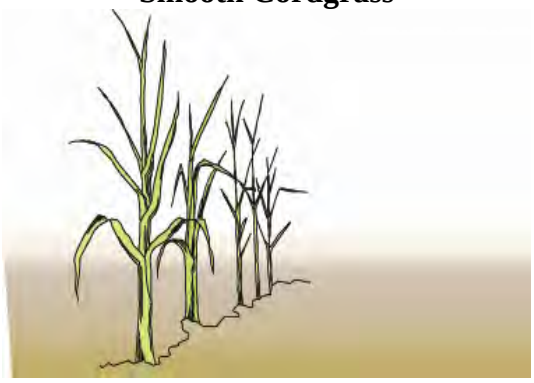
1. Excessive run-off from nearby golf course (or farm) dumps massive amounts of fertilizer and/or insecticides into the marsh.
2. Construction of large marina nearby, causing oil and fuel pollution.
3. Construction of condominiums require filling in of the high – mid marsh zones with fill dirt and numerous docks to be built.
4. Excessive rain and hurricanes
5. Drought
6. Marsh land protection act adopted by local zoning commission.
7. Local school group volunteers to conduct monthly chemical and biological monitoring of the salt marsh (Adopt-a-Wetland).
8. Local group of concerned citizens organize "Friends of the Marsh" club, dedicated to regular clean-up efforts of the area.
9. Local kayak shop organizes "Eco-tours" of the marsh.
10. Citizens organize recycling efforts of used automobile oil, plastics, and glass.

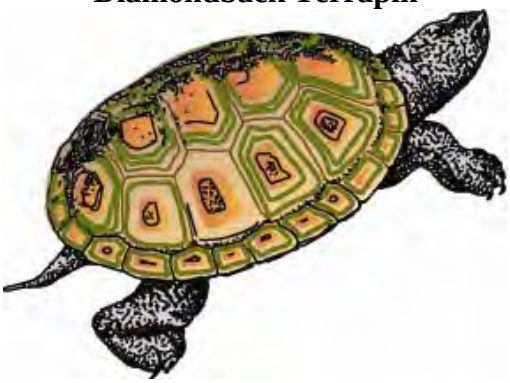
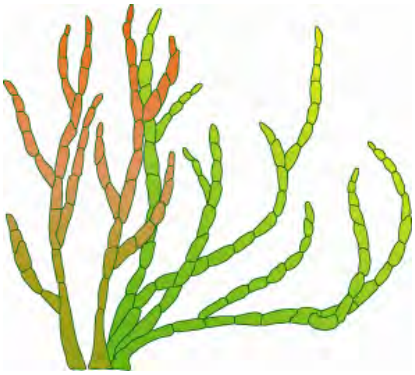
***possible effects of negative actions:**

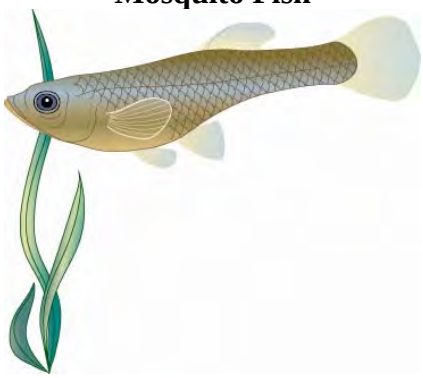
- Harmful algal bloom (from fertilizer) causes fish kills, oyster contamination.
- Oil and fuel pollution cause fish and shellfish kills and contamination.
- Insecticides eliminate plant hopper population.
- Insecticides ingested by plant hoppers travel through the food web, eliminating consumers of plant hoppers.
- Constructions of dock pilings disturb smooth cordgrass root mats, weakening stability of marsh.
- Drought causes rise in salinity, blue crab population decreases, smooth cordgrass die off.
- Excessive rain causes drop in salinity, causing loss of phytoplankton population, oysters and shrimp decrease.
- Loss of habitat

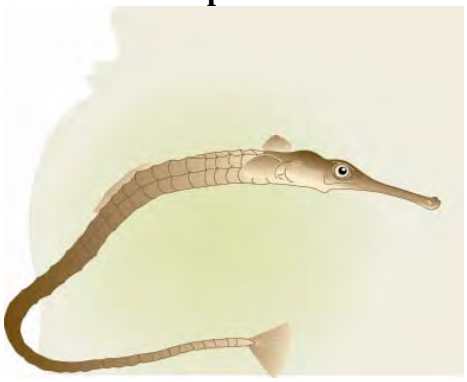
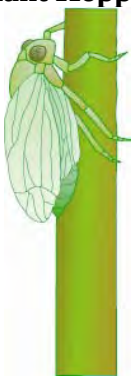
***possible effects of positive actions:**

- Marsh restoration
- Populations restored to healthy levels.
- Awareness and appreciation of the marsh ecosystem increases the need to protect the area for future generations.
- Regular monitoring of the marsh provides information that can be helpful in maintaining the health of the marsh.
- Cleaner water increases health of all species.

Smooth Cordgrass 	**Smooth Cordgrass** **Producer** **Range:** **Mid – Low Marsh** ***Provides main component of detritus in the marsh. Root mats hold marsh together.**
Periwinkle Snail 	**Periwinkle Snail** **Consumer** • **Smooth Cordgrass** • **Range:** **Mid – Low Marsh**
Blue Crab 	**Blue Crab** **Consumer** • **Juvenile fish and shrimp** • **Periwinkle snails** • **Fiddler crabs** **Range:** **Low Marsh**
Fiddler Crab 	**Fiddler Crab** **Consumer** • **Detritus** **Range:** **Mid – Low Marsh**

Clapper Rail 	**Clapper Rail** **Consumer** • **Mosquito Fish** • **Fiddler Crabs** • **Plant Hoppers** **Range:** **High – Mid Marsh**
Diamondback Terrapin 	**Diamondback Terrapin** **Consumer** • **Periwinkle snails** • **Fiddler crabs** **Range:** **High – Mid Marsh**
Glasswort 	**Glasswort** **Producer** **Range:** **High Marsh** ***Provide cover for small animals**
Marsh Rice Rat 	**Marsh Rice Rat** **Consumer:** • **Smooth Cordgrass** • **Fiddler Crabs** • **Periwinkle Snails** **Range:** **High – Mid Marsh**

Yaupon Holly 	**Yaupon Holly** **Producer** **Range:** **High Marsh** ***Provides food, cover, and nesting habitat for birds**
Marsh Wren 	**Marsh Wren** **Consumer** • **Plant Hoppers** • **Sand Gnats** **Range:** **High Marsh**
Mosquito Fish 	**Mosquito Fish** **Consumer** • **Mosquito Larva** **Range:** **Low Marsh**
Osprey 	**Osprey** **Consumer:** • **Fish** • **Marsh Rice Rats** **Range:** **High Marsh**

Pipefish 	**Pipefish** **Consumer** • **Detritus** **Range:** **Low Marsh**
Plant Hopper 	**Plant Hopper** **Consumer** • **Smooth Cordgrass** **High – Mid Marsh**
Sand Gnat 	**Sand Gnat** **Consumer** • **Blood of mammals** **Range:** **High – Mid Marsh**
Short-Eared Owl 	**Short-Eared Owl** **Consumer** • **Marsh Rice Rats** • **Marsh Wrens** **Range:** **High – Mid Marsh**

Juvenile Shrimp 	**Juvenile Shrimp** **Consumer** • **Detritus** **Range:** **Low Marsh**
Wood Stork 	**Wood Stork** **Consumer** • **Fish** • **Shrimp** **Range:** **Mid - Low Marsh**
Plankton 	**Plankton (Phytoplankton)** **Producers** **Range:** **Low Marsh** ***Provides oxygen for all living things**
Oyster 	**Oyster** **Consumer** • **Detritus** **Range:** **Low Marsh**

Performance Assessment 1

The student will create a model representing two different habitats which includes the chosen habitats' of plants and animals.

The student will present the model to the class, explain the differences between the two habitats, and describe how the animals and plants thrive in each

*See "Habitat Model Rubric"

Performance Assessment 2

The students will complete a graphic organizer to demonstrate cause/effect relationship of humans and pollution on the environment

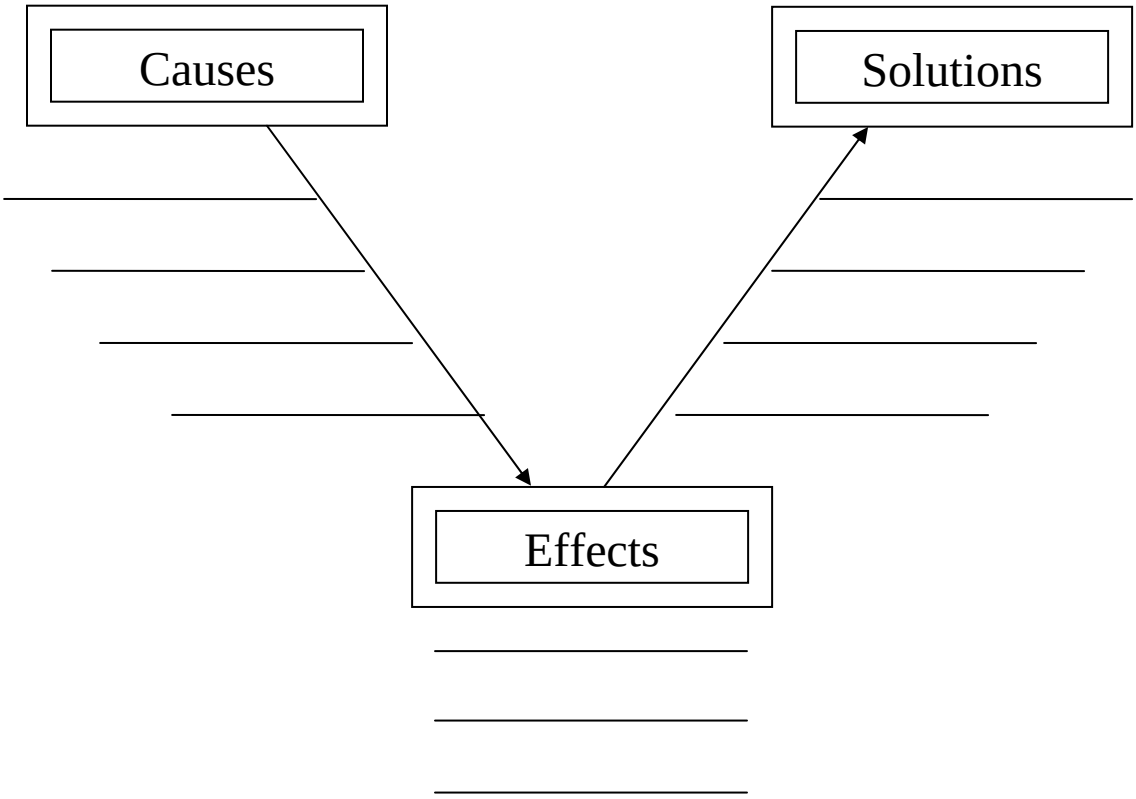
* See "Cause/Effect/Solution" graphic organizer

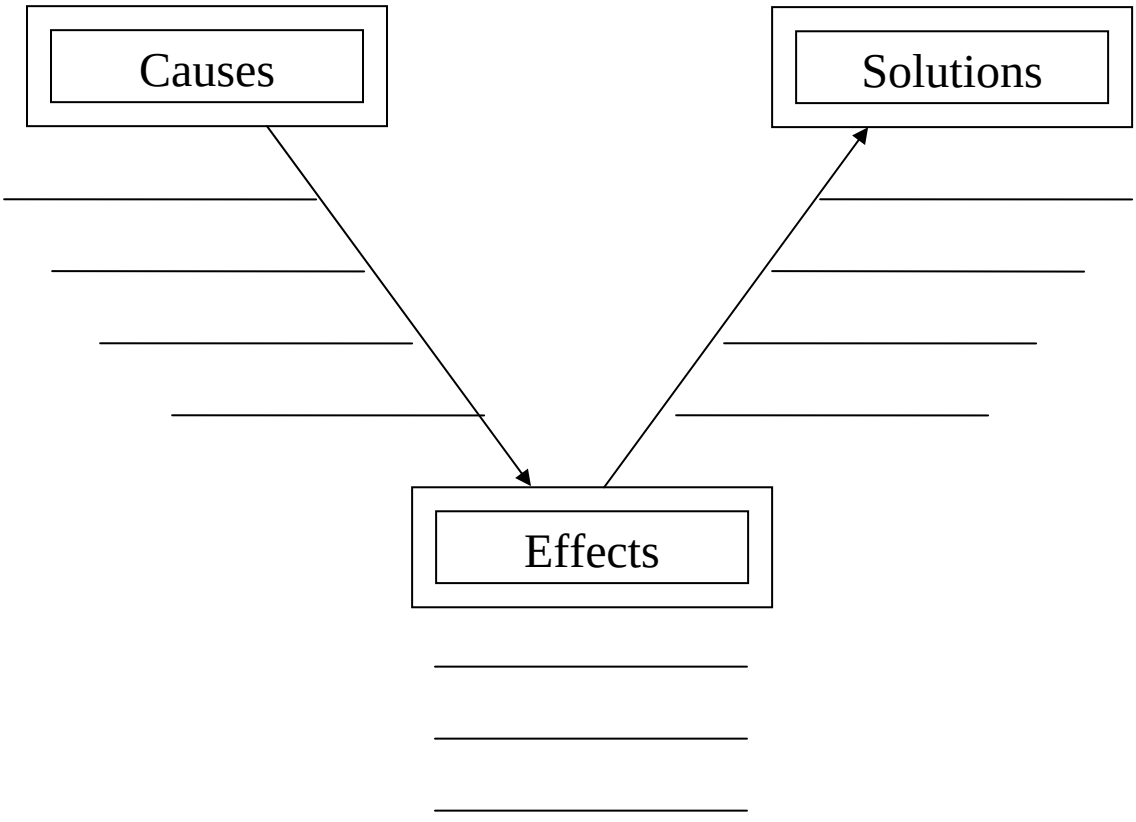
Performance Assessment 1: Habitat Model Rubric

Performance element	Level 3	Level 2	Level 1	Points
Representation of Content	Explains in great detail how the model represents two different habitats using approximate scale	Explains in some detail how the model represents two different habitats using approximate scale	Explains with minimal detail how the model represents two different habitats (no use of scale)	_____
Presentation	* Explains 4 ways the two habitats are different * Explains how plants and animals thrive in the habitats (4-5 examples)	* Explains 2-3 ways the two habitats are different * Explains how plants and animals thrive in the habitats (2-3 examples)	* Explains 0 - 1 way the two habitats are different * Explains how plants and animals thrive in the habitats (0-1 example)	_____
Creativeness	Uses a variety of media to creatively represent the habitat *3 dimensional	Uses a few different media to creatively represent the habitat *3 dimensional	Uses minimal resources to creatively represent the habitat *2 dimensions	_____
Communication	Uses the model as a tool to communicate learning. * Habitats are labeled * 12-15 different plants and animals are represented and labeled	Uses the model as a tool to communicate learning. * Habitats are labeled * 8 -12 different plants and animals are represented and labeled	Does not use the model as a tool to communicate learning or has little information about the topic. *Less than 8 different plants and animals are represented and labeled	_____
			YOUR TOTAL	
Teacher Comments:				

Scoring Key: 10-12 = A, 7-9 = B, 6-8 = C, less than 6 = F

Performance Assessment 2: Cause/Effect Relationship of Humans and Pollution on the Environment





South Carolina: Our Amazing Coast
Grade 4

Big Idea – Organisms and Their Environment

4th Grade
Enduring understanding:

- Students will understand how and why organisms are classified
- Students will differentiate between learned and inherited characteristics of organisms
- Students will understand how organisms cause changes in their environment

South Carolina Science Academic Standards
Scientific Inquiry
4-1.1 Classify observations as either quantitative or qualitative
4-1.6 Construct and interpret diagrams, tables, and graphs made from recorded measurements and observations

Life Science: Organisms and Their Environments
4-2.1 Classify organisms into major groups, including plants or animals, flowering or non-flowering plants, and vertebrates (fish, amphibians, reptiles, birds, mammals) or invertebrates
4-2.4 Distinguish between the characteristics of an organism that are inherited versus those that are acquired over time.
4-2.6 Explain how organisms cause changes in their environment

Activating Strategy:

- Students will work in small groups to sort the "Our Amazing Coast" Picture Cards into categories.
- Students will present and justify their reasons for categorizing.

Acquisition Lessons

Lesson 1

- How are animals sorted into groups (vertebrate and invertebrate)?
- How are vertebrates sorted into groups (fish, amphibian, reptile, bird, and mammal)?
- How are plants sorted into groups?
    1. Teacher will distribute Our Amazing Coast picture cards.
    2. Teacher will designate one area of the room for plants and one for animals.
    3. Students decide which group they belong to and go to that area.
    4. Students will share which card they have and why they chose their category.
    5. Students who have plant cards will trade their card to teacher for an animal card.
    6. Teacher will designate one area of the room for vertebrate and one for invertebrates.
    7. Students decide which group they belong to and go to that area.
    8. Students will share which card they have and why they chose their category.
    9. Students who have invertebrate cards will trade their card to teacher for a vertebrate card.
    10. Teacher will instruct students to sort themselves into groups based on their skin covering.
    11. Teacher leads class discussion about how students sorted themselves (coaching into further groups if necessary)
    12. Class completes a wall chart with examples and descriptors for each category.
    13. Teacher leads class discussion about why scientists use classification.
    14. Students repeat activity using plant cards.
    15. Ticket out the Door: Students choose final animal and list the ways that animal was classified.

**For extra fun – Play the "Classify this!" PowerPoint game

Lesson 2

- What are learned behaviors?
- What are inherited traits?
- What role do genes play in the transfer of traits?
    1. Teacher reads several pages from Georgia's Amazing Coast (Alligator Hole, Blue Crab, Kingfisher, Octopus, Sand Tiger Shark, Seahorse, Tiger Salamander)
    2. After each selection class suggest particular traits or behaviors that are particular to that species and aid in its survival.
    3. Teacher leads a discussion about student findings (learned behaviors, traits, and genes), completing "Physical Traits and Behaviors" graphic organizer foe each.

4. Students choose one animal from above list and write a creative story from the following scenarios:
    - The animal is born without the traits or behaviors
    - How one animal teaches another of the same species the behavior
    - An animal is born with, or learns, the traits of a completely different animal

***Animal Traits/Behavior Story Map included for use in this activity

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Lesson 3

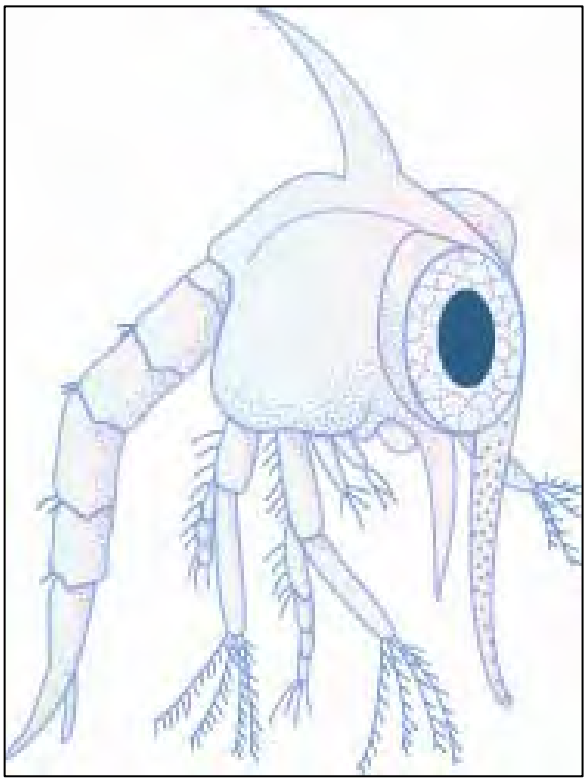
- How do organisms (humans) cause changes in their environment?
    1. Teachers reads the book The Lorax" by Dr. Seuss.
    2. Teacher reads pages from Georgia's Amazing Coast: Longleaf Pine, Eastern Indigo Snake, and Gopher Tortoise.
    3. Complete a graphic organizer comparing the truffulla tree community to the longleaf pine community.
    4. The students will complete a cause & effect chart using the examples from "The Lorax".

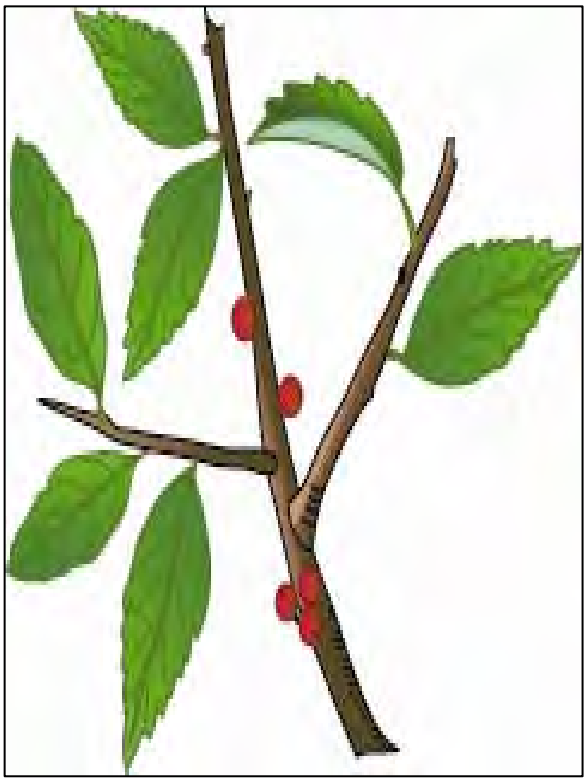
Lesson 4

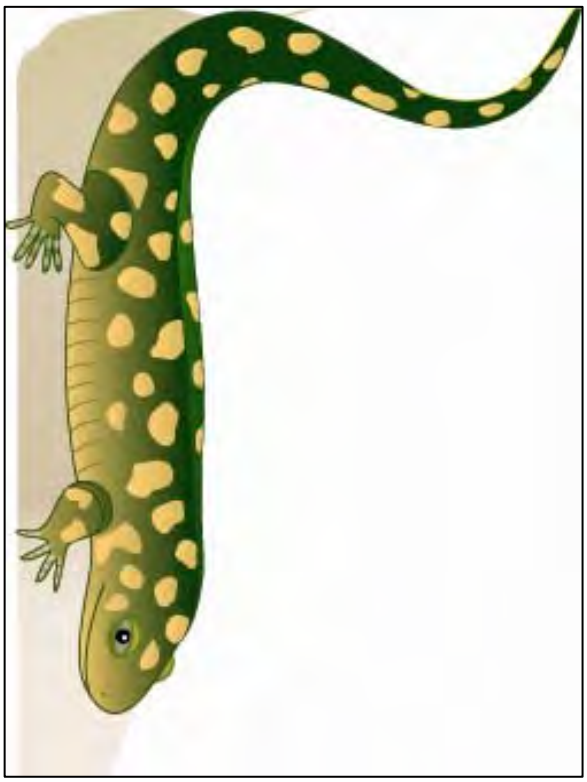
- How do organisms become extinct?
    1. Students play "Georgia Coastal Marsh Survivor Game" (included in 3rd grade section).
    2. Discuss the cause and effects of the populations after each scenario.

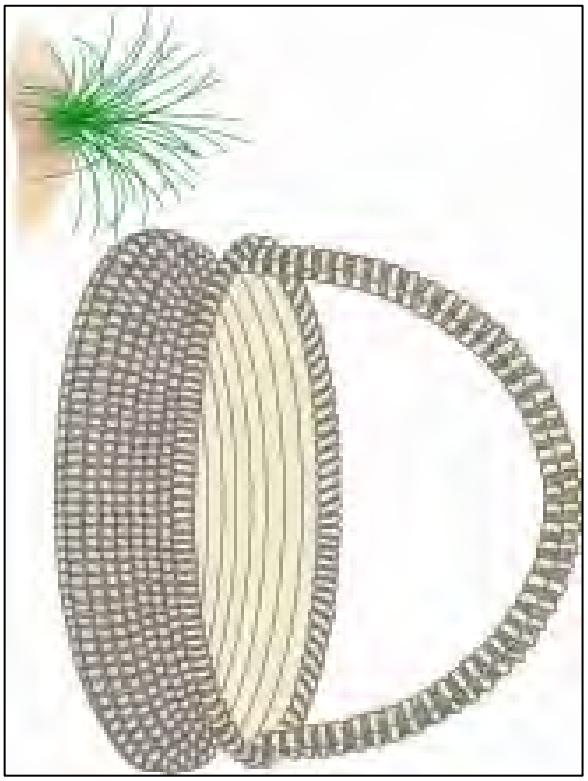
- How do external features of organisms help them to survive and reproduce? (e.g. camouflage, use of hibernation, protection, etc.).

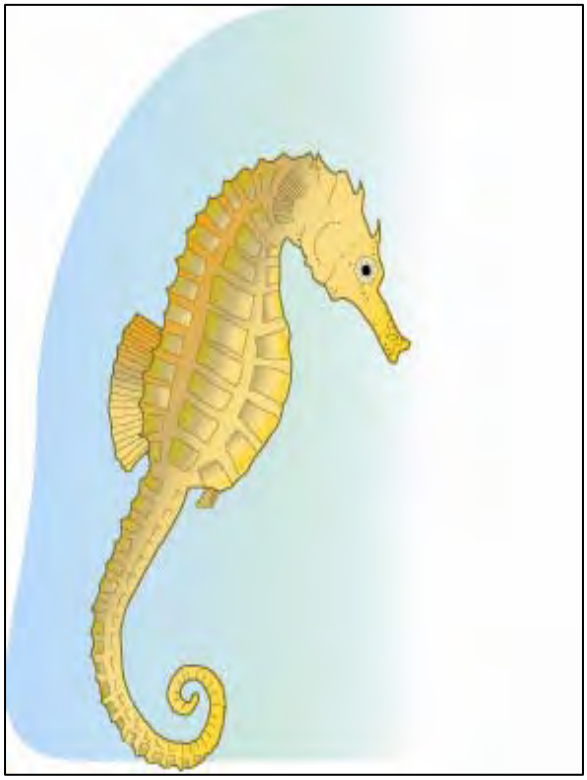
    1. Students choose four plants/animals from the Georgia's Amazing Coast book.
    2. Students complete Plant/Animal Survival" graphic organizer illustrating and explaining survival features.

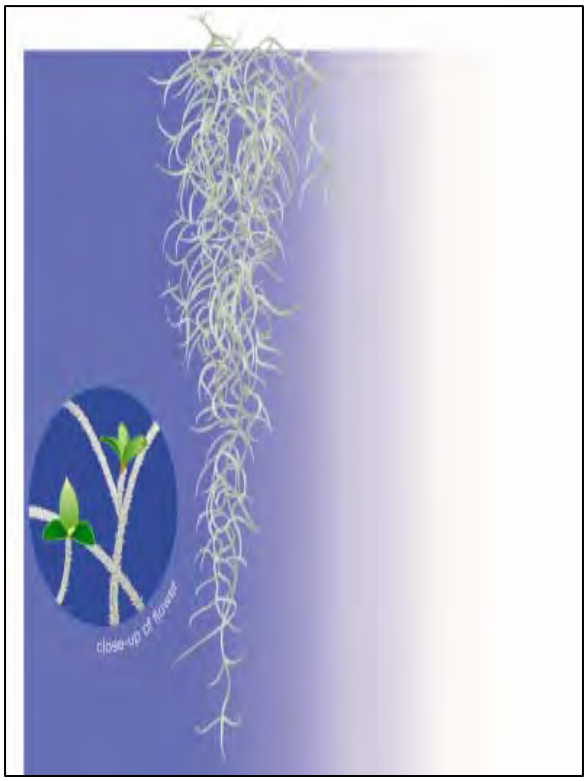


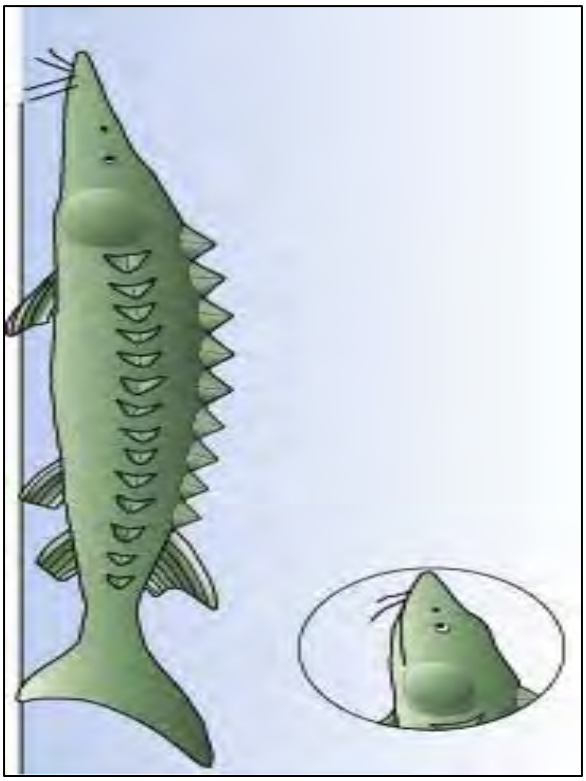


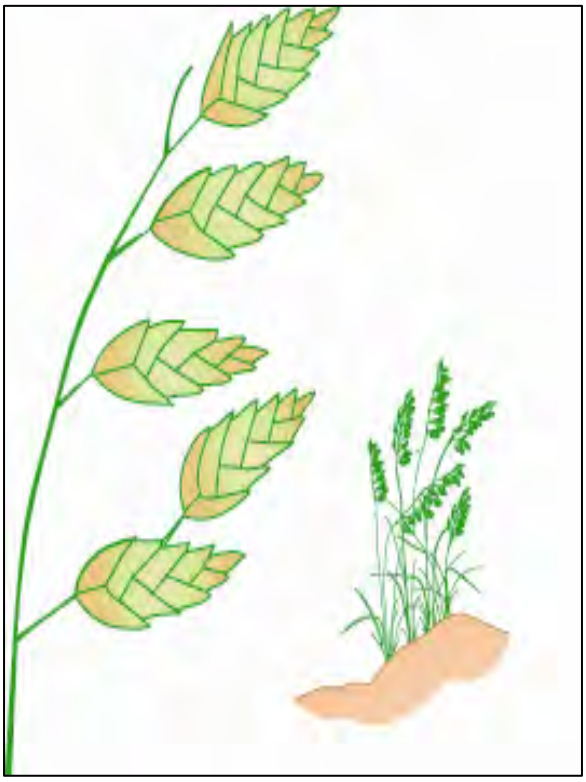


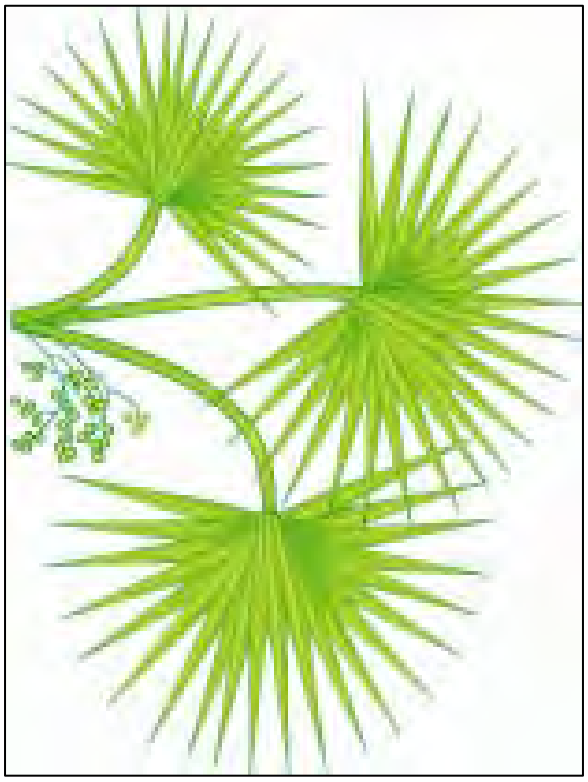


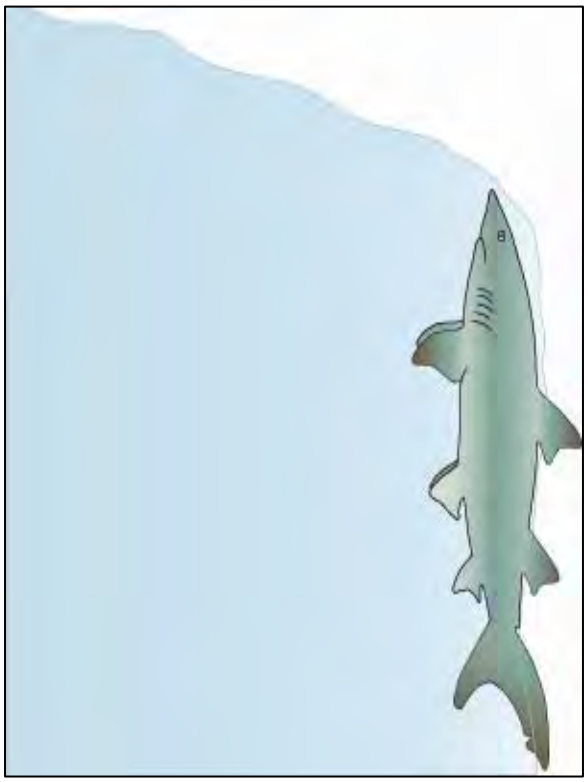


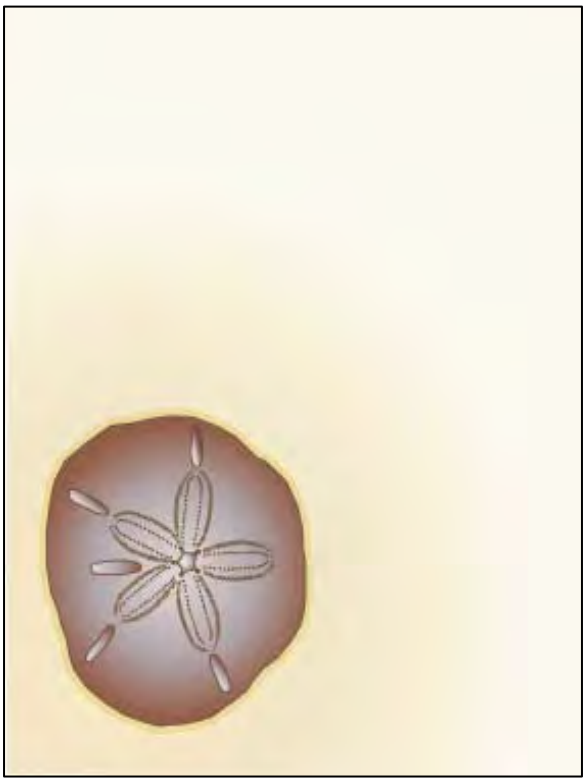

close-up of flower

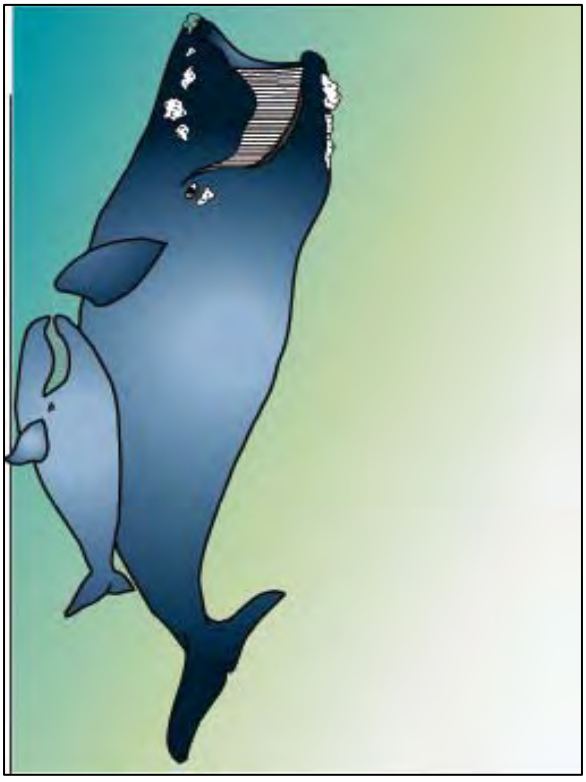


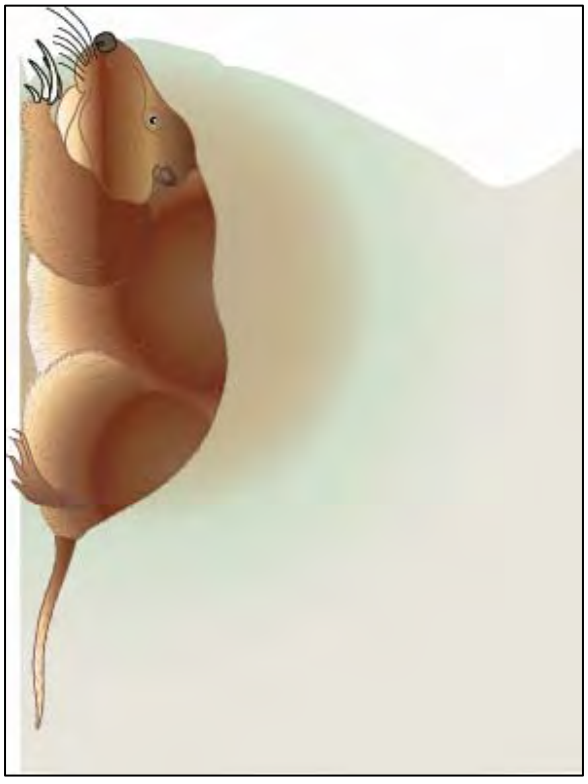


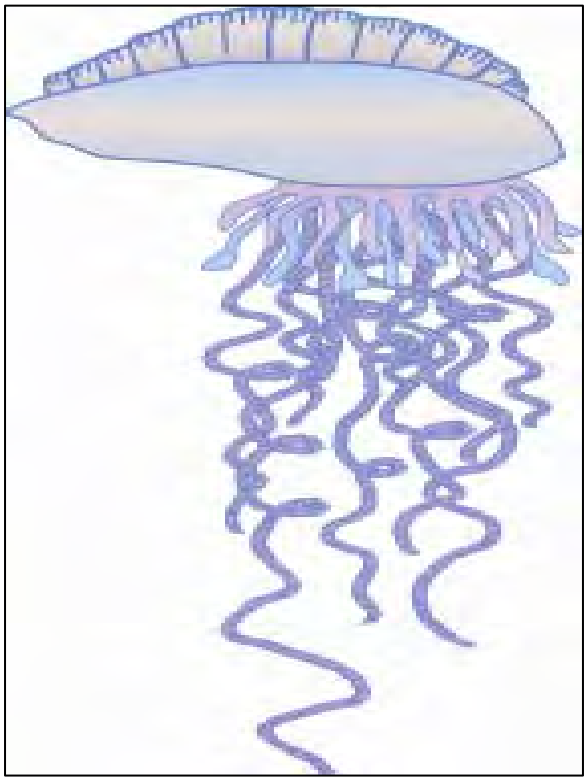


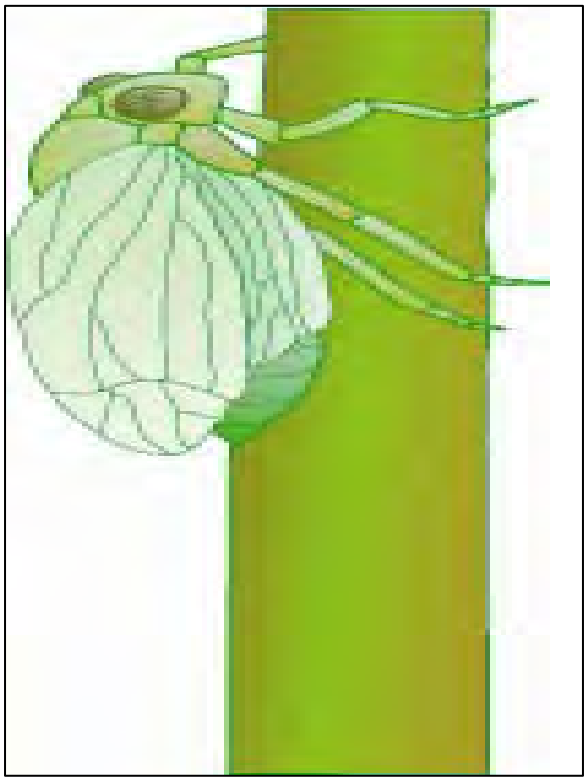


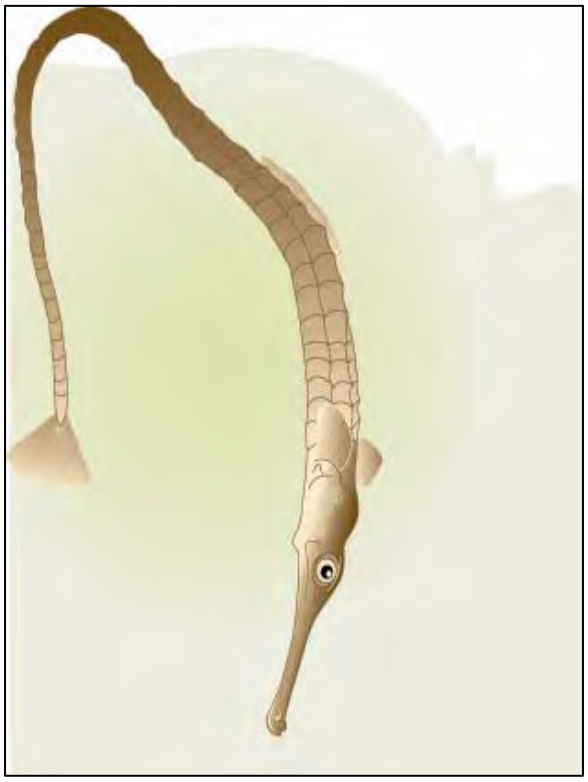


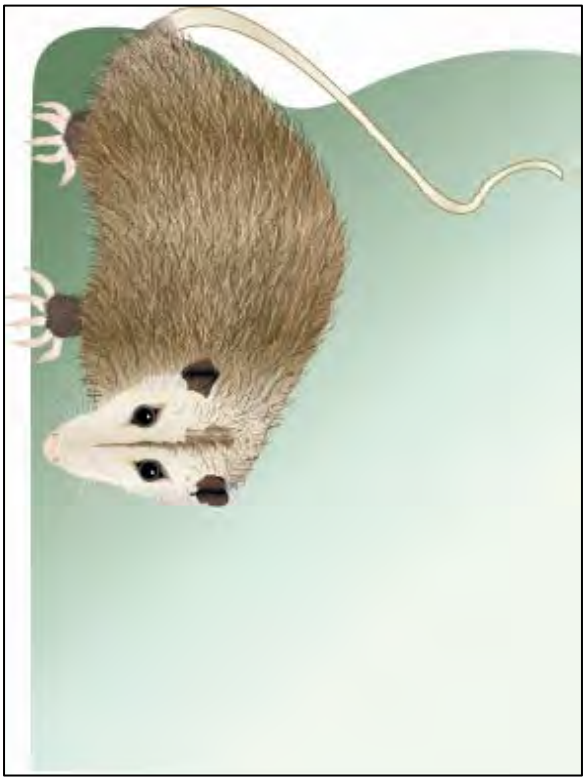


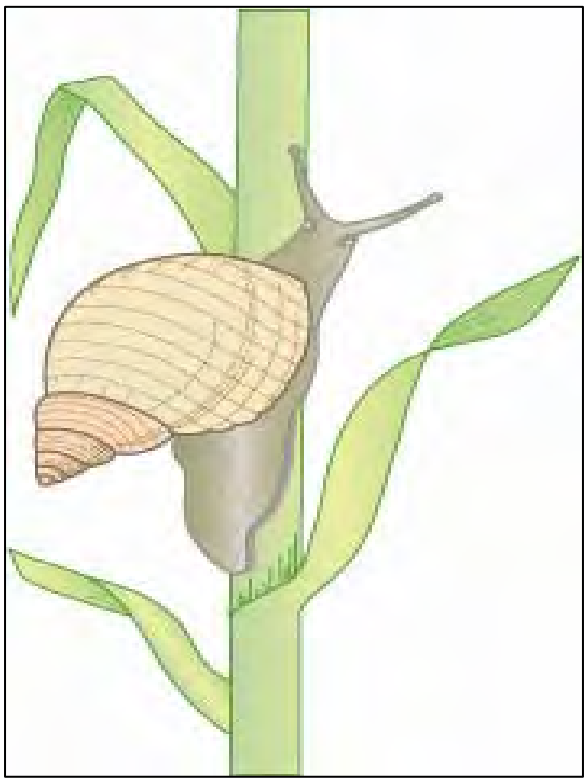


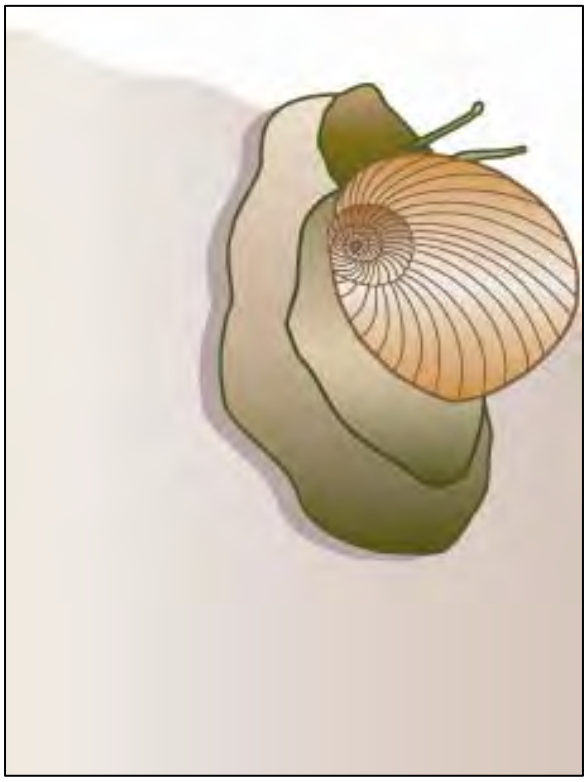


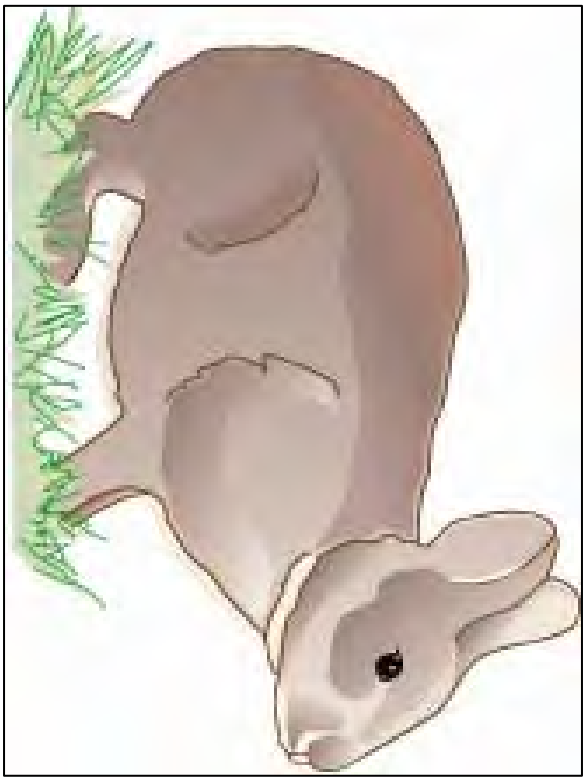


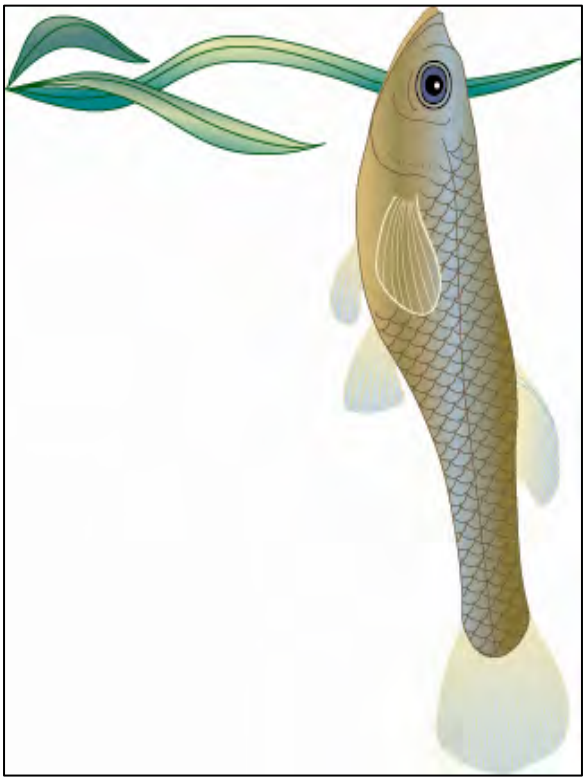


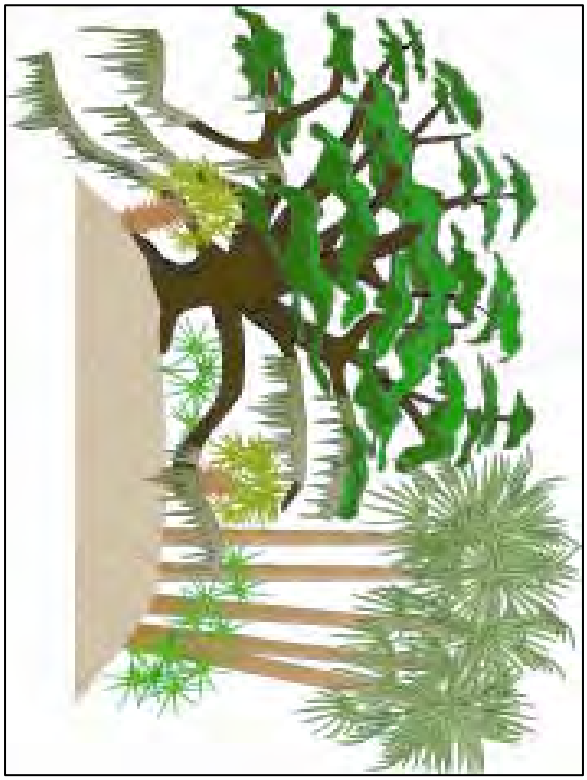


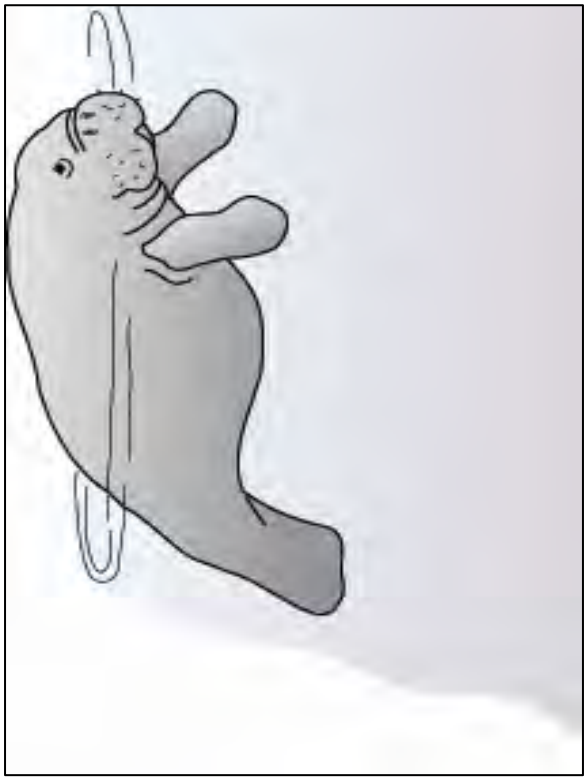


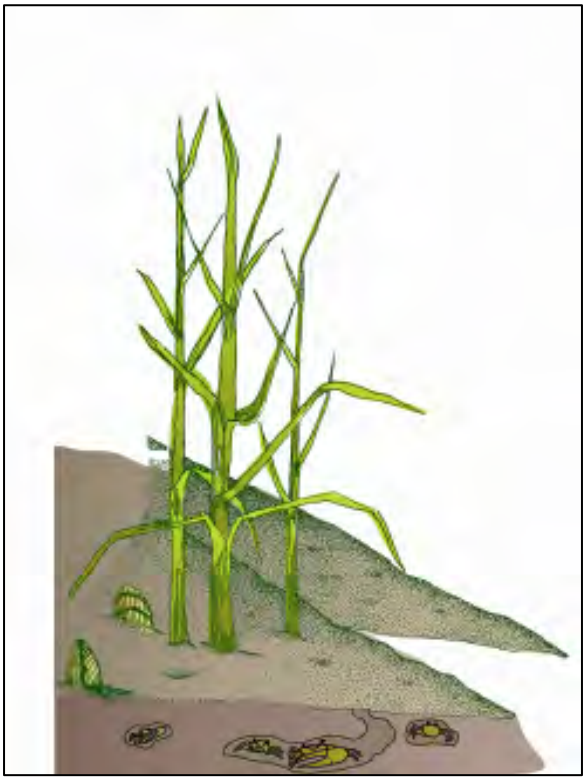


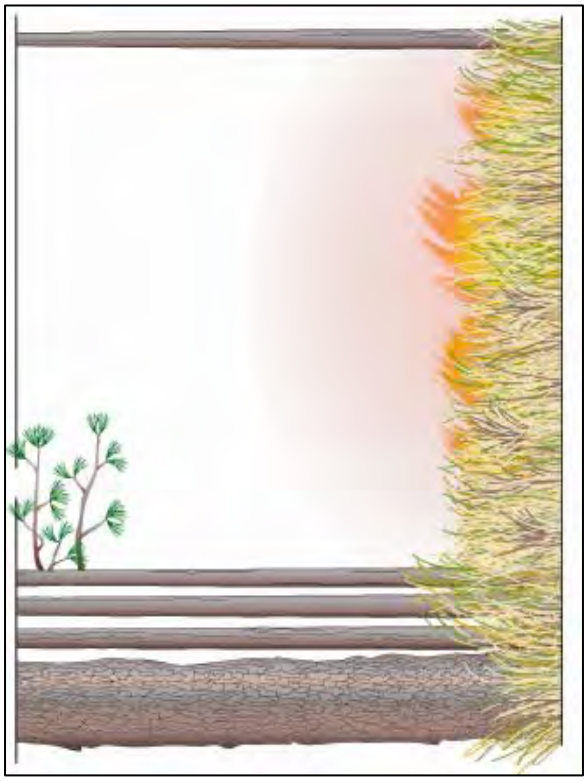


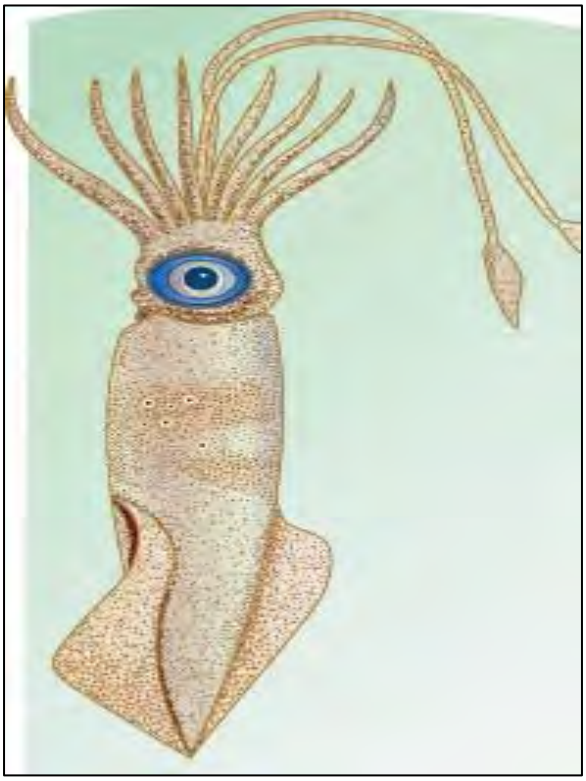


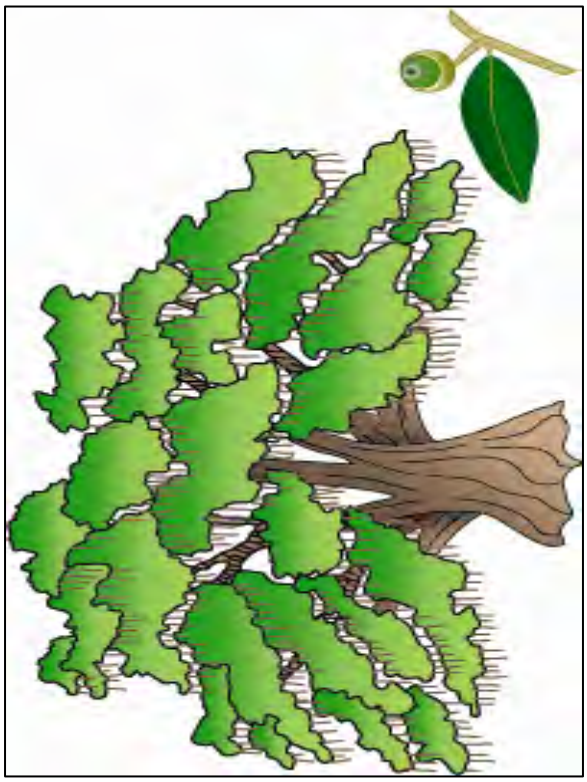


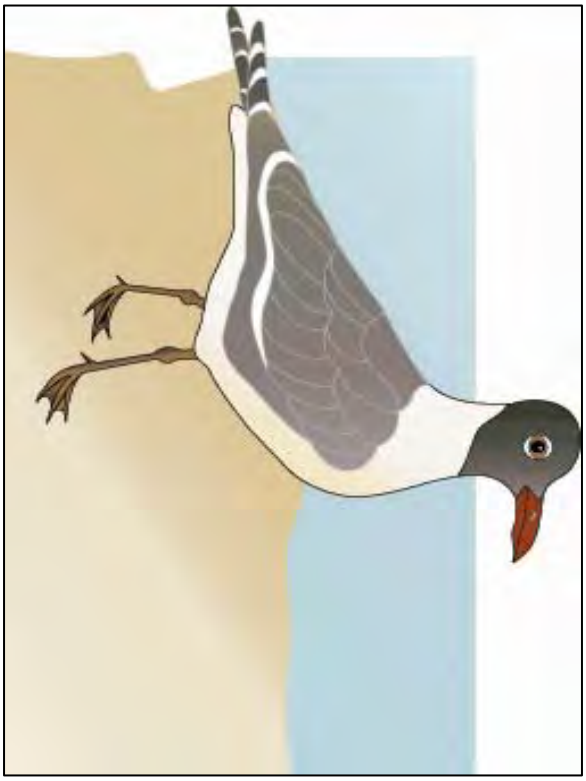


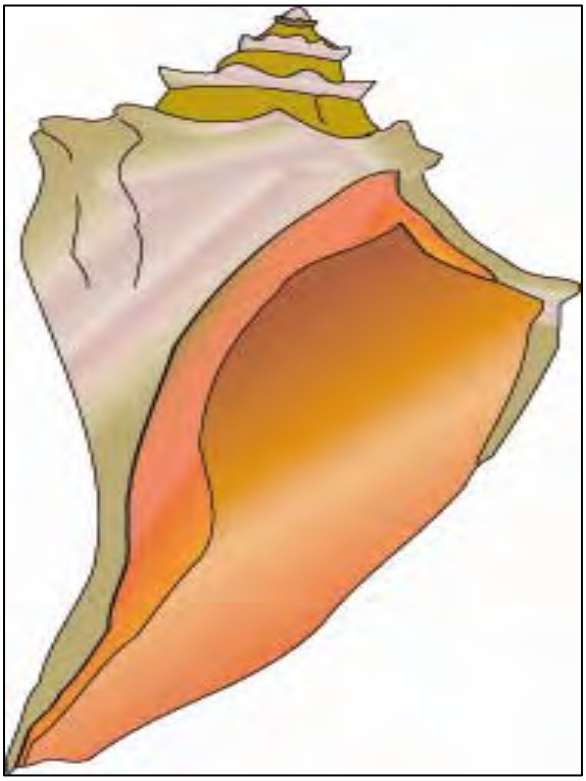


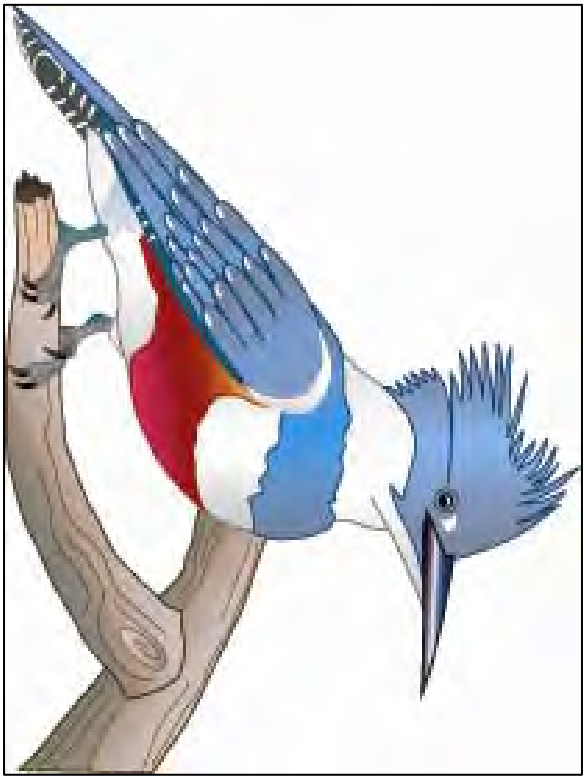


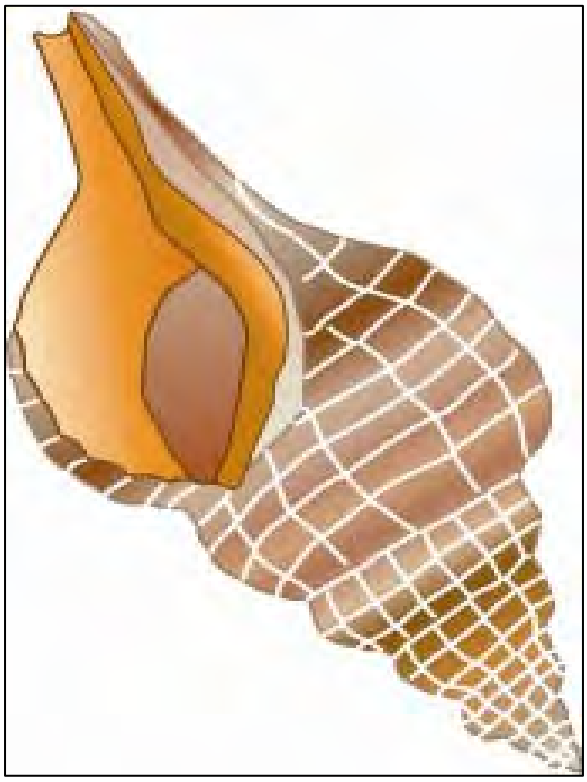


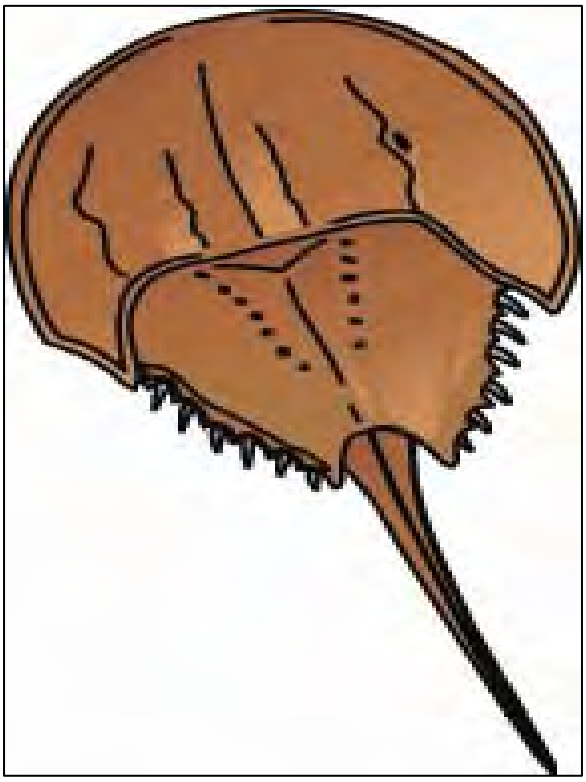


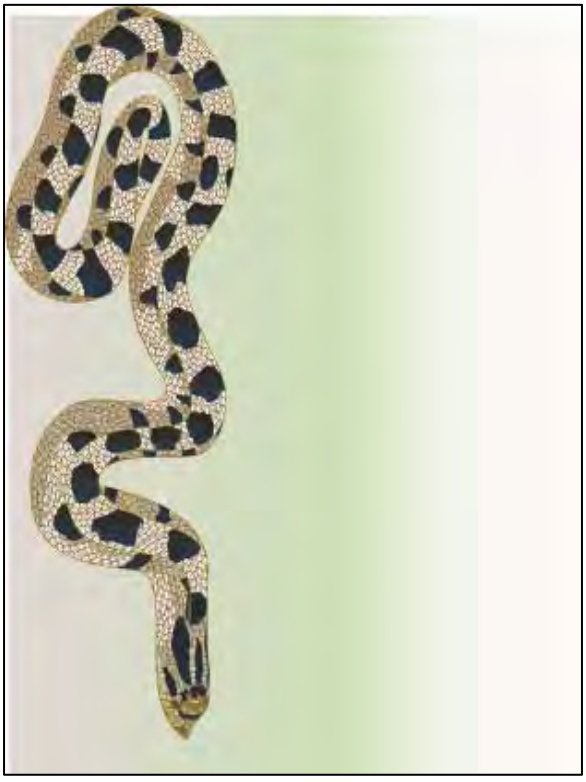


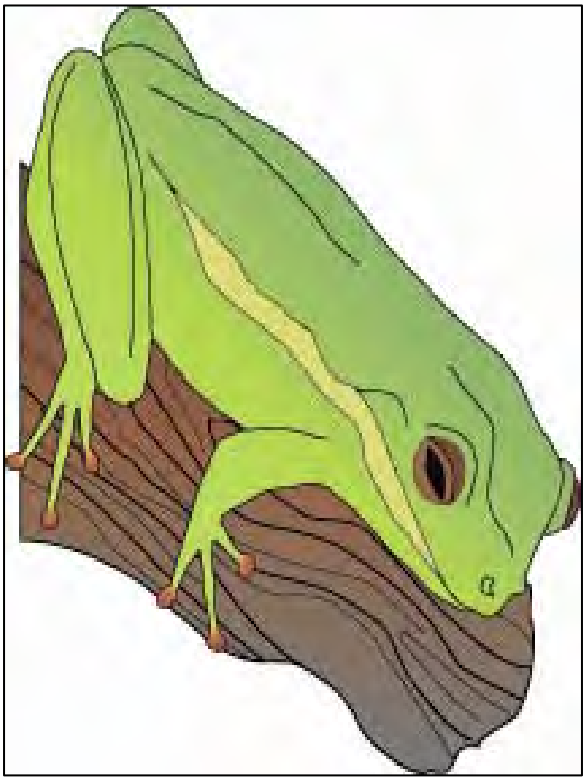


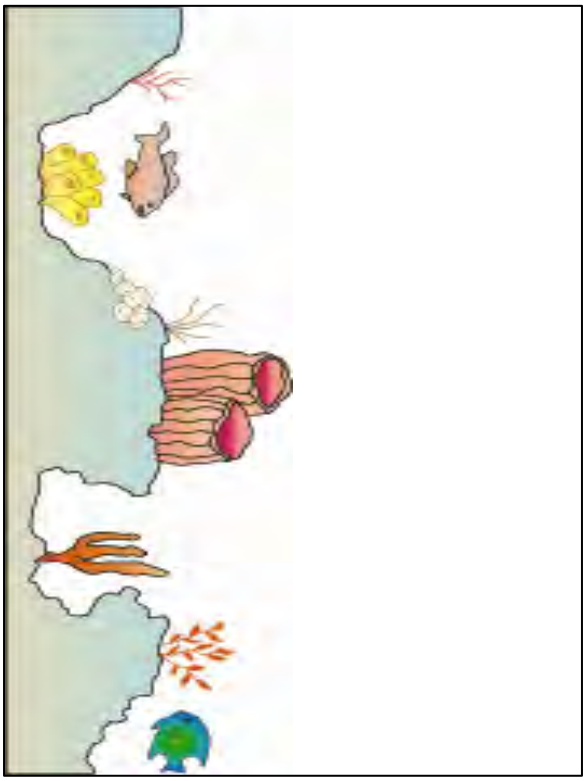


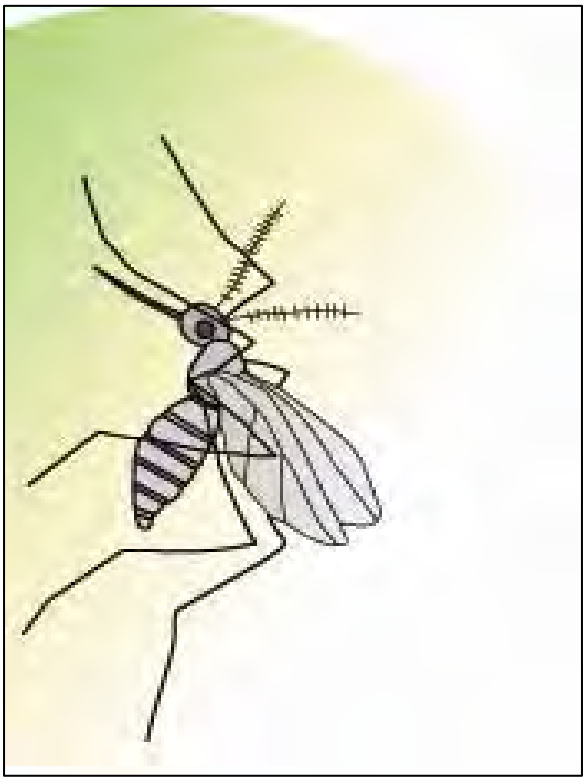


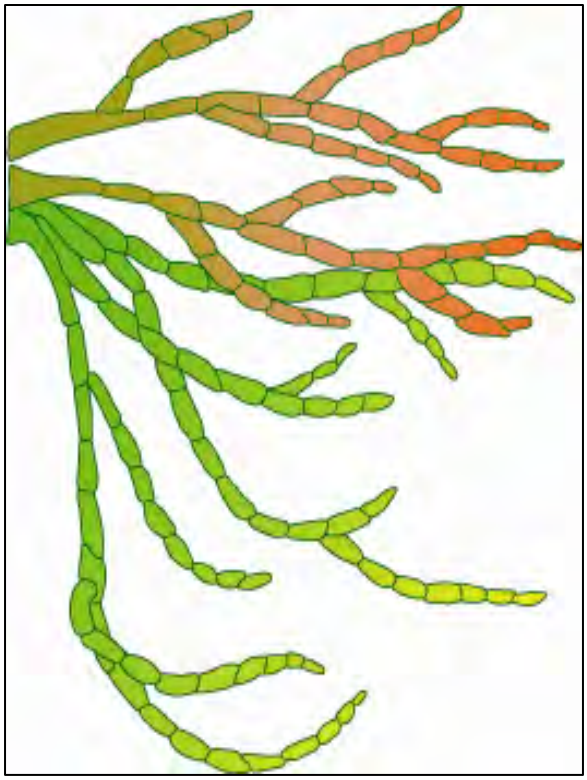


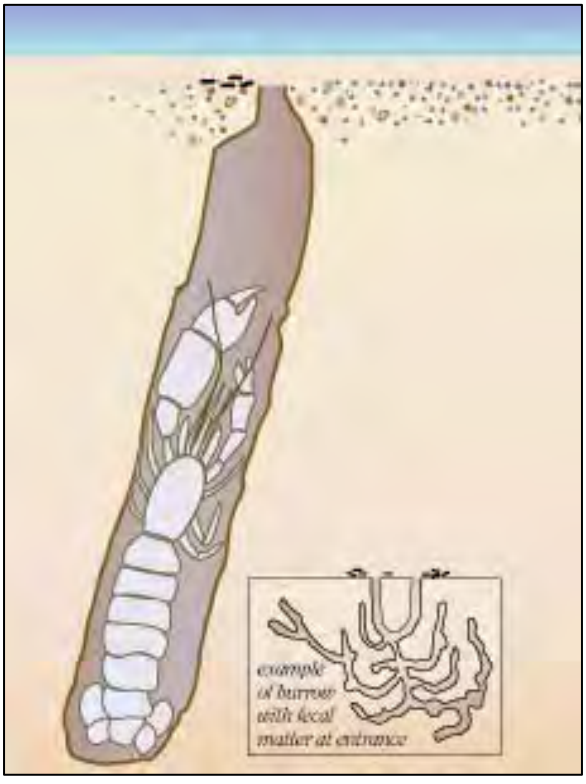


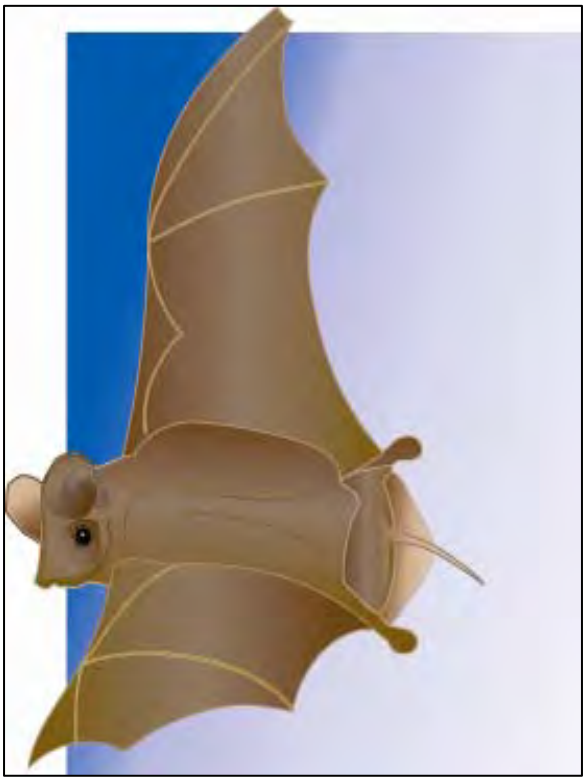


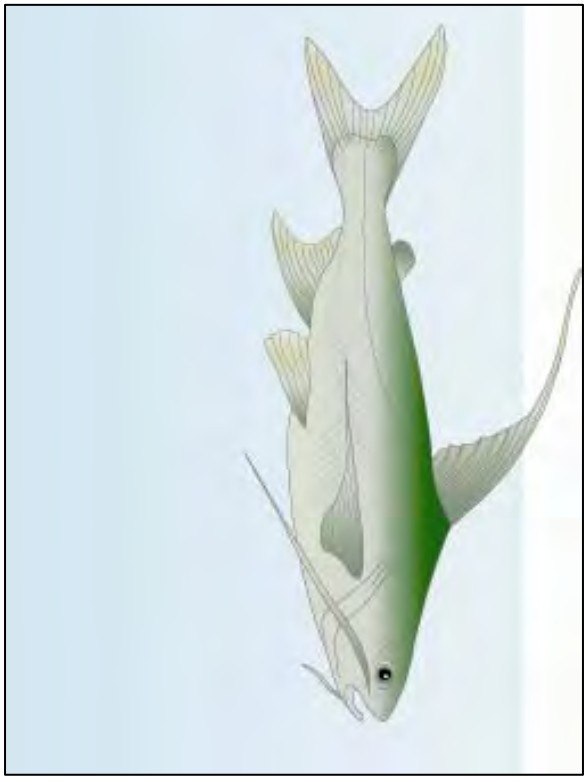


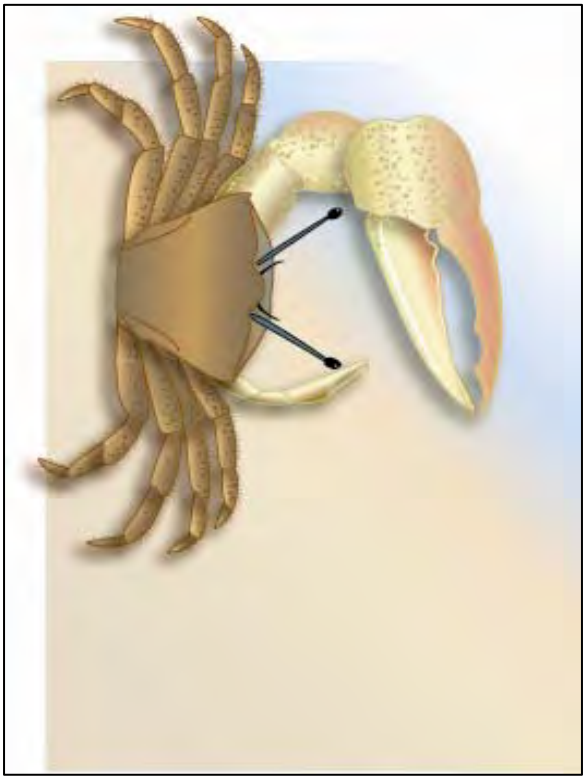


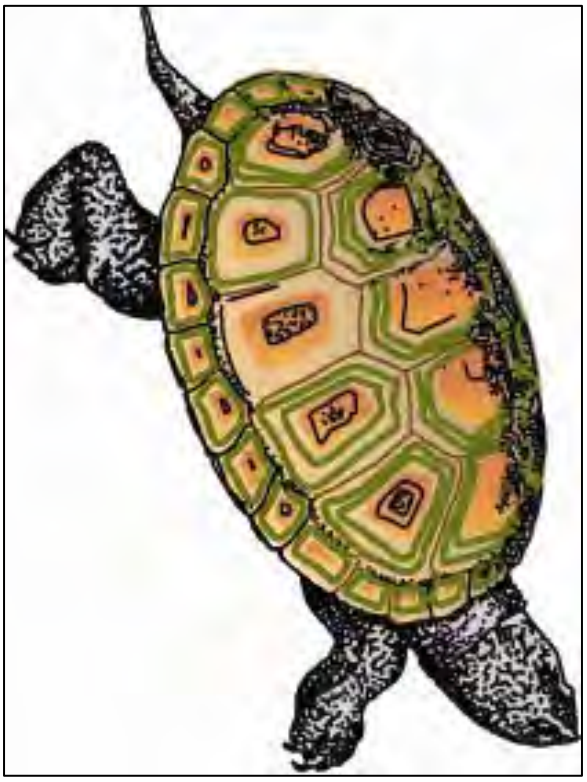


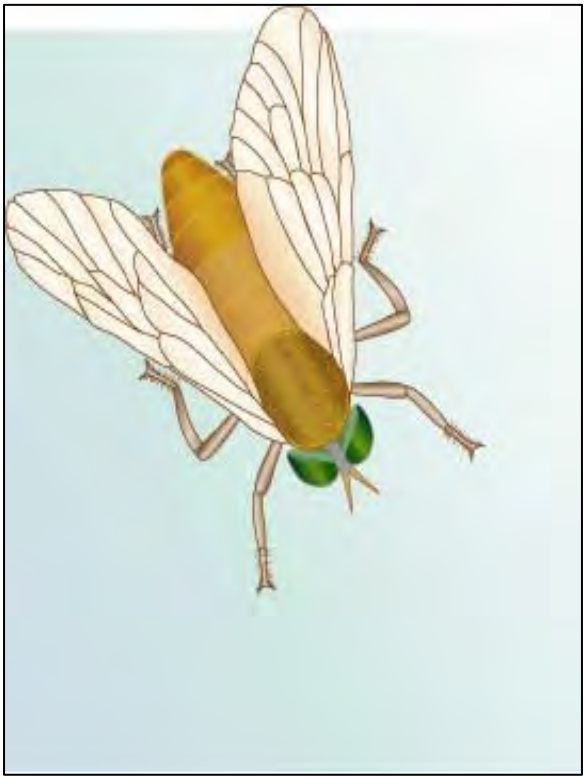

example
of burrow
with fecal
matter at entrance

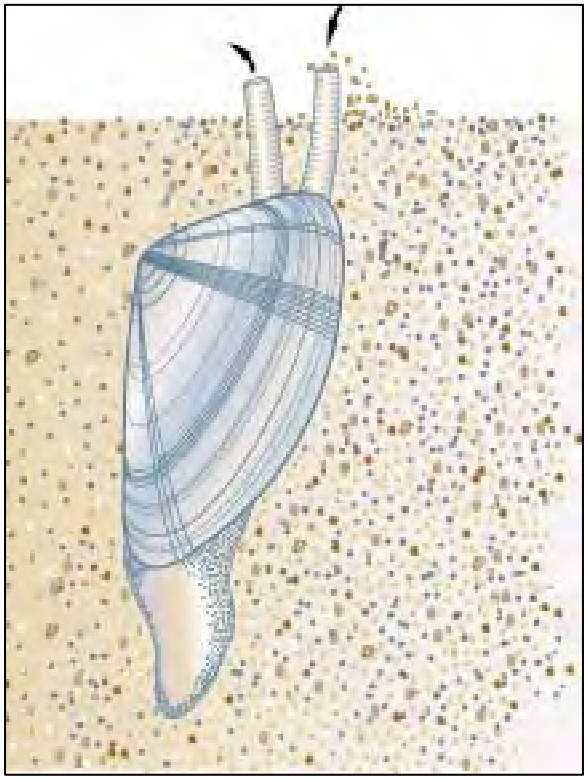


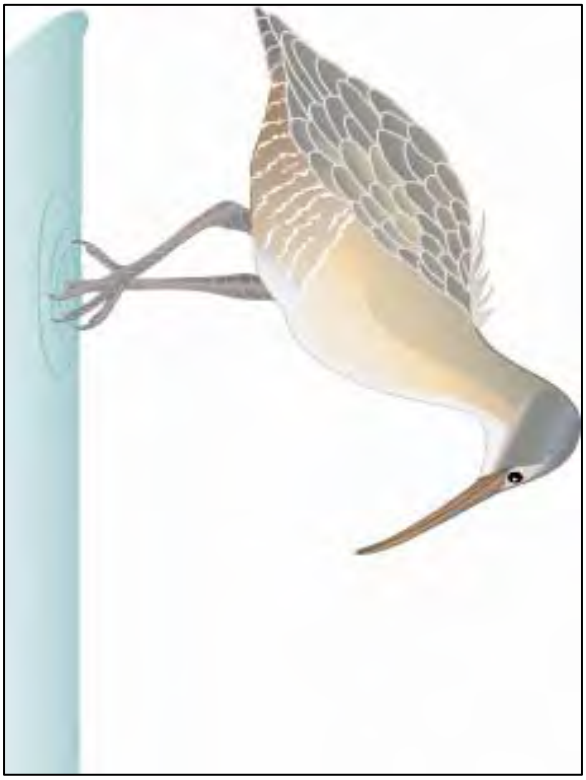


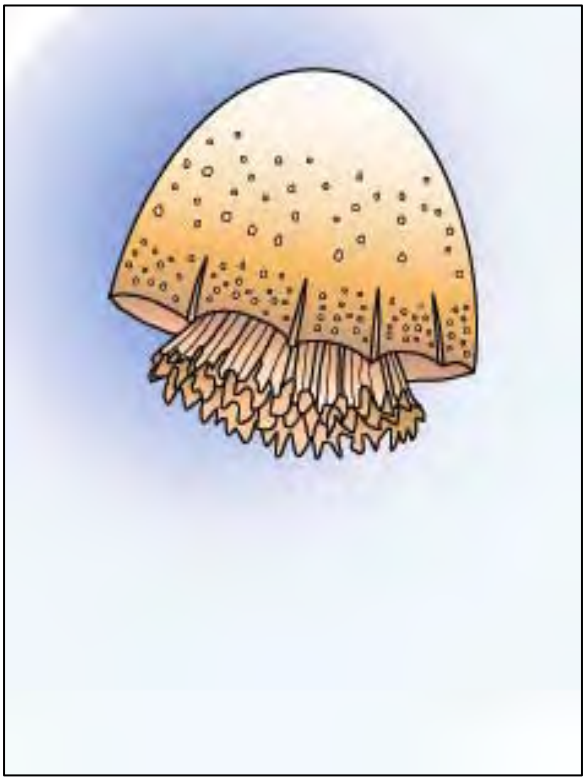


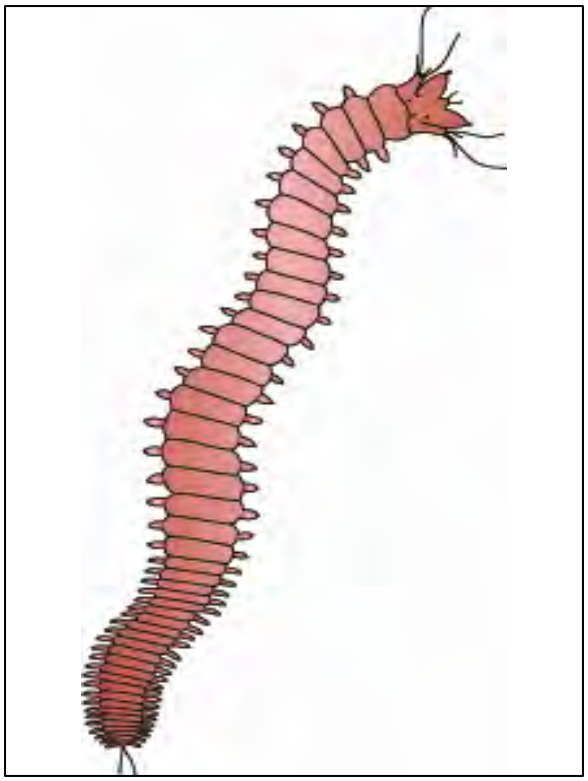


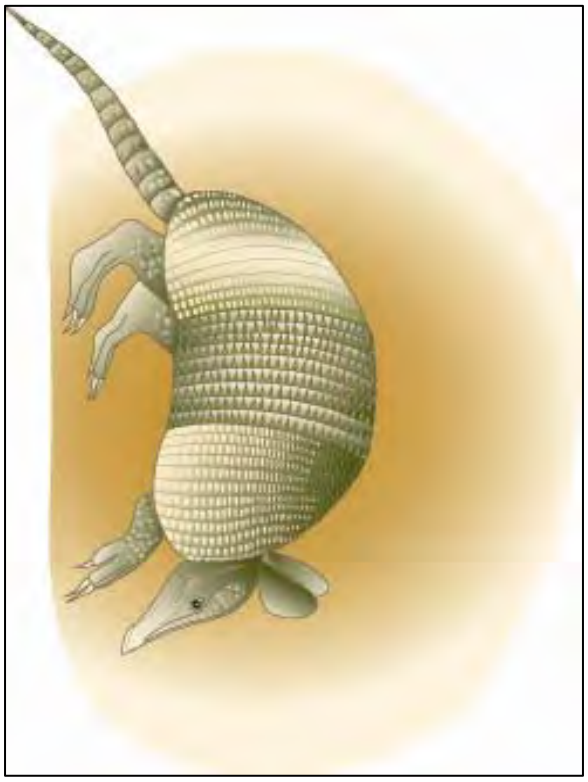


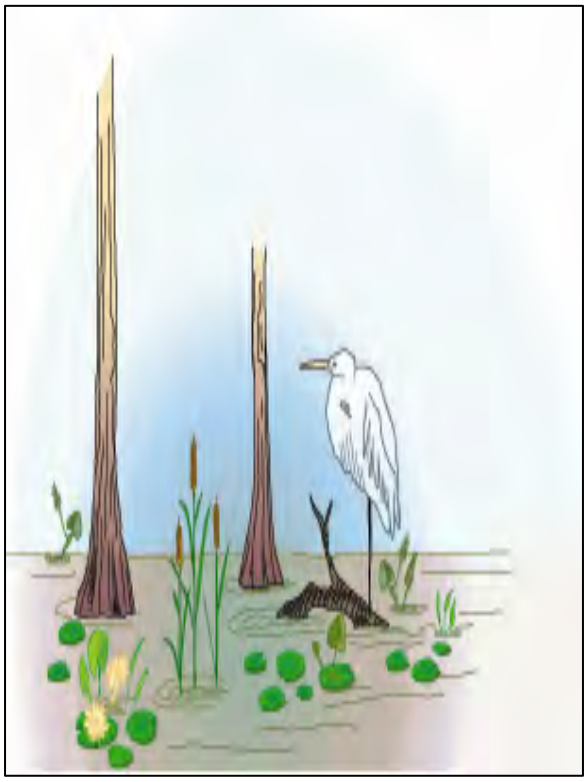


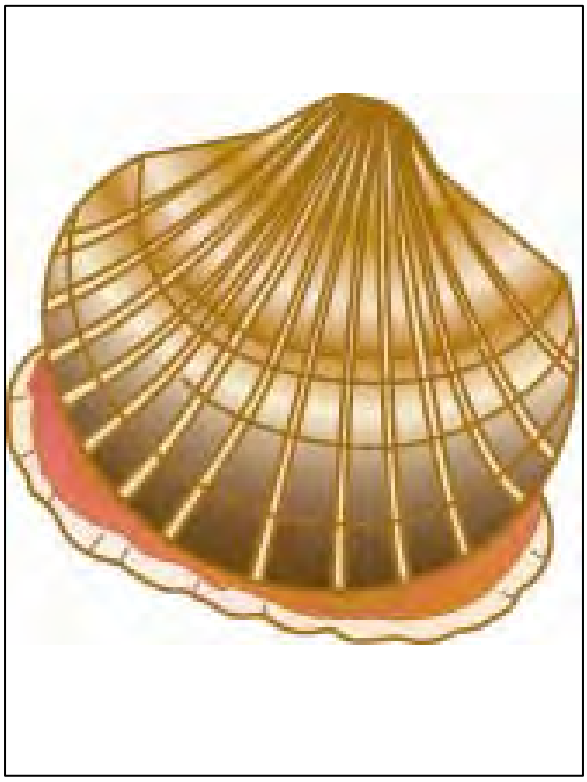


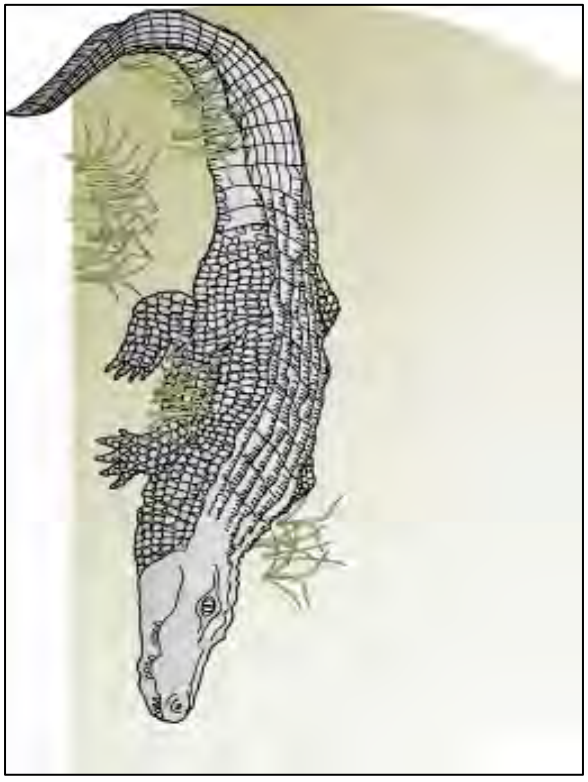


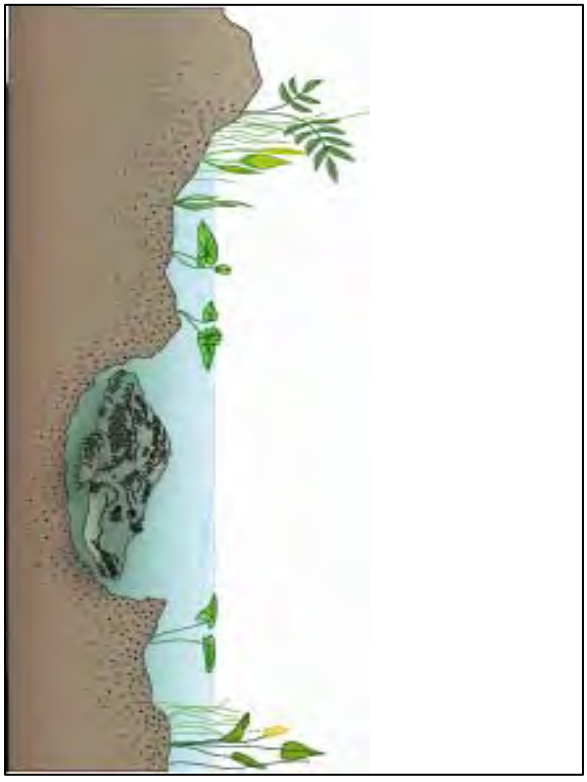












Animal Traits/Behavior Story Map

Title: _____

Setting:

Characters: _____

_____

_____

_____

Problem:

Event 1: _____

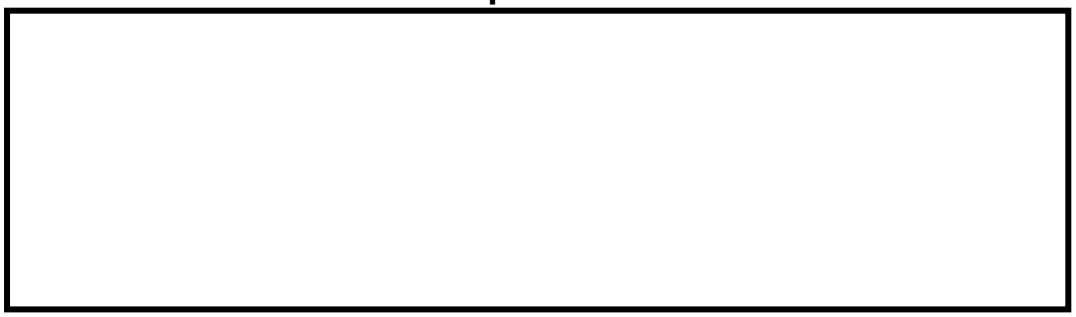
Event 2: _____

Event 3: _____

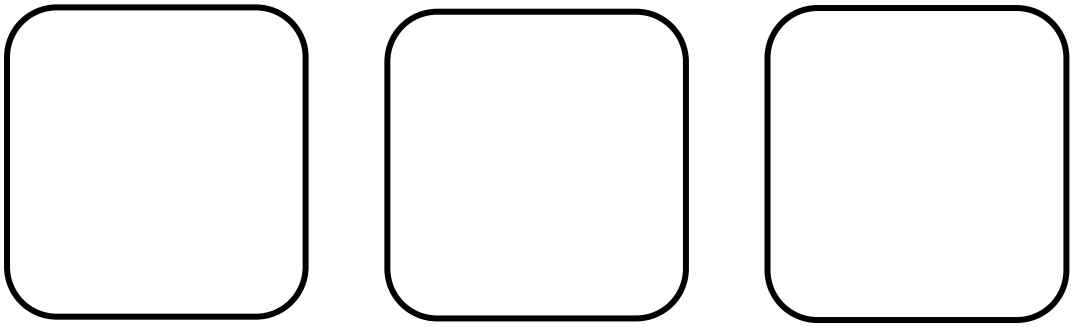
Solution:

Physical Traits and Behaviors

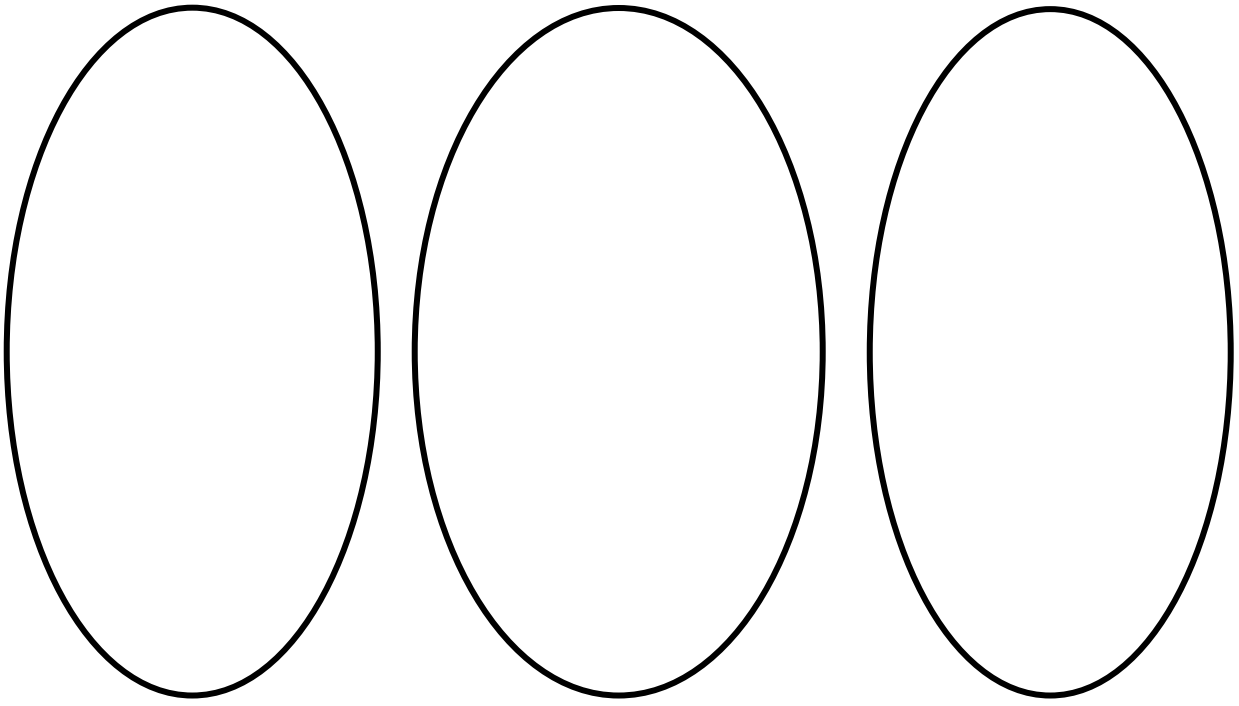
Species



Physical Traits



Behaviors



Compare / Contrast Truffulla & Longleaf

Truffulla Tree Community

Longleaf Pine Community

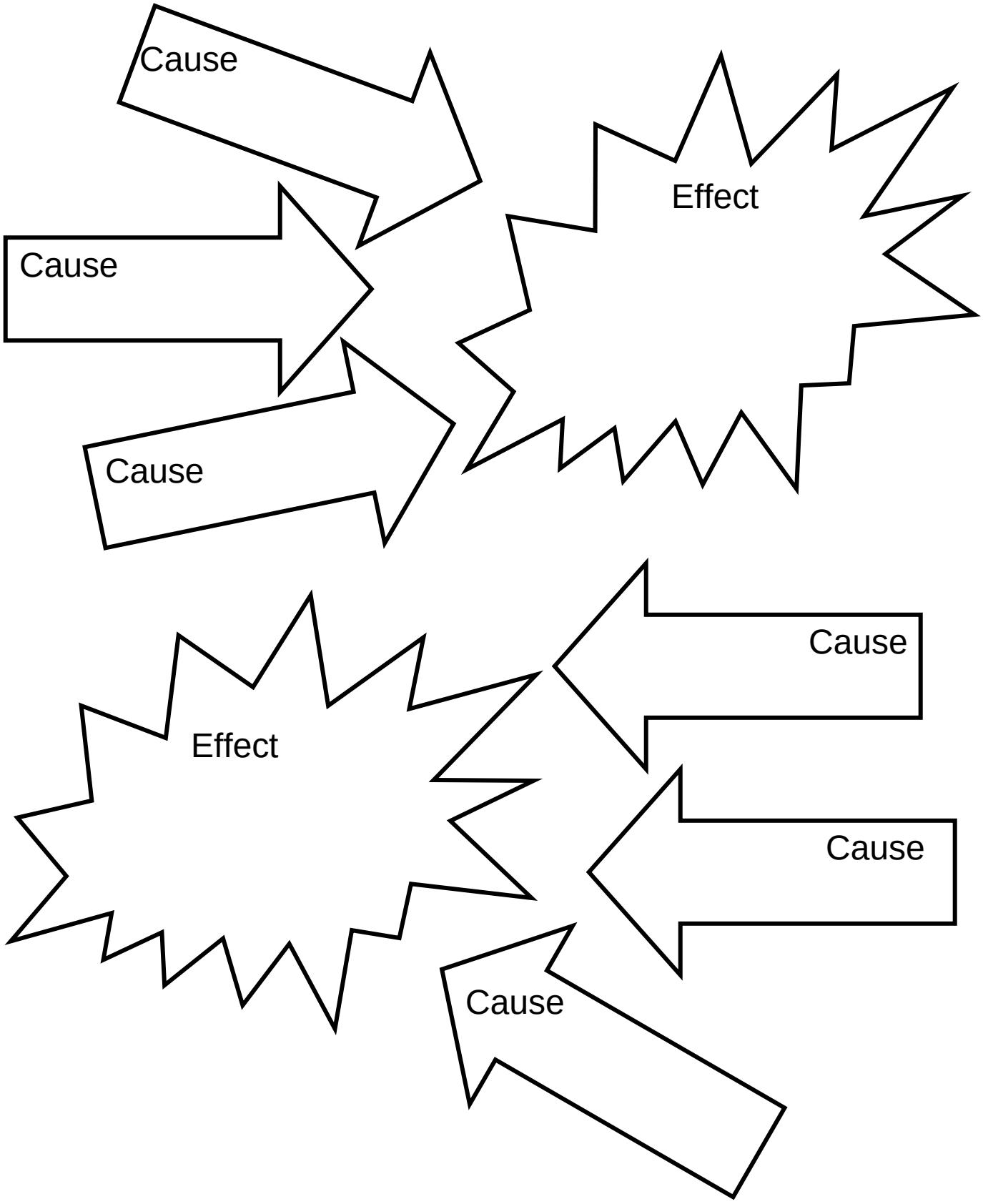
How Alike?

How Different?

With Regard To

Summarize:

Lorax Community



Performance Assessment 1

- The student will complete "Classification Descriptive Organizer" to demonstrate understanding of classification (vertebrate, invertebrate, fish, amphibian, reptile, bird, and mammal).

Performance Assessment 2

- After viewing two pictures (male and female of same species), students draw four examples of what the offspring may look like on "Inherited and Learned Behaviors & Traits" graphic organizer.
- Students list details of inherited and learned behaviors and traits for each.

Performance Assessment 3

- Students will select one plant and one animal, illustrate each, and identify factors that affect the survival or extinction of the organisms such as adaptation, variation of behaviors (hibernation) and external features (camouflage and protection).
- See "Adaptations Rubric" (choice of two)

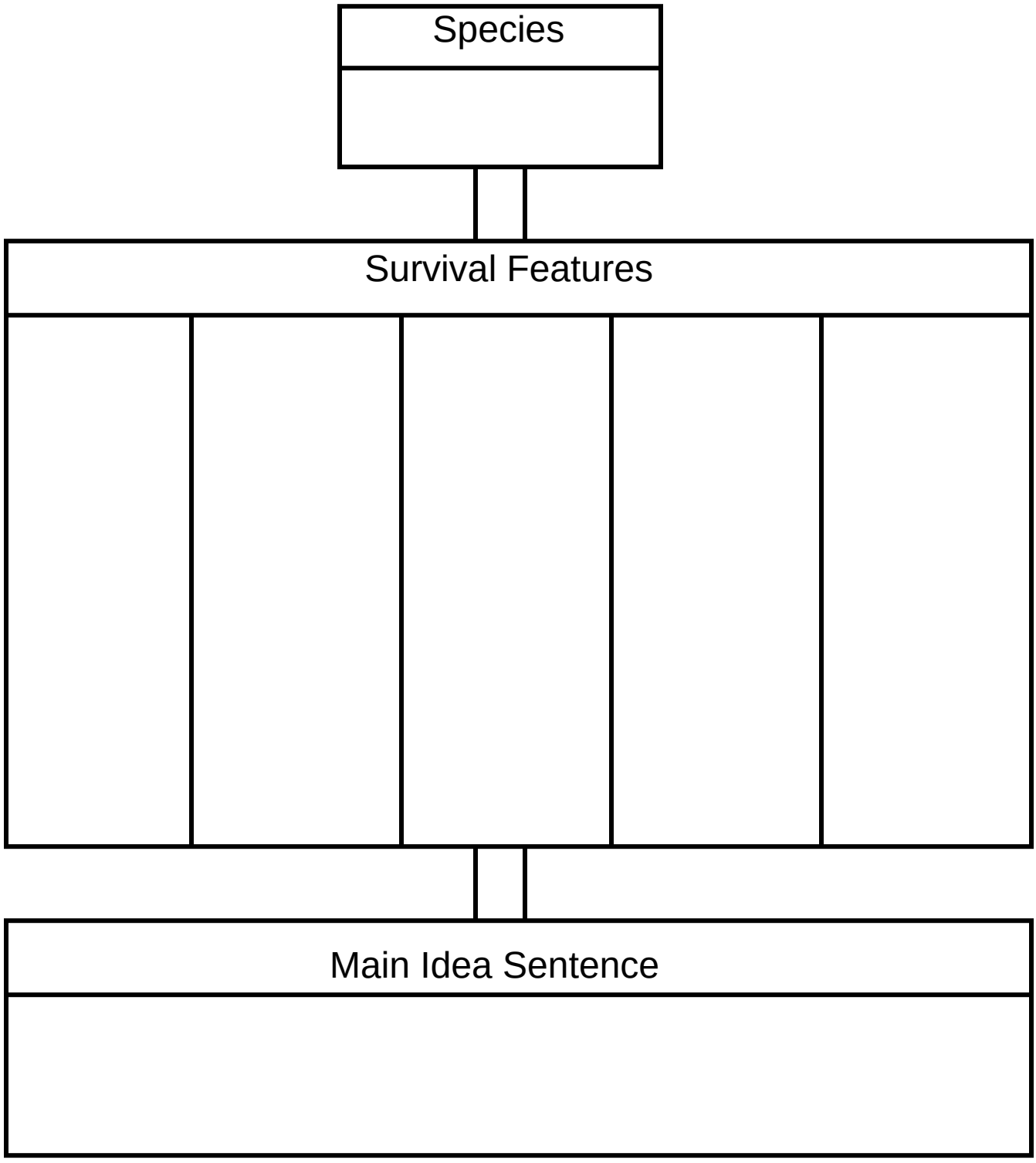
Classification Descriptive Organizer

Vertebrates	Invertebrates

Examples				
Fish	**Amphibians**	**Reptiles**	**Birds**	**Mammal**
Traits Specific to Each				

Inherited and Learned Behaviors & Traits Name_____

Plant / Animal Survival



Adaptation Rubric

Name _____ Date_____

One plant and one animal are identified,

Observer **Investigator** **Expert**

One plant and one animal are illustrated.

Observer **Investigator** **Expert**

One plant and one animal are described

Observer **Investigator** **Expert**

Animal adaptations necessary for survival are described.

Observer **Investigator** **Expert**

Plant adaptations necessary for survival are described.

Observer **Investigator** **Expert**

Animal behaviors necessary for survival are described.

Observer **Investigator** **Expert**

External features of plants necessary for survival are described.

Observer **Investigator** **Expert**

KEY: Observer=5 pts., Investigator=10 pts., Expert-15 pts. Your total_____

Adaptation Rubric

Student's Name:_____

	Beginning 1	**Developing 2**	**Accomplished 3**	**Exemplary 4**	**Score**
Illustration of Plant	Plant is drawn with little or no details or labels	Plant is drawn clearly, with 2-3 labels and details	Plant is drawn clearly, with 4-6 labels and details	Plant is drawn clearly, with more than 6 labels and details	
Illustration of Animal	Animal is drawn with little or no details or labels	Animal is drawn clearly, with 2-3 labels and details	Animal is drawn clearly, with 4-6 labels and details	Animal is drawn clearly, with more than 6 labels and details	
Description of Plant	Plant adaptations are not listed or those listed are incorrect	One plant adaptation is listed and/or is correct	2-3 plant adaptations are listed and/or are correct	More than 3 plant adaptations are listed and are correct	
Description of Animal	Animal adaptations are not listed or those listed are incorrect	One animal adaptation is listed and/or is correct	2-3 animal adaptations are listed and/or are correct	More than 3 animal adaptations are listed and are correct	
Over quality of Assessment	Drawings and writing are messy, unorganized, and difficult to read and understand	Drawings and writing are somewhat neat and easy to read	Drawings and writing are neat, organized, and easy to read	Drawings and writing are exceptionally neat, detailed, organized, and easy to read	

TOTAL:

Teacher's Comments:

South Carolina: Our Amazing Coast
Grade 5

Big Idea – Ecosystems: Terrestrial and Aquatic

5th Grade
Enduring understanding:

- Students will summarize the composition of an ecosystem, considering both biotic and abiotic factors.
- Students will understand living organisms are made up of cells.
- Students will understand the roles of organisms and the flow of energy within an ecosystem.
- Students will understand the benefits and harmful effects of microorganisms.

South Carolina Science Academic Standards

Life Science
5-2.1 Recall the cell as the smallest unit of life and identify its major structures
5-2.2 Summarize the composition of an ecosystem, considering both biotic factors and abiotic factors
5-2.4 Identify the roles of organisms as they interact and depend on one another through food chains and food webs in an ecosystem, considering producers, consumers, decomposers, predator and prey, and parasites and hosts.

Activating Strategy

- Before ever discussing what an ecosystem is, have students use colored pencils and have them illustrate and label what they think an ecosystem may be on a sheet of construction paper. Then show the students a United Streaming short video on Ecosystems. After the students have viewed the video, have them illustrate and label an ecosystem with their new knowledge on the back of the same construction sheet.
- Compare the two illustrations and discuss differences and similarities.
- Ask the students, "What are the main components of an ecosystem?"
- Brainstorm and discuss various terrestrial and aquatic ecosystems.

Acquisition Lessons

Lesson 1

- What are the biotic and abiotic components (factors) of an ecosystem?
- Are there similar or different biotic and abiotic factors within terrestrial and aquatic ecosystems?

1. Copy and laminate the five Biotic and Abiotic Factor picture cards of various ecosystems.
2. Group students into five teams. Distribute one picture card per team and a vis-à-vis pen.
3. Have students label the biotic and abiotic factors on their cards. Have students write the letter “b” for biotic factors and the letter “a” for abiotic factors on the picture card.
4. Discuss each picture card. Have students complete the Biotic and Abiotic T-chart. Are there similarities and/or differences among the ecosystems?

Lesson 2

- What are the roles of producers, consumers, and decomposers in a community?

1. Begin K-W-L matrix for producers, consumers, and decomposers (provided).
2. Students will select one producer and one consumer from the Georgia’s Amazing Coast book or picture cards from the Our Amazing Coast CD.
3. Students will work in collaborative groups to complete a “Frayer Model Organizer for Producers / Consumers” for each organism.
4. Students will complete their Frayer models and place them on a bulletin board divided into sections labeled: producers, consumers, and decomposers.
5. Class will brainstorm a list of decomposers to add to last section and discuss their roles in the ecosystem.
6. Summarizing strategy: Complete K-W-L chart.
7. Ticket out the Door: students name one producer, consumer, and decomposer.

- How does energy flow through a food chain / web?
- What would happen to a population if some of the plants or animals in the community became scarce, or if there were too many?

Lesson 3

- What are the parts and function of a plant cell (membrane, wall, cytoplasm, nucleus, chloroplasts)?
- What are the parts and function of an animal cell (membrane, cytoplasm, and nucleus)?

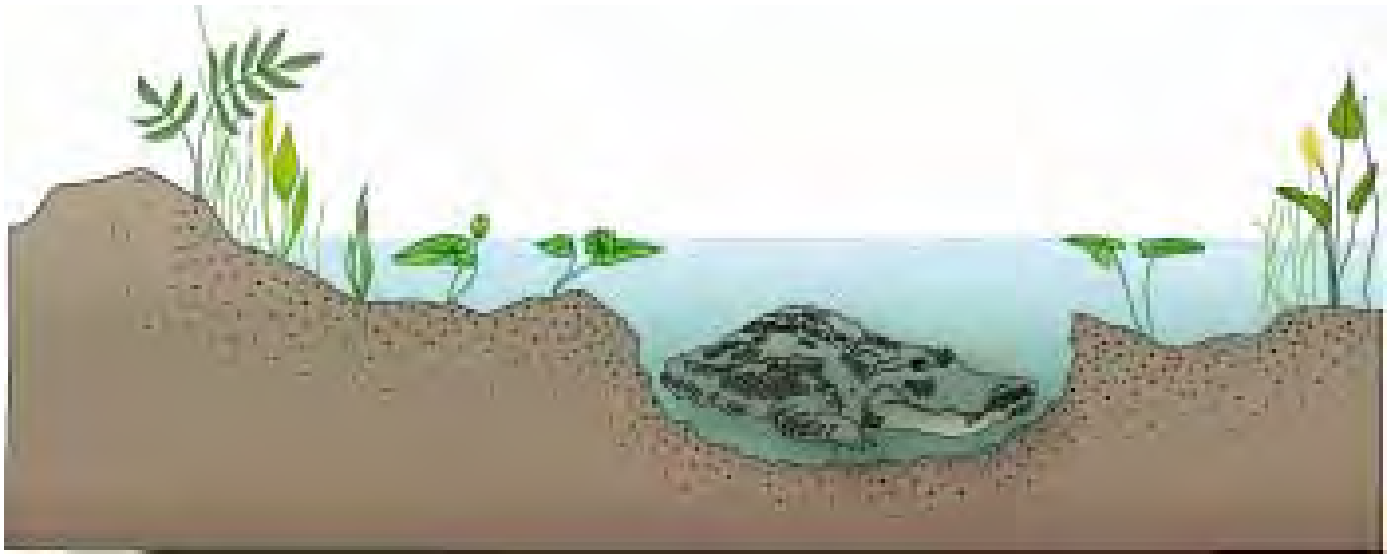
1. Teacher leads class on a walk around campus to collect plant and animal samples.
2. Students prepare slides from samples and examine them under the microscope (or use prepared slides).
3. Watch BrainPop movies on animal and plant cells. Take accompanying quizzes (whole group).
4. Teacher leads class brainstorming session to complete Venn diagram on plant/animal cells.
5. Students draw and label an example of each cell.

Lesson 4

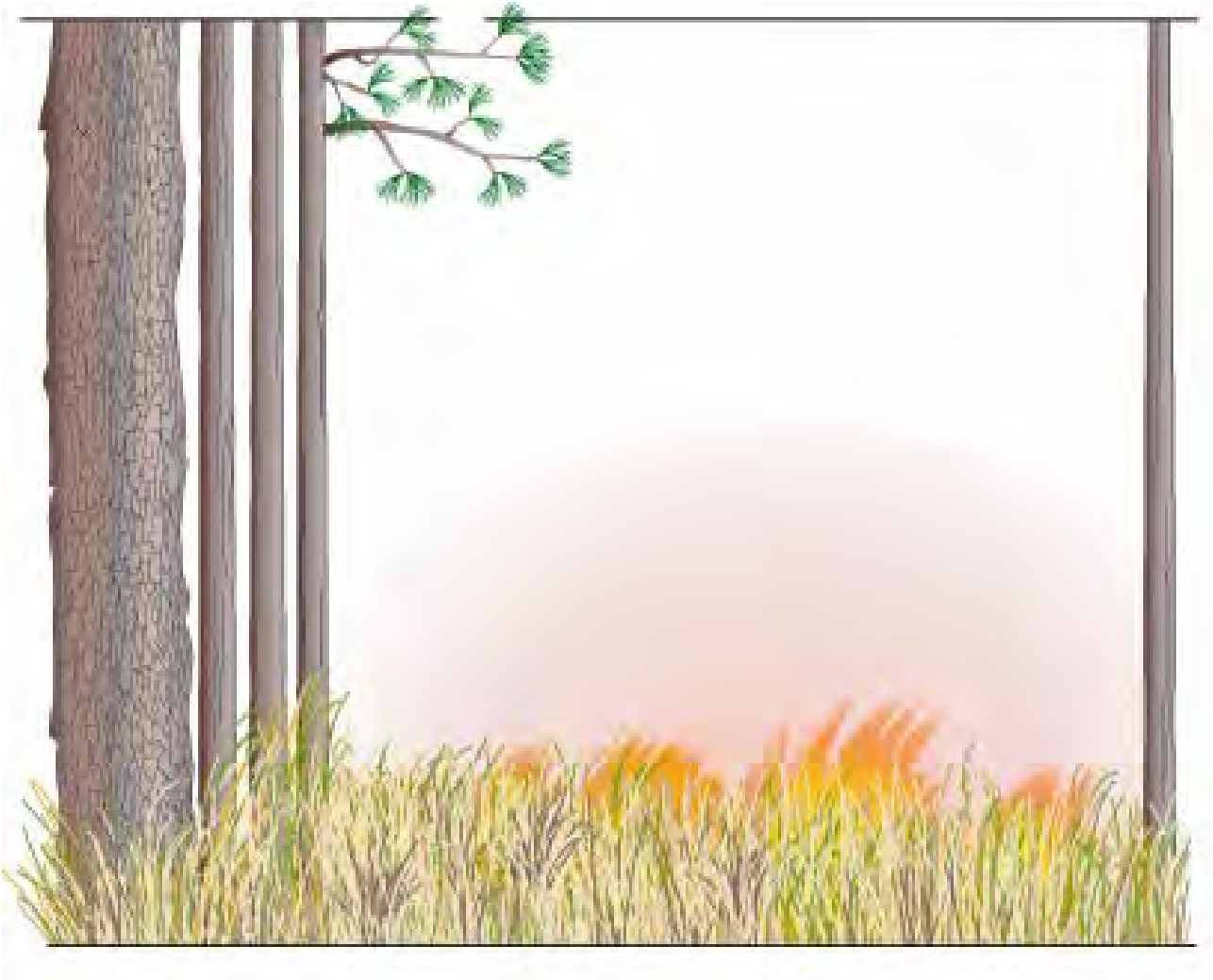
- Why are some microorganisms beneficial and some are harmful?

1. Teacher introduces the Frayer model for microorganisms. Teacher instructs students to listen as the pages are being read for examples of microorganisms and their specific traits of being harmful or beneficial.
2. Teacher reads several pages from Georgia's Amazing Coast (Ghost Shrimp, Marsh Mud, Marsh Periwinkle, Marine Bacteria, and Plankton).
3. Class completes Frayer model.
4. Class creates chart describing how each example from the book is helpful or harmful.
5. Ticket out the door: Student tells teacher one trait of microorganisms.

Biotic and Abiotic Ecosystems Picture Cards



Biotic and Abiotic Ecosystems Picture Cards



Biotic and Abiotic Ecosystems Picture Cards

Biotic and Abiotic Ecosystems Picture Cards

Biotic and Abiotic Ecosystems Picture Card

BIOTIC AND ABIOTIC FACTORS
IN TERRESTRIAL AND AQUATIC ECOSYSTEMS

BIOTIC	ABIOTIC

Producers, Consumers, and Decomposers

-K- I think I know…	-W- I want to know…	-L- I learned…

The Frayer Model Organizer of Producers/Consumers/Decomposers

Description:

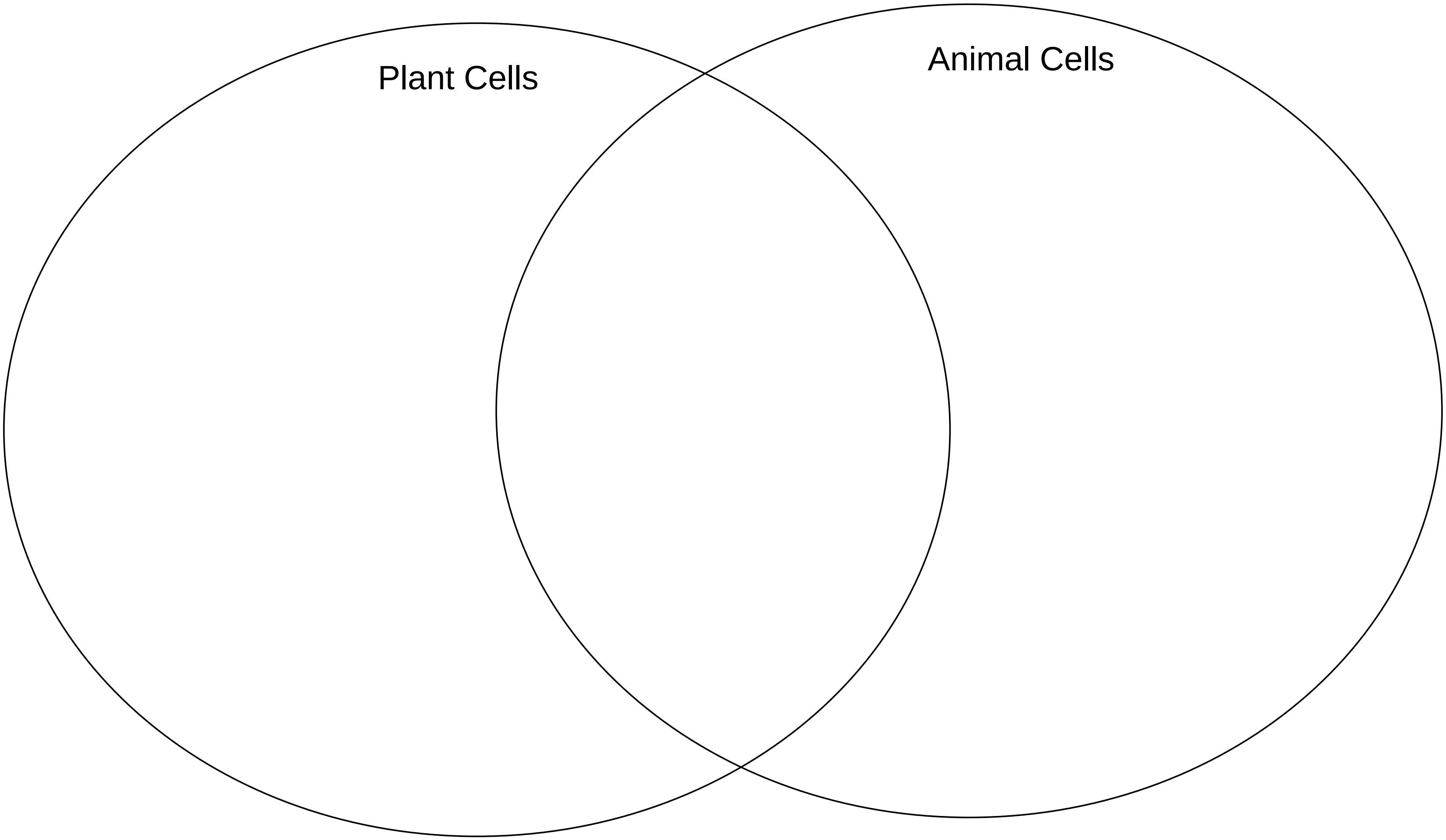
Characteristics:

Organism

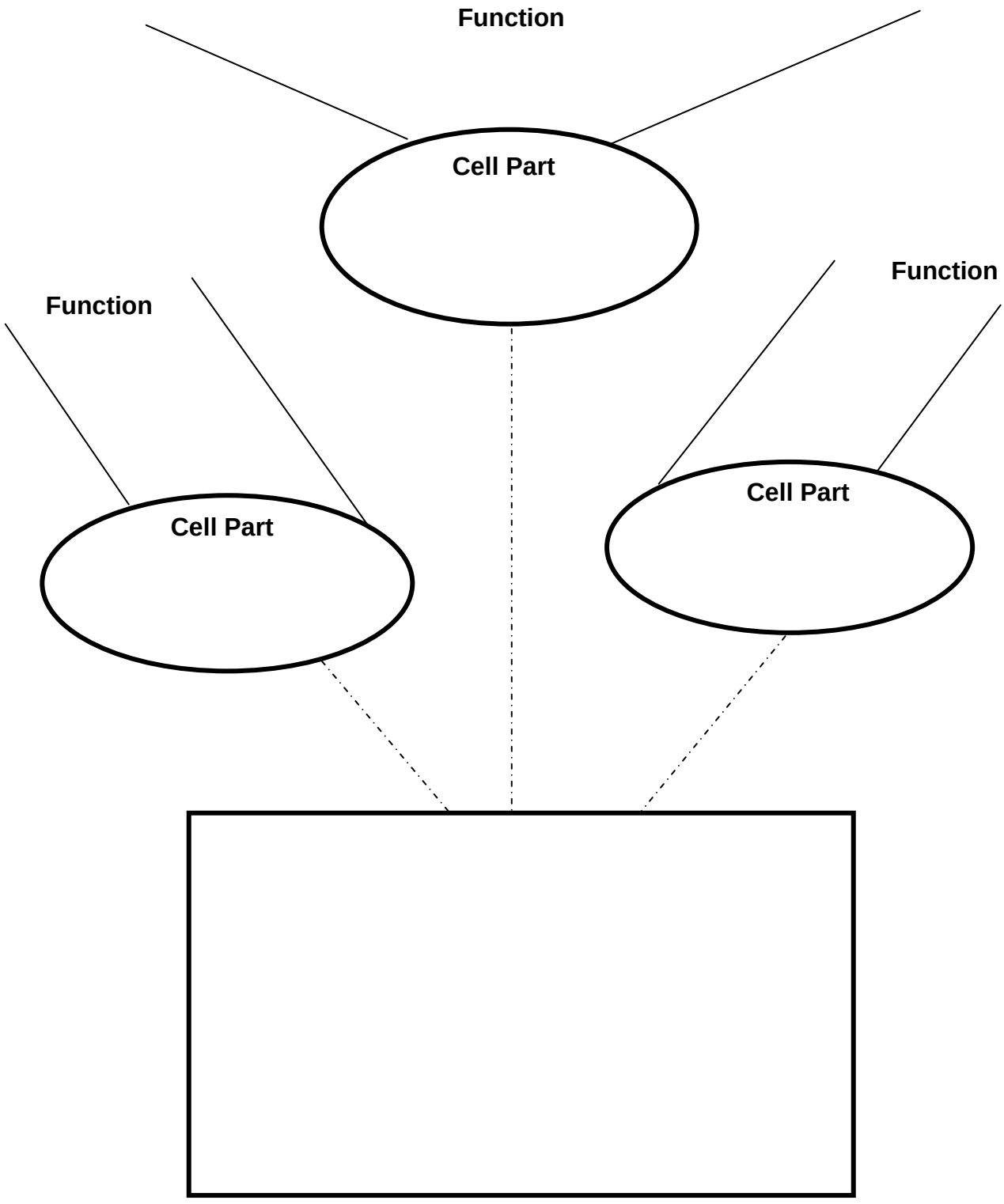
Examples:

Drawing:

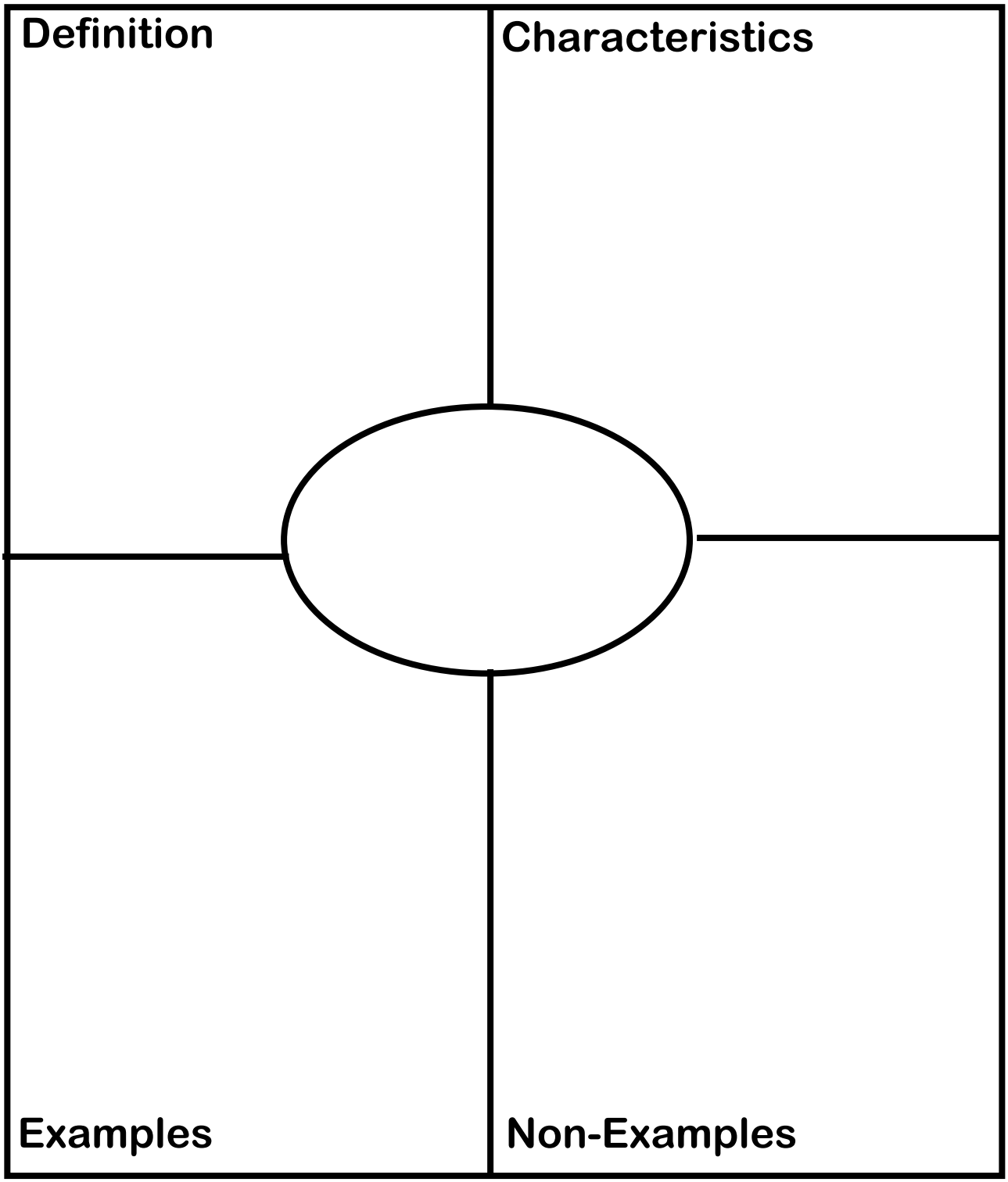
Comparing Plant and Animal Cells



Cells: Parts and their Functions



Microorganisms



Microorganism

Helpful or Harmful?

Describe:

Performance Assessment 1

- The student will create a poster depicting the roles of organisms and the flow of energy within an ecosystem.

- See “Flow of Energy Rubric” (choice of two)

Performance Assessment 2

- Students will draw and label a plant and animal cell (scoring rubric provided)

Performance Assessment 3

- Students will choose one page (marsh mud, marine bacteria, or plankton) from the Georgia’s Amazing Coast book.
- Student will describe the ways in which microorganisms are “Helpful, Harmful - or Both?” on provided organizer.

Overall Assessment for Enduring

- Our Amazing Coast: “I have…Who has…? Game

"**Flow of Energy Rubric**" Student Name:_____

CATEGORY	Weight for Each Category	4	3	2	1
Title	X1 (up to 4 pts available)	Title is informative, centered, and larger than other text.	Title is informative and larger than other text.	Title is informative and centered.	The title is incomplete.
Labels	X2 (up to 8 points available)	Every item that needs to be identified has a label. It is clear which label goes with which plant or animal.	Almost all items (90%) that need to be identified have labels. It is clear which label goes with which plant or animal.	Most items (75-89%) that need to be identified have labels. It is clear which label goes with which plant or animal.	Less than 75% of the items that need to be identified have labels OR it is not clear which label goes with each plant or animal.
Accuracy	X3 (up to 12 points available)	Every plant and animal is clearly identifiable and it's role in the habitat is described	Most of the plants and animals are identifiable and some of their roles in the habitat are described	Some of the plants and animals are identifiable. Their roles in the habitat are unclear.	Less than half of the plants and animals are accurate
Knowledge Gained	X3 (up to 12 points available)	The flow of energy is depicted clearly, with numerous examples.	The flow of energy is depicted clearly, with 2-3 examples.	The flow of energy is depicted clearly, with one example.	The flow of energy is not clear.
Spelling	X2 (up to 8 points available)	All words are spelled correctly in the title, labels and caption/description.	All common words are spelled correctly in the title, labels & description. 1-2 scientific words may be misspelled.	75% of the words are spelled correctly in the title, labels & description.	Fewer than 80% of the words are spelled correctly in the title, labels & description.

Flow of Energy Rubric

Name _____ **Date**_____

Poster is neat, both drawings and writing.

Observer **Investigator** **Expert**

Plants and animals included in poster are clearly labeled.

Observer **Investigator** **Expert**

Plants and animals are easily identifiable.

Observer **Investigator** **Expert**

The beginning of the flow of energy is clearly depicted.

Observer **Investigator** **Expert**

The flow of energy is clear throughout the poster.

Observer **Investigator** **Expert**

The role of each plant or animal is clearly illustrated.

Observer **Investigator** **Expert**

Scientific language is used in descriptions.

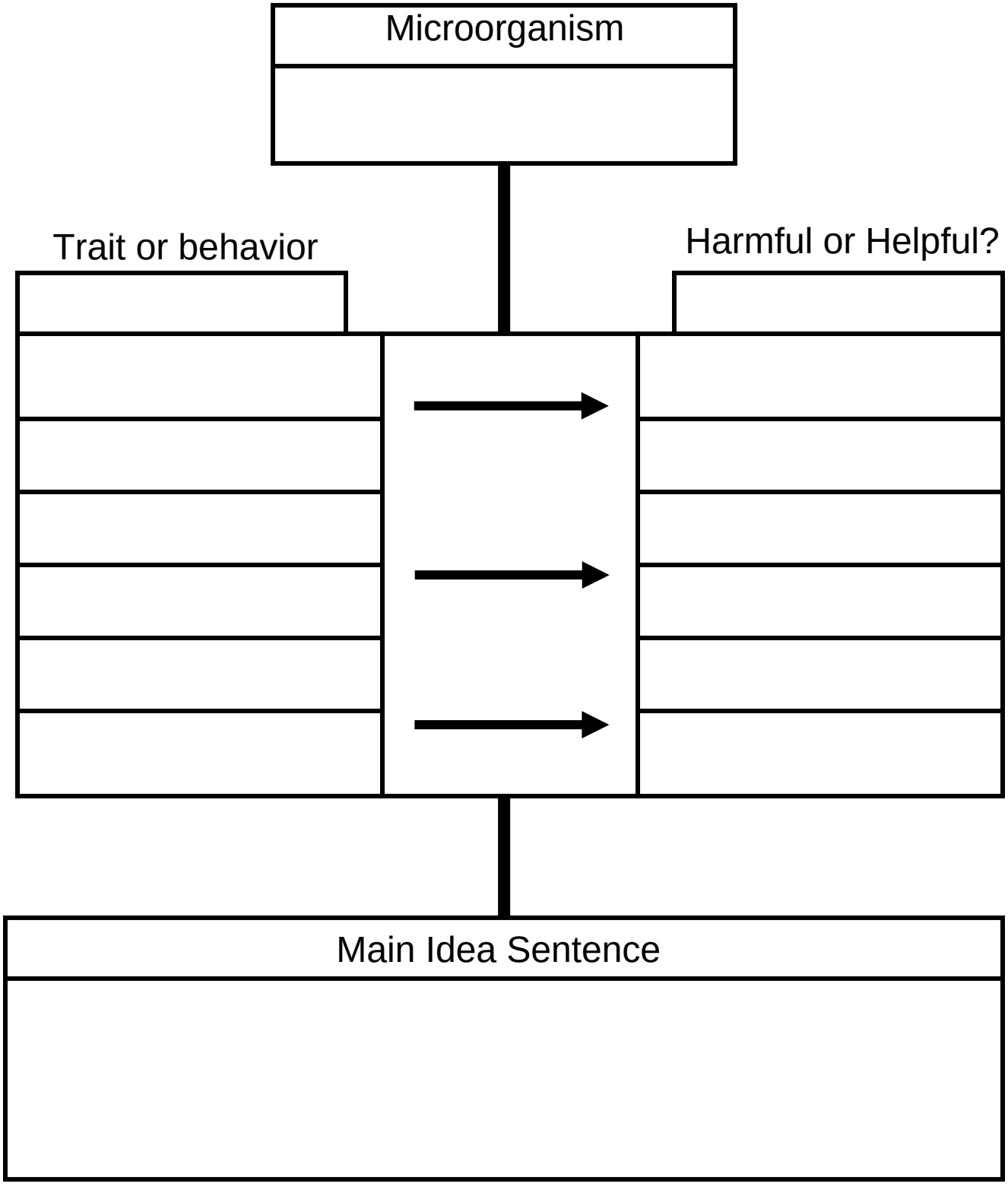
Observer **Investigator** **Expert**

KEY: Observer=5 pts., Investigator=10 pts., Expert-15 pts. Your total_____

Cell Drawing Rubric Student Name: _____

CELL DRAWING RULES		PLANT CELL	ANIMAL CELL
1. Used unlined paper	1 pts		
2. All labels printed Minus 1 pt for each label not printed	5 pts		
3. First letter of label is capitalized	2 pts		
4. 1" margin on all sides	2 pts		
5. Title at top of paper	1 pt		
6. Title All Capitals	1 pt		
7. Title centered; in middle of paper	2 pts		
8. Very little erasing; neat looking paper	1 pt		
9. Name printed	1 pts		
10. Name in lower right corner	2 pt		
11. No Crossed Label Lines	4 pts		
12. All labels horizontal; straight across the paper Minus 1 pt for each crooked label	5 pts		
13. Ruler used to draw lines from label to cell part Minus 1 pt for each line not drawn with a ruler	5 pts		
CELL PARTS			
14. Cell Wall	2 pts		NONE
15. Cell Membrane	2 pts		
16. Nucleus	2 pts		
17. Endoplasmic Reticulum	2 pts		
18. Ribosomes	2 pts		
19. Mitochondria	2 pts		
20. Vaculoes	2 pts		
21. Lysosomes	2 pts	NONE	
22. Chloroplasts	2 pts		NONE
SUB TOTAL	50 pts		
Extra Credit Cell parts colored with pencils	2 pts		
Extra Credit Cell parts outlined in marker	3 pts		
FINAL TOTAL with extra credit	55 pts		

Helpful, Harmful – or Both?



Our Amazing Coast:
I am… Who has…? Game

Preparation:
Copy cards on card stock. Laminate cards and then cut apart.

Directions:

1. Distribute entire set of cards to students (some students may have more than one card).
2. Game begins with any student reading the descriptive paragraph printed on their card, beginning with “Who has…”
3. The student who holds the card that names the thing described calls out “I have…” and then asks “Who has…” and reads the description on their own card.
4. Game continues until full circle is made back to first student and all cards have been read.

Our Amazing Coast: I am… Who has…? Game

I am… **Alligator** Who has… The larval stage of the Blue Crab, it floats from the estuary out to the sea and then back again before changing into something that resembles a blue crab.	I am… **Armadillo** Who has… Nearly hunted to extinction by the early 1970's, this animal is once again a common sight in southern wetlands, rivers, and swamps.
I am… **Blue Crab** Who has… This nearly blind, burrowing animal is found second only to the opossum as road kill in Georgia and South Carolina.	I am… **Cow Killer** Who has… Like other members of the Decapod order, it has five pairs of legs. It gets its name from its bright coloring along its frontal area.
I am… **Diamondback Rattlesnake** Who has… Also called the velvet ant, it is in fact a wingless wasp. It is a shocking shade of red with two black bands at its abdomen.	I am… **Eastern Indigo Snake** Who has… The largest and deadliest of the world's thirty-two species of rattlesnakes.

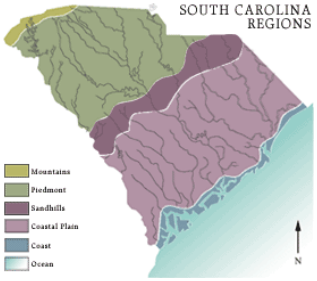
I am… **Fossilized Shark Tooth** Who has… One of the largest non-venomous snakes in North America, it often lives in a gopher tortoise burrow.	I am… **Tides** Who has… South Carolina's most prevalent fossil find and Georgia's official state fossil. It present compelling evidence that much of the state was once under the sea.
I am… **Gopher Tortoise** Who has… Every twelve hours, billions of gallons of seawater rush into or out of the marsh through a web of small rivers or streams.	I am… **Marsh Mud** Who has… Considered a "keystone species" because its burrow serves as a refuge for at least 39 invertebrate and 42 vertebrate species.
I am… **Gray's Reef** Who has… A thick nutrient soup that transforms the carbon in dead plants into energy to power higher forms of life, replenishing the state's coastal waters.	I am… **Hooded Pitcher Plant** Who has… 17 miles east of Sapelo Island, GA, this national marine sanctuary is a vast complex of underwater limestone outcroppings that rise up 10 feet off the ocean floor.

I am… **Island Glass Lizard** Who has… With the promise of nectar, this plant lures ants, bees, butterflies, and other insects deep inside its tubular leaves, where they are guided to a pool of fluid & drown.	I am… **Knobbed Whelk** Who has… A slender, legless creature that can grow to 26 inches in length, most of which is tail. It spends most of its life underground.
I am… **Live Oak Tree** Who has… One of the largest sea snails found in South Carolina.	I am… **Longleaf Pine Forest** Who has… This tree gets its name by keeping its leaves throughout the winter.
I am… **Marsh Periwinkle** Who has… Home to the Gopher Tortoise & Eastern Indigo Snake. Logging, agriculture, and population change have almost done what fire and lightning couldn't – eliminate this ecosystem.	I am… **Octopus** Who has… Not a flower, these snails can be found at the base of one of their favorite foods – the smooth cordgrass.

I am… **Oyster** Who has… One of the shyest underwater creatures found in the coast, this cephalopod has the ability to change colors.	I am… **Painted Bunting** Who has… We use this creature's meat as food, its pearl and shiny lining as ornament, and its shell as a building material.
I am… **Plankton** Who has… One of the most colorful birds in North America, its plumage is bright blue, red, green, and yellow. They summer in South Carolina and winter in the Caribbean.	I am… **Right Whale** Who has… A wide variety of drifting plants and animals, ranging in size from a single cell to a huge sea jelly.
I am… **Sand Gnat** Who has… A Marine Mammal - adults of this species reach 50 feet in length and weigh about 60 tons. Today it is close to extinction.	I am… **Sargassum** Who has… Also known as "no-see-ums", these insects are members of a group of insects known as biting midges.

I am… **Sea Island Cotton** Who has… A type of brown algae that floats freely on the ocean currents. Fish, baby sea turtles, and other sea life value it as habitat.	I am… **Horseshoe Crab** Who has… This plant was used to make luxurious fabric for the wealthy in the first half of the 1800's.
I am… **Sea Oats** Who has… Often called a living fossil, this creature dates back 250 million years in its present form. Its tail was used by Native Americans as a spear tip.	I am… **Leatherback Sea Turtle** Who has… Often referred to as "pioneer plants" for their role in creating and stabilizing sand dunes, this hardy grass grows in clumps along the edge of the sea.
I am… **Smooth Cordgrass** Who has… The world's largest sea turtle, it can reach 6-8 feet in length and weigh as much as 2,000 pounds. It eats only sea jellies.	I am… **Wood Stork** Who has… A salt marsh plant that grows between barrier islands and the mainland. Its matted roots hold the marsh together.

I am… **Yaupon Holly** Who has… North America's only native stork, It frequents the beaches, marshes, and swamps of South Carolina, where it can be seen fishing for food.	I am… **Zoea** Who has… The only native American holly that contains caffeine. It grows wild along coastal dunes and stream banks. Scientific name: *Ilex vomitoria*



9Source: *SOUTH CAROLINA AQUARIUM ONLINE CURRICULUM*

Grades 3-5: COMMUNITIES

Activity: Sculpting South Carolina, Background Information

South Carolina is divided into five separate geographic regions, each with its own unique topography. These regions are the Mountains, the Piedmont, the Sandhills, the Coastal Plain and the Coast. Though some animals can be found in all five regions, each region contains unique communities determined by the physical features of the region. For example, the American alligator, found throughout the Coastal Plain of South Carolina, is not found in the Mountain region. This animal is adapted for living in large pools of standing water, such as swamps and ponds. Because of the sharp relief in the Mountains, water in most places is always flowing and a swamp habitat cannot exist. Also, the climate is often too cool for the cold-blooded alligator. Conversely, the trout that are abundant in the cool, shallow, fast-moving streams of the Mountains are not able to survive in the warm, slow-moving, murky waters of the blackwater swamps of the Coastal Plain. Spartina grass, which dominates the saltmarsh because of its tolerance to saltwater, cannot compete in freshwater habitats with other plants and so is not found out of the brackish waters of the Coast habitat. In all these cases, the abiotic factors of the regions determine which organisms can live there and thus what communities develop there.

Below are excerpts from the excellent book *South Carolina: The Making of a Landscape* by Charles F. Kovacik and John J. Winberry. In these excerpts you can find just about everything you could possibly want to know about the abiotic factors found in each region of South Carolina as well as much about the biotic communities that develop there.

From: Kovacik, C. and J. Winberry. South Carolina the Making of a Landscape, pp. 13-48. University of South Carolina Press, (1987).

The natural environment is an entity in its own right and forms the framework within which humans have structured history, in this case the history of South Carolina. A common misconception is that the physical environment is a pristine setting formed exclusively by natural processes. In truth, virtually all parts of the world have been affected in some fashion by human occupation or transgression, and South Carolina is no exception. Probably 15,000 years ago, native North Americans first occupied a Piedmont formed by hundreds of millions of years of uplift and metamorphism and a Coastal Plain laid down beneath an ocean tens of millions of years ago. Their use of fire modified the vegetation; the later agricultural economies of the colonial and cotton-growing eras introduced new plants and contributed to severe erosion and the loss of topsoil. Modern-day construction of reservoirs, destruction of sand dunes and coastal marshes, and planting of pine trees continue this pattern of human-induced change. As we look at the natural setting, therefore, we must remember that it was created not only by natural processes but also by human actions.

South Carolina extends 225 mi (360 km) north to south and 285 mi (459 km) east to west. With a 31,113-sq-mi (80, 583-sq-km) area, it is the smallest of the Deep South states (the others are Virginia, North Carolina, Georgia, Alabama, Mississippi, and Louisiana) and ranks only fortieth in size among the 50 states of the Union. Its small area is deceptive because South Carolina extends literally from the mountains to the sea, and its physical geography varies considerably in form and origin. In this and the next chapter, we will focus on that diversity as we look at the state's landforms, climate, soils, and vegetation.

Landform Regions
The topography of South Carolina ranges from moderately high mountains to rolling hills to some of the flattest areas in the United States. In the first geography of the state, *A View of South Carolina,* written in 1802, John Drayton divided South Carolina into the "lower, middle, and upper country." As we noted already, these general terms are still used, but for our purposes we will organize the state into the five landform regions Blue Ridge, Piedmont, Sandhills, Coastal Plain (which can be divided into Inner and Outer Coast Plains) and Coastal Zone. This regionalization is based on a number of criteria, including relief, rock types, and geologic history.

Blue Ridge Mountains
South Carolina's Blue Ridge Mountains are a small portion of the Appalachian Mountain system. Situated in the extreme northern parts of Oconee, Pickens, and Greenville counties, these 600 sq mi (1,554 sq km) of rugged terrain constitute only about 2 percent of the state's surface area. With elevations ranging from 1,400 to over 3,500 ft (427 to 1,067 m), the Blue Ridge provides the greatest relief and steepest slopes in the state. The highest peaks include Sassafras Mountain, at 3,554 ft (1,083 m) the highest point in the state, and Pinnacle Mountain, 3,425 ft (1,044 m), the highest mountain totally within the state. Even though elevations in South Carolina do not approach Mount Mitchell's 6,684 ft (2,037 m) in the Blue Ridge of North Carolina, the area is described accurately as rugged and truly mountainous. The best views of this region are along State Route 11 between I-26 and the Walhalla area, along U.S. Route 25 north from Route 11 toward Hendersonville, North Carolina, and along U.S. 276 between Cleveland and Caesars Head.

The rocks that form the Blue Ridge are predominantly crystalline schists and gneisses. These metamorphic rocks were formed hundreds of millions of years ago by the subjection of igneous and sedimentary rocks to the tremendous heat and pressure associated with mountain building. Most are very resistant to erosion, and this accounts for the steep slopes and narrow stream valleys that form the area's rugged topography.

South Carolina's mountains certainly are not as impressive as those in Alaska and western North America, which soar to altitudes of 15,000 to 20,000 ft (4,572 to 6,096 m) with steep walls and angular peaks. Not only are they lower, but they appear more rounded in form and worn down. One reason for this is that the Rockies, Sierra Nevadas, and Cascades were uplifted only about 100 million years ago, whereas the Blue Ridge was formed more than 350 million years ago. As a result, the forces of erosion have been at work much longer in the Blue Ridge, and the effect is very evident. Another factor relates to climate. Moderate temperatures and greater precipitation in the eastern part of the country have hastened weathering and erosion that have tended to round off the mountains by a process called "creep," the gradual movement of material downhill.

Piedmont
The Piedmont (from a French word meaning "foot of the mountains") consists of a 100-mi-wide (161-km) belt between the Blue Ridge and the Sandhills. It covers some 10, 500 sq mi (27, 195 sq km) within South Carolina, one-third of the state's total area. Elevations range from about 300 ft (91 m) at the Sandhills margin to 1,200 ft (366 m) toward the northwest near the Blue Ridge, which is separated from the Piedmont by a northeast-southwest trending fault line called the Brevard Zone. The land surface varies from gently rolling in its southeastern part to extremely hilly toward the northwest.

The Piedmont and Blue Ridge have a complex geologic history. The basement rock of both regions is an estimated 1 billion to 1.3 billion years old. Current explanations for the formation of the Blue Ridge and Piedmont rely on concepts of continental drift and global tectonics, and these new theories have invalidated many of the traditional interpretations of mountain building. The rock types are primarily metamorphic, mainly schists, gneisses, and slates, with some granite igneous rocks where intrusive activity took place. Metamorphism, the tremendous heat and pressure that transformed sedimentary and igneous rocks into the crystalline schists and

gneisses that characterize the Blue Ridge and Piedmont today, occurred a number of times as a result of major continental movements.

During the late Precambrian, some 600 million years ago, what is now the Piedmont existed as a continental fragment, an island off the coast of the proto-North American continent. But about 470 million years ago this island joined North America in a collision that began the formation of the Blue Ridge Mountains. Metamorphism recurred when the proto-North American continent, whose leading edge was the Piedmont, continued to drift eastward and collided with northwest Africa to form the massive ancient continent of Pangaea about 350 million years ago. The continents began to separate some 225 million years ago, and present-day North America began to take shape as the landmass drifted westward and northward to its present location.

Another process going on about the same time, which complicated matters, was intrusive activity. Magma, the molten material below the earth's crust, can move toward the surface of the earth in response to pressure and heat. In the South Carolina Piedmont, it did not reach the surface but instead moved between large and small cracks and joints in the existing stata and filled large cavity areas, where it eventually cooled to form isolated granitic plutons that are the foci of the state's granite quaries. These forces of metamorphism and intrusion soon settled down, and running water became the major agent of earth sculpture. Streams have flowed across the region for millions of years, removing material and cutting into the land to create the forms we see today.

Although both the Blue Ridge and Piedmont have a similar geologic history and are underlain by basically the same rock types, the two are differentiated by topography, elevation, and relief. The Blue Ridge is characteristically rugged with steep-sided, almost V-shaped stream valleys separated by narrow ridge tops. Streams are short and fast flowing, with clear water, many rapids and waterfalls and few tributaries.

The Piedmont, on the other hand, has a more rolling, hilly topography. Its river valleys, although quite steep walled in some cases, usually are sloped more gently and are much wider. Piedmont rivers are long, have many tributaries, and their waters are discolored by a heavy sediment load. The valleys are separated by broad upland areas, or interfluves, whose elevations do not vary significantly within local areas and whose relief is much less than that of the mountains. A typical Piedmont landscape may be seen along U.S. route 321 north from Columbia and along U.S. Route 21 north of Ridgeway. In addition, many road cuts reveal the process of soil formation.

One interesting feature found in the Piedmont landscape is the monadnock, or inselberg. Looking like a small isolated mountain that stands above the surrounding uplands, a monadnock is a residual feature that is formed because the rock of the monadnock is more resistant to erosion than the rock surrounding it; monadnocks frequently are of granite. Perhaps the most well known is Stone Mountain, Georgia, but the best examples in South Carolina are Paris Mountain and Glassy Mountain near Greenville, King's Mountain east of Blacksburg, and Table Rock Mountain north of Pickens. Most monadnocks in South Carolina occur within 20 mi (32 km) of the Blue Ridge and all are within 100 mi (161 km). Some were probably spurs or extensions of the main ridge that were separated from it by stream erosion; the common rock material and similar trend of structure support such an interpretation. Other monadnocks are of granitic rocks and sometimes quartzite that formed beneath the surface of the original landscape. As the overlying material eroded, these structures were exposed. Their more-resistant composition retarded erosion, and they became prominent as the surrounding land surface was worn down more rapidly. Commonly, erosion of these features is in the form of exfoliation, and slabs of granite are scattered on their lower slopes.

Sandhills

The Sandhills are a narrow, discontinuous northeast-southwest trending band of rolling hilly topography situated in portions of Aiken, Lexington, Richland, Kershaw, Sumter and Chesterfield counties. The rounded hills have gentle slopes and generally moderate relief, although in certain places the relief can be as great as 200 ft (61 m). These hills generally define the Midlands of South Carolina, and they constitute a distinctive landscape formed by sands and clays deposited millions of years ago.

The Sandhills overlap what is called the Fall Line, which runs northeast-southwest through the Midlands and separates the Piedmont and Coastal Plain. Along the Fall Line the resistant crystalline rocks of the Piedmont abut the more easily eroded sedimentary rocks of the Coastal Plain. This difference in resistance to erosion results in rock outcrops and many rapids that may extend more than a mile (1.6 km) along some river course. The exact position of the Fall Line is difficult to define because some rivers have cut through the sedimentary into the underlying crystalline rock, and rapids can shift locations during periods of high and low water. Many geographers, therefore, feel that the Fall Line is a misnomer and prefer Fall Zone as a more accurate term.

We usually associate sand with ocean beaches, but the Atlantic is over 100 mi (161 km) away from the Sandhills. Millions of years ago, however, this was not the case. As late as the Eocene, about 55 million years ago, the sea covered a large portion of eastern and southern South Carolina, and its shoreline corresponded to the present-day Sandhills. Marine sediments were laid down beneath the ocean to form the near-horizontal strata of sedimentary rocks that today constitute the Coastal Plain.

The weathering and erosion of the Piedmont and the Blue Ridge provided the clays and sand that were carried by rivers and deposited at their mouths. The ocean waves reworked these materials to form beaches and sand dunes along this ancient coastline, just as the oceans are forming shore-zone features along South Carolina's present-day coast. The sea began retreating about 40 million years ago to approximately its present location. Examples of old dunal features may be seen along State Route 261 south of Wedgefield and north of Pinewood in the Manchester State Forest. In several areas the road cuts through the top of old beach ridges; along both sides of the road, these ridges appear in profile as a series of small hills.

Coastal Plain

The Coastal Plain is the largest landform region in South Carolina. It extends 120 to 150 mi (193 to 241 km) from the Sandhills to the Atlantic Ocean and covers nearly 20,000 sq mi (51, 800 sq km), about two-thirds of the state's total area. Its topography varies from nearly flat and featureless to a rolling surface similar to the lower Piedmont. Elevations range from sea level near the coast to about 300 ft (91 m) at the edge of the Sandhills.

The Coast Plain has a geologic history that is much less complicated than that of the Blue Ridge and Piedmont. The sedimentary rocks that underlie it are made up of muds, silts, sands, and other substances of marine origin. After deposition, these materials were consolidated by compaction and cementation to form shales, sandstones, conglomerates, and coquinas. Over the tens of millions of years during which Coastal Plain sedimentary rocks were laid down, they formed a series of horizontal layers. Because the underlying crystalline basement structure slopes at a steep angle toward the coast, the sedimentary layer is only a few feet thick at the Fall Zone, but attains a thickness of about 3,500 ft (1,067 m) at the coastline. The oldest surface rocks in the Coastal Plain are found nearest to the Piedmont margin, and the youngest occur adjacent to the coast.

This landform region can be divided into the Inner Coastal Plain and the Outer Coastal Plain. The topography of the Inner Coastal Plain is rolling and hilly and is very difficult, in most cases, to differentiate from the topography of the Sandhills and the lower Piedmont. Elevations range from

about 300 ft (91m) near the Sandhills to 220 ft (67 m) at the Citronelle Escarpment (Orangeburg Scarp). Some 20 to 30 million years ago, this terrace marked a temporary shoreline as the ocean gradually retreated to its position. Southeast of the escarpment lies the Outer Coastal Plain, whose topography is flatter and almost featureless. The land slopes almost imperceptibly towards sea level at the coast in a series of 10 broken terraces formed by marine and fluvial processes. Among the sediments that formed beneath this ancient ocean are the phosphate beds that extend through the Outer Coastal Plain. Formed by insoluble phosphate material and marine fossils, these deposits became the focus of the state's phosphate industry after the War Between the States and continued to be mined into the early twentieth century.

Despite its relative flatness, the Outer Coastal Plain is not without features. The sea withdrew initially from the Sandhills and then from the Citronelle Escarpment, but during the 2-million-year Pleistocene Epoch sea level rose and fell in response to advances and retreats of the glaciers. The glaciers themselves did not reach into South Carolina, extending only about as far south as the Ohio River, but they did affect the state's physical geography. As they formed and grew, these continental sheets of ice locked up great quantities of water, and sea level fell as much as 450 ft (137 m) below what it is today, exposing South Carolina's continental shelf up to 50 mi (80 km) beyond the present-day coastline. When the glaciers melted, water was returned to the ocean, and sea level was even higher than it presently stands, reaching perhaps as far as 60 mi (97 km) inland of the modern coastline. This advance and retreat of the ocean across the Coastal Plain formed a number of temporary shorelines, which persist today as terraces.

Beside the terraces, various other coastal features were formed as the ocean moved inland and then stabilized with each retreat of the glaciers. But as the glaciers renewed their growth, the sea withdrew once more; and the former shorelines and their beach ridges, ocean terraces, and deltas were abandoned far inland. Some of these remnant features have diverted rivers and streams from a straight course to the sea. The abrupt northeastward turn of the Black River is due to old beach ridges, whereas the sharp southward bend in the Edisto River at Givhan's Ferry apparently results from its following an old distributary channel in an ancient delta formation.

Distinctive among landform features of the Coastal Plain province are the Carolina bays. Perhaps one-half million of these strangely regular features occur in the Coastal Plain from Maryland to Florida. Confusion exists as to the origin of their name, which does not refer, as is commonly thought, to the embayments of water that often form their centers but, in fact, derives from the bay trees that characterize the vegetation found on their edges. Oval or elliptically shaped depressions, Carolina bays are identified easily on a topographic map because of their distinctive shapes, but in the field they look like isolated swamps with standing water and buttressed trees. For a long time, bays were uncultivated and bypassed by settlement, but the rich organic soils that underlie them have enticed farmers to drain and convert many of the bays to agriculture. They range in size from 4 or 5 acres (1.6 to 2 ha) to the thousands of acres that make up big Swamp in Manchester State Forest in Sumter County.

In addition to their common shape, the bays' axes regularly parallel each other; in South Carolina they all are oriented in a northwest-southeast direction. A sandy ridge may encircle a bay but commonly forms only the southeastern rim. These peculiar characteristics have led to considerable speculation about the bay's origin. Several theories focus on two major ideas: Either some single catastrophic event occurred that formed the bays, or the bays are the result of ongoing processes that are observable today. The most popular of the catastrophic theories is that the depressions actually are meteorite scars, left by a huge meteor that, just prior to striking the earth, broke apart into hundreds of thousands of pieces that dug depressions into the Coastal Plain surface. Pieces of a meteor hitting the earth from a northwesterly direction could explain the oblong shape and parallel arrangement of the bays. It is an interesting idea, but no meteor remains have been found near the bays, and measurement of the magnetism that normally is associated with such remains has given ambiguous results.

A second theory is based on studies of similarly shaped lakes in other parts of the world and on laboratory models. It argues that the peculiar shape of the bays results from prevailing winds that cause basins to form ovals whose axes are perpendicular to the wind direction. South Carolina's southwesterly winds would, therefore, form bays with northwest-southeast axes. The buildup of sand on the southeastern rim would result from the very strong northwesterly winds associated with infrequent but intense winter storms. Needless to say, a fully accepted explanation for the origin of Carolina bays has not yet come along.

Although seismic activity characterizes almost the entire state, the most sever episode occurred in the Coastal Plain-the famous Charleston earthquake of August 31, 1886, which probably ranked a 10 on the Mercalli 12-point scale of earthquake intensity. The epicenter of the Charleston quake lay between the city and Summerville, about 20 mi (32 km) to the northwest. The shocks lasted more than four days, caused damage estimated at about $23 million, and left 60 dead. Tremors were felt as far west as the Mississippi River. Many rural people who experienced the quake developed a folk calendar around its occurrence, referring to events as so many years before or after the "Shake."

Some 300 aftershocks were recorded during the 35 years after 1886, and mild earth tremors continue to characterize the Piedmont. Over the last decade, seismic activity again has occurred in the Coastal Plain. Studies have indicated the existence of a major South Carolina-Georgia seismic zone that runs northwest-southeast for more than 300 mi (483 km) across the entire state. Among the faults that form it is the northeast- southwest trending Woodstock Fault near Charleston. No other earthquake in the state has equaled the severity of the one at Charleston, and few seismologists predict a recurrence any time soon. Nevertheless, the history of the Charleston episode has resulted in the classification of eastern South Carolina as a major earthquake risk area. Old Charleston houses bear scars of the experience. After the earthquake, long rods were inserted between the opposite walls of a house to brace them and were held in place by plates placed on the outside of the walls. The plates are visible on these houses today.

A feel for the Coastal Plain topography may be acquired along any highway toward or along the coast. A fine overview of the Outer Coastal Plan may be had from U.S. Route 378, east of Shaw Air Force Base, just outside Sumter. Here, from the Citronelle Escarpment, the broad, flat Outer Coastal Plain stretches off to the coast. The rock outcrops and rapids marking the Fall Zone are evident on the Broad and Saluda rivers Columbia. An excellent example of a Carolina bay is Woods Bay State Park, just north of Turbeville in Clarendon County. Other bays, both cleared and uncleared, are found in its vicinity.

Coast

South Carolina's coastline is about 185 mi (298 km) long. The Coastal Zone extends some 10 mi (16 km) into the interior to encompass about 1.2. million acres (486,000 ha) of land and water. South Carolina's coast may be seen as a transition from North Carolina's strand to Georgia's Sea Islands and can be divided into three zones. The first is the 60-mile-long (96 km) arcuate strand that extends, almost unbroken by tidal inlets, from the North Carolina boundary to the area of Winyah Bay. The relatively stable strand is built on a 100,000-year-old barrier sand formation and is paralleled by the Waccamaw River, which flows southward just inland from it. This section of South Carolina's coast is called the Grand Strand and today is the focus of the state's major recreational development that includes large hotels, motels, and resort condominiums. Despite the shoreline's stability, erosion does occur along its beaches and especially endangers the hotels that are built near the water's edge. A series of storms in the winter of 1982-1983 caused considerable erosion, and hundreds of sandbags were used to protect these structures. In the spring of 1986 Myrtle Beach began a beach nourishment program and trucked sand from inland relict dunes to replenish the resort's beaches.

Santee delta forms the second subdivision of the Coastal Zone. It is about 20 mi (32 km) wide and is the largest deltaic complex on the east coast. It is a cuspate, or pointed, delta, but is has suffered severe erosion over the last 40 years, retreating almost 900 ft (274 m) at certain locations. This is largely because of the decreased sediment load in the Santee River that has resulted from the completion of Lakes Marion and Moultrie in 1942 and the diversion of the Santee's waters into the Cooper River and Charleston Harbor, as well as the creation of other reservoirs on the Piedmont tributaries of the Santee system. As a stream enters one of these lakes, the velocity of its flow drops sharply, and this reduces its ability to carry sediment. The reservoirs, therefore, accumulate much of the alluvial material that otherwise would have been deposited on the coast.

South of the Santee delta lies the Sea Island complex that extends for more than 100 mi (160 km) to the Savannah River and into Georgia. There is considerable diversity among these islands in size, origin, and development. Some, such as Kiawah, Fripp, and Hilton Head, have been developed commercially, whereas others, including Bull, Hunting, and Daufuskie, remain in a more pristine state. North of the Edisto River, extensive marsh areas separate the islands from the mainland, but toward the south the islands are separated from the mainland and from each other by embayments, such as Port Royal Sound and St. Helena Sound; numerous tidal inlets; and extensive interior waterways.

The Sea Island province comprises two types of islands: erosion remnant islands and active barrier islands. For example, St. Helena Island, off Beaufort, is inland from the ocean and is classified as an erosion remnant. This means that it was at once time part of the mainland. But as seal level declined during the glacial advances of the Pleistocene Epoch, streams began cutting down behind it to from river valleys. As the ocean returned at the end of the Ice Age, about 10,000 years, these river valleys were flooded, and St. Helena and similar areas became islands.

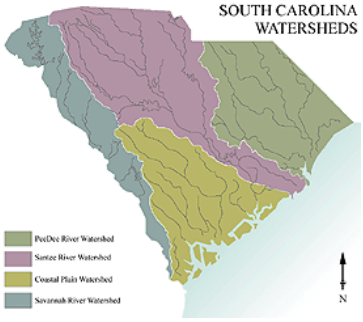
Hunting and Fripp are right on the ocean and are referred to as barrier or beach ridge islands. They are anchored by beach ridges and sand dune complexes, and, in contrast to the erosion remnant islands, they are dynamic and constantly changing. The origin of barrier islands has been much debated. The classic theory explains their formation from offshore sandbars built up by wave action, but a new theory based on emergence and submergence of the coast during the Pleistocene Epoch has been offered. As sea level declined during the glacial period and the ocean retreated from the coast, dunes were built along the new coastline, and the old dunes were left inland. But as the ocean returned and inundated the former dune ridges, parts of them remained above water to become the cores of coastal islands. Wind and wave action built additional sand dunes on them, and the barrier islands developed.

These islands are still subject to active modification by marine processes. Waves and tidal action constantly alter their beaches; storms bring marked changes, and the prevailing currents slowly wash material away and transform their shapes.

Generally, the northern ends of the islands experience erosion, whereas deposition occurs on the southern ends. This erosion is a natural process that will continue to occur, but people seem unaware of this as they vigorously but ineffectively try to arrest the changes with jetties, groins, seawalls, and beach nourishment programs. A very limited success sometimes is realized, but it must be emphasized that the coast is naturally a dynamic area and that barrier islands are always subject to change.

The Barrier Islands Act, initiated by the federal government in 1983, removed undeveloped barrier islands from federal flood insurance programs and ended subsidies for the construction of roads and sewer systems on them. The act affected 13 locations in the Sea Islands of South Carolina (Waites Island complex, Litchfield Beach, Pawley's Inlet, Debidue Beach, Dewees Island, Morris Island complex, Bird Key complex, Captain Sam's Inlet, Edistor complex, Otter Island, Harbor Island, St. Phillips Island, and Daufuskie Island) and will make their development

more difficult. Though opposed initially by some groups, this action is seen now as logical recognition of the peculiarities of barrier islands and their susceptibility to sudden and pronounced changes. The Sea Island landscape may be seen along various coast roads, especially U.S. Route 21 north and south of Beaufort and U.S. Route 278 approaching Hilton Head Island. A spectacular view of a barrier island may be had from atop the old lighthouse in the Hunting Island State Park.



Rivers and Streams

The rivers and streams of South Carolina have been and continue to be active forces in shaping the state's physical geography, but they also have influenced the formation of the cultural landscape. Native North Americans often located settlements near streams, and many of their trails paralleled the course of streams. Advancing colonial settlement penetrated the interior by following rivers, and waterways were major avenues of commerce prior to the completion of the railroads. Streams provided power and water supply needed for the initial growth of industry and were crucial to the early urban development. Today, rivers serve a variety of economic and recreational purposes.

South Carolina is drained by three major river systems, the Pee Dee, the Santee, and the Savannah, as well as a number of smaller streams. These generally follow the topographic slope of land from northwest to southeast across the state. The headwaters of the major rivers form on the slopes of the Blue Ridge in North Carolina, east of the Appalachian Divide. Smaller rivers and streams, such as the Combahee, Edisto, and Ashley, form at the edge of the Sandhills are situated entirely within the state. In contrast to the large river systems draining the Piedmont, whose waters are colored yellow and red by heavy loads of silt and clay, streams originating in the Coastal Plain are called "black-water rivers." They transport very little sediment, and their dark color comes from a high tannic-acid content resulting from the decomposition of swamp hardwoods and their leaves. A characteristic black-water river is the Black River that heads in Lee County and flows through Williamsburg and Georgetown counties.

We have already discussed the characteristics of streams in the Blue Ridge and Piedmont. Rivers in the Coastal Plain typically meander and form wide, flat floodplains. As a meander grows it develops an increasingly narrow neck of land that the river will cut through during periods of high water. This forms a new channel, and the old channel becomes a remnant lake known as a cut-off, or oxbow, lake. This process allows the widening of the floodplain as new channels form to cut more deeply into the adjacent bluffs. A good example of a meander and cut-off lake is Bates Old River, in the Congaree floodplain, which may be seen from the U.S. Highway 601 causeway, just south of Wateree Store.

Large rivers with considerable flow and carrying a quantity of sediment, such as the Santee, usually form deltas through the buildup of alluvial material at their mouths. On the other hand, smaller rivers carry little sediment and have less potential for delta formation; estuaries or deep embayments usually develop where they enter the ocean. Examples of these include Charleston

Harbor, St. Helena Sound, and the Port Royal Sound, all of which form the mouths of black-water rivers.

Of South Carolina's three major river systems, the largest is the Santee. It and its tributaries in the Piedmont and Blue Ridge drain nearly 40 percent of the state's total area. The Great Pee Dee River winds 197 mi (317 km) from the North Carolina line to the Atlantic Ocean, and its system drains the eastern quarter of the state. The Savannah River drains about 15 percent of South Carolina's total area. The larger part of its basin is in Georgia; South Carolina's portion is about 260 mi (418 km) long but is only 15 to 60 mi (24 to 97 km) wide. A number of smaller rivers, including the Ashley, Edisto, and Combahee, form a fourth drainage basin south of the Santee system. Lying totally within South Carolina and originating at the edge of the Sandhills, these rivers together drain about 20 percent of the state's area.

Lakes and Waterways

The free-flowing rivers described by the early colonists have been modified considerably over the past century. Not only has erosion in the Piedmont-a result of constant cropping of the land-added great quantities of sediment to streams and caused flooding in the Outer Coastal Plain, but the construction of dams has created a number of large lakes. Impoundments of water are not recent innovations, and many of the hundreds of small millponds that dot the Piedmont date to the eighteenth and nineteenth centuries. Only within about the last 50 years, though, have dams and reservoirs been built that cover tens of thousands of acres. These reservoirs have been created on every major river in South Carolina except the Pee Dee. The major impounded water bodies in South Carolina were all constructed during the twentieth century and include Lakes Wateree (formed in 1919, Wiley (1925), Murray (1930), Greenwood (1940), Marion (1942), and Moultrie (1942) on the Santee and its tributaries; and Lakes Clarks Hill (1954), Hartwell (1963), Keowee (1971), Jocassee (1974), and Russell (1984) on the Savannah system.

These reservoirs were constructed primarily to produce hydroelectric power, but in one notable instance a successful project created a serious problem. In the 1930's construction began on the two earth-fill dams that formed the 155-sg-mi (401-sq-km) Lake Marion on the Santee River and the 95-sq-mi (246-sq-km) Lake Moultrie on the Cooper River. A 7.5-mi-long (12-km) diversion canal connected the lakes and effectively directed much of the Santee River's waters through Lake Moultrie into the Cooper River. As a result, the flow in the Cooper River was increased from about 100 to over 15,000 cu ft per sec (from 3 to 425 cu m/sec). This allowed electric power generation for the Outer Coastal Plain, but Charleston Harbor, important for shipping and as major naval base began to experience silting and shoaling, and the alluvium had to be removed expensive dredging.

The Corps of Engineers determined that this resulted almost exclusively from the increased flow of fresh water into the harbor. The fresh water did not mix well with the salt water and gave rise to upstream density currents that blocked the movement of sediments out of the harbor and caused shoaling. To remedy this situation, the Corps projected a rediversion of the flow from the Cooper River back into the Santee. This was accomplished by at 12-mi-long (19-km) rediversion canal from Lake Moultrie, completed in 1985, that is supposed to return about 80 percent of the presently diverted flow back into the Santee. Experiences such as this make us acutely aware of the interrelatedness of our environment, and we now realize that one action may affect a number of unintended and unwelcome results. In an attempt to anticipate such new problems, the National Ecosystems Team of the U.S. Fish and Wildlife Service is now studying the potential impact of this rediversion project on the Santee delta and the adjoining Coastal Zone.

The waterways of South Carolina offer one of the best examples of human modification of natural systems. Vegetation and erosion are subtle indicators of this impact, but the numerous vast lakes are highly visible. As we consider the physical setting, we must realize that human activity remains one of its most important shapers.

Climate, Soils, and Vegetation

Another component of the physical setting is the climate, the regional classification of atmospheric conditions. Climate and weather are often confused, but they are different in terms of their time perspective. Weather focuses on atmospheric conditions over a day or a few days and is based on immediate observations. Climate, on the other hand, deals with the annual cycle of atmospheric conditions derived from analysis of observations over a long period of time, usually 30 years. Climate and its elements-temperature and precipitation-in turn have a major effect on two other components of the physical setting: soils and vegetation.

Climate

Climatically, South Carolina is classified as humid subtropical, typical of many areas situated on the mid-altitude eastern margins of large continents. An abundant precipitation is distributed fairly evenly throughout the year, and temperatures show some seasonal variation. Summers are hot and humid; winters, though usually having some below-freezing temperatures, generally are mild. Within this general framework, South Carolina's climate does vary from one part of the state to another. The average annual precipitation in South Carolina is about 49 in. (124 cm), but it varies from 81 in. (206 cm) recorded in the mountains at Caesars Head to between 45 and 46 in. (114 to 117 cm) in portions of the Sandhills and Inner Coastal Plain. Average annual temperatures generally decrease from the southernmost Outer Coastal Plain to the Blue Ridge region.

Precipitation

South Carolina receives almost all of its precipitation as rainfall, but snow, sleet, and hail do make a small contribution from one year to the next. Although the state records precipitation in every month, the amount fluctuates from season to season as a result of two separate processes: convectional and frontal. Convectional precipitation occurs primarily during the summer months and is characterized by often violent, late afternoon and early evening thunderstorms. The rainfall is brief but heavy and commonly is accompanied by locally high winds, thunder, and lightning.

The convectional rainfall process develops through as a succession of stages. To begin with, the warm, moist air of a tropical mass dominates South Carolina's atmosphere during the summer. At the same time, the land surface receives intense solar radiation. As the summer day wears on, the temperature of the earth's surface rises, and it begins to warm the layers of air just above it. This causes convection currents in the lower atmosphere, and as these updrafts continue and intensify, the moisture-laden air is lifted to an elevation at which it cools to the point of condensation. Cumulus clouds then develop, and continued convectional uplifts and further cooling create the familiar threatening thunderhead clouds. The sky grows dark and precipitation soon follows. Summer weather forecasts usually include a chance of showers because the conditions necessary for the development of these convectional systems, their intensity, and geographical location make them difficult to predict.

A very different precipitation process occurs during the winter. Called frontal precipitation, it is related to the movement of warm and cold air masses. In contrast to the summer thunderstorm, frontal precipitation can include snow or sleet but usually is a drizzle or a steady rain that may last for hours. It normally involves no thunder or lightning and, in the case of cold fronts, is associated with a sharp drop in temperature. This type of precipitation may be related to either warm or cold fronts. Typically, however, frontal precipitation occurs when a mass of cold air overtakes a warm air mass. Being denser, the cold air wedges itself beneath the warm air. As the warm air is forced to rise, it cools, and rainfall or snowfall results. Because fronts move at different speeds and air masses vary in intensity, it is difficult to generalize about the time necessary for this sequence of events to unfold. Normally, it involved a day or more. The typical scenario for a cold front starts with the presence of warmer, moist air, cloudy or partly cloudy skies, and generally southerly winds. When the front approaches, the sky becomes grayer as clouds build up and precipitation begins. As the hours of rain continue, temperatures drop sharply. Once the cold air mass following the front establishes itself, the sky clears, cold temperatures prevail, and northerly winds dominate.

Seasonal Climatic Differences

These different precipitation processes are but one indicator of South Carolina's annual cycle of climatic variation. Although the state is not characterized by extreme wet and dry periods or wide ranges in temperatures, it does experience a notable seasonality.

South Carolina can be affected by warm, moist air from the Gulf of Mexico, but winter normally is typified by the presence of cold, dry continental air masses. December, January, and February, therefore, are the coldest months of the year. Two to five very cold outbreaks of polar air occur each year, and they substantially lower temperatures for several years. The full thrust of most cold fronts is weakened or deflected by the Blue Ridge Mountains, and southerly winds often bring in warmer maritime air from the Caribbean and South Atlantic. Mild winter days are not common and occasionally can be truly hot. Columbia, for instance, recorded 84° F (29° C) in January 1970 and again in February 1973. Coastal temperatures are moderated by the Atlantic Ocean and especially the warm Gulf Stream, whereas the higher elevations of the upper Piedmont and Blue Ridge experience significantly colder temperatures.

Snowfall is rare in the Outer Coastal Plain, occurs at least once in 9 of 11 winters in Columbia, and is more common in the upper Piedmont and Blue Ridge. February is statistically the snow month, and the state's record snowfall occurred in February 1973. This once-in-a-century phenomenon paralyzed South Carolina, but even light snowfalls cause snarled traffic, closed schools and offices, and a general holiday spirit. The true scourge of winter, however, is the ice storm, which causes serious traffic hazards, fallen trees, power outages, and often severe discomfort to many South Carolinians.

March, April and May represent a transition from winter temperatures and precipitation to those of summer. The frequency of cold fronts declines during the spring as continental air masses are replaced by warmer maritime air, and more convectional precipitation occurs. Despite a general warming, temperatures can vary considerably from year to year. Columbia recorded 90° F (32° C) in March 1974 and 18° F (-8° C) in March 1975. Spring marks the beginning of the growing season, or frost-free period, which is the number of days between the last killing frost of spring and the first killing frost of fall. The average length of the growing season varies from just over 290 days, immediately adjacent to the coast in the Sea Islands near Beaufort and Charleston, to less than 200 days in the Blue Ridge near Pickens and Walhalla. The average last spring frost occurs about February 19 in the Sea Islands and along the coast, during the last week of March near Columbia, and in last April in the mountains. This two-month difference between the average last spring frost on the coast and in the mountains is related to the moderating effect of the Atlantic Ocean and Gulf Stream on the immediate coastal area as well as to the higher elevations of the upper Piedmont and Blue Ridge.

Tornadoes form during all seasons of the year and at all hours of the day, but about one-third of the annual total is recorded in April and May. Conditions favorable to the formation of tornadoes occur when the atmosphere consists of sharp temperature contrasts between layers of air. These can develop rapidly when a mass of cold air approaches during the late afternoon. At that time, surface heating from solar radiation is at its peak and the lower layers of air at their warmest. This causes an intense low pressure to develop, and violent winds, blowing in a counterclockwise direction, are drawn into it. Tornadoes can be very destructive and are always dangerous. A series of tornadoes that followed two separate paths, one across the upper Piedmont from Anderson to York counties and the other through the Midlands from Aiken to Florence counties, left 77 people dead and 800 injured on April 30, 1924. Another serious incident involved 8 or 9 separate tornadoes that touched down in McCormick, Abbeville, Newberry, Fairfield, and Marlboro counties in the early evening of March 28, 1984.

Twenty-one people died and 448 were injured, and property damage was estimated in excess of $100 million. South Carolina averages about 10 tornadoes a year and has the highest tornado frequency of any South Atlantic coast state.

Summer's hot and humid weather prevails from June through August, and the heat is relatively unbroken. In contrast to winter patterns, temperatures are about the same across much of the state, although Blue Ridge locations are noticeably cooler because of higher elevations (Map 3.4). Strong solar heating causes daytime temperatures to rise, whereas nights tend to be humid and warm. The single most important factor influencing South Carolina's summer weather is the Bermuda High, and extremely large high-pressure cell centered over the Atlantic. The clockwise circulation around the Bermuda High causes a prevailing southerly flow of warm and humid maritime tropical air from the Gulf of Mexico and South Atlantic Ocean into the state during the summer months. Normally, this steady supply of moist air, coupled with strong solar heating of the land surface, provides ideal conditions for the convectional precipitation. Frequent thunderstorms during these three months account for 33 percent of the state's annual rainfall, making summer the wettest season of the year.

The Bermuda High, however, frequently stalls or becomes stationary off the coast and tends to block or divert frontal systems before the reach South Carolina. Because of this and the presence of the Blue Ridge Mountains, few cold fronts pass through the state during the summer, and there is little relief from the high temperatures and humidity. Furthermore, the stable subsiding air of the Bermuda High can become so intense that it prevents the convectional process necessary for cloud development and thunderstorm activity. When this occurs, host, sunny days prevail, drought threatens, and the stagnant air exacerbates atmospheric pollution problems. Sometimes these dry conditions last for weeks or even months. July is usually Columbia's wettest month with a mean of 5.65 in (14.35 cm) of precipitation, but in 1973 only 0.57 in. (1.45 cm) was recorded.

The sea breeze plays an important role on the coast during the summer months. During the day, the land absorbs solar radiation very rapidly, and convection currents begin to form. The ocean waters, however, maintain a more constant temperature than does the land surface. The warm air over the land rises, creating a zone of low pressure, and the relatively cooler and denser air above the ocean flows onshore to take its place. This results in a refreshingly cool breeze off the ocean during late summer afternoons and evenings. Also, during last summer afternoons while cumulonimbus clouds, large and fluffy but with a menacing dark underline, form inland, the sky above the ocean remains clear. Rain often will fall inland but usually does not occur on or near the coast, where convectional activity is suppressed by the cooler, more stable air coming onshore from the ocean as a result of the sea-breeze effect.

Between September and November, temperatures slowly become cooler, and the high summer humidity diminishes. Drier continental air masses become more frequent, and the continued presence of the Bermuda high also contributes atmospheric stability. As a result, South Carolina receives only about 20 percent of its annual precipitation in the fall; October and November are statistically the two driest months of the year. Nearly one-half of all fall days are warm and sunny with bright blue skies, whereas nights are cool to cold.

Fall also marks the end of the growing season. The first freeze comes earliest in the mountains and latest along the coast. On the average, it occurs in Walhalla toward the end of October, in Greenville in early November, and at Charleston during the first week in December. Because of the drainage of cold air along the river valleys from the upper Piedmont, the initial freeze occurs in Columbia as early as the first week of November. Cool to cold overnight temperatures result from the nocturnal cooling of the earth's surface. Because there is little cloud cover, the earth rapidly loses the heat it absorbed during the day, and surface temperatures drop quickly at night.

This rapid nocturnal cooling and the stagnant circulation associated with the Bermuda High frequently create temperature inversion that cause fog during the night and early morning. A temperature inversion occurs when the normal lapse rate-that is, the pattern of progressively cooler air temperatures with increasing altitude-is replaced by a situation in which cooler air is trapped beneath a layer of warmer air. Temperature inversions often occur on clear, still nights when heat reradiated from the earth's surface during the day had warmed the atmosphere. The

cool surface at night chills the lower layers of the atmosphere, and as the air is cooled, its water vapor begins to condense and form fog. The fog typically "burns off" during the morning as solar radiation heats the earth's surface. When the lower layers of air are warmed, normal lapse rate conditions are reestablished.

Similar to such inversions, but lasting for days in some instances, are stagnant air conditions related to very stable high-pressure systems. These are associated during the late fall with cool air masses that settle over the state. The results are much like the situations during the summer and early fall when a stalled Bermuda High dominates the region. The high pressures, like the Bermuda High, tend to block advancing frontal systems and can also limit convectional activity. Skies are clear, and the weather is generally pleasant. The stable atmospheric conditions that cause this ideal weather also create a serious potential for air pollution. Stable air provides little opportunity for the dispersal of pollutants and traps them over their point of origin. The frequency of such atmospheric conditions in Piedmont South Carolina is among the highest of any region in the eastern part of the country and makes air pollution a potentially dangerous situation. Special concern must be given, therefore, to the types of industries that locate in the Midlands and Piedmont, and awareness of this potential pollution problem should be an integral part of any development plan.

A very dangerous climate phenomenon for coastal South Carolina is the hurricane. Hurricanes are most common in late summer or early fall and pose the greatest threat in September. A large tropical storm with surface winds of at least 74 mi per/hr (119 km per hr), a hurricane develops out of an "easterly wave," a line of low pressure that moves with the prevailing easterly winds flowing across the warm tropical waters of the Atlantic and Caribbean. As the storm forms out of one of these atmospheric disturbances, its winds converge in a spiraling counterclockwise fashion around a developing center of low pressure and reach speeds of up to 200 mi per hr (322 km per hr). These high winds and great quantities of rainfall can range up to about 400 mi (644 km) in diameter, but at the center of this intense low pressure is the "eye," an area of relative calm between 10 and 15 mi (16 o 24 km) in diameter.

Part of the damage along the coast is caused by high winds, but most death and destruction result from the storm surge, which raises tides 8 to 15 ft (2 to 5 m) above normal levels and carries them towards shore at speeds of 50 to 50 mi per hr (80 to 97 km per hr). Tornadoes sometimes develop out of this system, and torrential rains always accompany it. The high wind speeds diminish rapidly as the storm moves inland, but heavy rainfall continues. The greatest amount of precipitation recorded in a 24-hour period in South Carolina was associated with the passage of a hurricane.

Soils

Soils are perhaps the most complex but least appreciated aspect of the physical setting. South Carolina has soils representing 5 of the 10 soil classification orders-Ultisols, Alfisols, Entisols, Inceptisols, and Spodosols-although the state is covered primarily by Ultisols, or what formerly were called the red-yellow Podzols. These soils are typical of forested, humid, subtropical areas and generally are below average in fertility and suitability for row crop agriculture. Although most Ultisols are now under forest in South Carolina and across the South, almost all of them were cultivated at one time. Even today, crops are grown successfully on the Ultisols of South Carolina's Inner Coastal Plain. The soil is characterized by leaching, which is the solution of plant nutrients and other minerals by rainwater and their removal from the top layers of the soil by downward percolation. The remnant insoluble iron and aluminum as well as clays are thus concentrated in the upper zones of the soil, and their oxidation gives the soils a characteristic red or red-yellow color.

Soil Characteristics

Only within the last few decades have soils received proper attention after more than a century and a half of poor management and exploitative land use. Continuous row crop agriculture

removed their nutrients and resulted in severe erosion during the nineteenth and early twentieth centuries. By the 1930s the Piedmont in South Carolina was one of the most severely eroded areas in the United States, so scarred and gullied that much of the land had become unsuitable for cultivation. It is estimated that from the beginning of the "King Cotton Era" in the 1800s through the 1930's much of the South Carolina Piedmont lost almost 10 in (25 cm) of topsoil and in some large areas more than 12 in (30 cm).

Texture is one of the most important characteristics of soils. It determines the rate at which water drains through particular soil and the amount of water that it can hold for use by plants during dry periods. Texture is dependent on the sizes of particles that make up the soil's mineral matter. Normally, these range from sands-the largest particles-through silts to clays, which are finest particles. Sands allow water to drain through quickly and provide little moisture storage, whereas clays, with minimal space between particles, permit little water to drain through and exhibit maximum retention. Between these extremes are various combinations such as sandy clays, silty clays, and loams. Loams provide ideal textures for cultivation and are made up of 20 percent or less clay, 30 to 50 percent silt, and the remainder sand. They are easily cultivated and are characteristically neither too dry nor too wet for plant growth.

Regional Soil Types

The Blue Ridge Mountains in South Carolina are characterized by a narrow band of Inceptisols, which are young, poorly developed soils that lack levels of clay accumulation beneath the surface. They are moderately deep soils and usually are loamy in texture. Their suitability for row crops ranges from mostly poor to fair, and they are used largely for pasture or forest. The small amount of agriculture practiced in this area is confined to ridgetops or narrow stream floodplains, referred to as "bottoms," where slopes are not so steep.

Piedmont soils are dominantly Ultisols, but there are scattered occurrences of Alfisols, especially in Fairfield, Chester, and Greenwood counties. The Alfisols also have clayey subsoils but are brownish to reddish in color and normally have higher concentrations of calcium, magnesium, potassium, and other minerals. The topography of the Piedmont provides for good surface drainage, but internal soil drainage is relatively poor because the Ultisols and Alfisols are compact and clayey in texture. As a result, rainfall does not readily percolate through the soil, and runoff potential is considerable, creating a high risk of erosion. Overall suitability for row crops is ranked fair to poor. The Alfisols are considered adequate for field crops in some areas, such as broad, relatively flat interfluves of northern Fairfield, Chester, and Newberry counties. Most of the Piedmont, however, is devoted to pasture of forest.

The soils of the Sandhills are classified as Entisols, and their sandy parent material extends down to depths of 80 in. (203 cm). The rolling uplands of the Sandhills allow good surface drainage; and, as soil texture is mostly sandy with some areas of loam, internal drainage is rapid and even excessive. Sandhills soils are generally low in plant nutrients and organic material because the soil texture allows rapid leaching. Agriculture in the region never has been especially prosperous, and most of the soils have little potential for row crops. Although traditionally used for woodland, Sandhills soils, with proper management, can support the successful cultivation of vegetable crops and peaches.

Ultisols also characterize the Inner Coast Plain, but here their texture tends to be loamy with good surface and internal drainage. Well over half the Inner Coastal Plain is forested, but the good physical qualities of its soils contribute to its being the state's major agricultural zone. The Ultisols in the Outer Coastal Plain, however, suffer from poor surface drainage, and the high water table has resulted in the formation of a gley horizon beneath the surface. This heavy, claylike layer causes poor internal drainage because it hampers percolation. Although these soils have good agricultural potential, their wetness discourages such use. They are excellent for forest, and slash pines are planted through much of the Outer Coastal Plain.

A band of Entisols extends across Colleton and into Hampton County. Remnant of the advance and retreat of the ocean during the Pleistocene Epoch, the parent material of these soils comprises sandy and loamy Coastal Plain sediments. Forests occupy a good portion of the area, but truck crops and especially watermelons are grown successfully in Hampton County.

In the Coastal Zone, a strip of land, as narrow as 3 mi (5 km) in the Myrtle Beach area and gradually widening to more than 25 mi (40 km) near Beaufort, consists of soils developed on former tidal marshes, beach ridges, and dunes. These include Entisols along the coast and a band of Alfisols just inland. North of Charleston, poor drainage generally leaves the area unsuitable for row crops, and forests have been planted widely. South of Charleston, though, certain areas have loamy, better-drained soils. Good management practices, including artificial drainage systems, have allowed profitable truck farming to develop.

The major rivers flowing across the Coastal Plain are bordered by wide floodplains that have agricultural potential. Classified generally as Inceptisols, these soils are rich in alluvial material. They are usually loamy but also can be clayey, depending upon the nature of the riverine sediments. In either case, they are high in plant nutrients and organic matter, but both surface drainage and internal drainage is good or the land has been drained artificially, the soils are suitable for row crops ad may be very productive. Such areas in the Outer Coastal Plain and in the Coastal Zone were the focus of the prosperous Carolina rice industry during the colonial and antebellum eras. In most cases, however, extensive floodplain forests, like the Congaree Swamp, predominate.

Vegetation

South Carolina's humid subtropical climate causes the state's vegetation to be lush. Forests cover some 65 percent of South Carolina, and trees largely define the vegetation complexes that dominate much of the state.

Mountains

The Blue Ridge Mountains are characterized by a predominantly hardwood forest that extends southward from New England. The vegetation has distinctly northern attributes because of the higher elevations. Many species became established in South Carolina during the Pleistocene Epoch, when the region experienced much colder temperatures. Today, the Appalachian forest is restricted to the northwestern corner of the state, although it does extend beyond the mountains to form a transition to the oak-hickory-pine forests of the Piedmont.

The vegetation of the Blue Ridge was classified originally as an oak-chestnut forest, and species of these trees dominated the native stands. But in the early twentieth century a fungus called the oriental Chestnut Blight reached the United States and ravaged the American chestnut trees *(Castanea dentate*) in the eastern part of the country. Today, dead trunks and rotting stumps are all that are left of these once mighty trees. As the chestnut tree disappeared from the mountains, oaks, especially the chestnut oak (*Quercus prinus*), and the tulip popular (*Liriodendron tulipifera*) competed to replace it on the topmost canopy of the forests.

Other trees with northern associations include the hemlock (*Tsuga canadensis*), white pine (*Pinus strobes*), beech (*Fagus grandifolia*), and yellow birch (*Betula alleghaniensis).* Shrubs like the flame azalea (Rhododendron calendulaceum), pink azalea (R. nidiflorum), and rhododendron (R. maximum) constitute the understory and give the mountains a yellow, pink, and white brilliance in late spring and summer (Fig 3.4). Near the streams, the vegetation complex is adapted to a wetter habitat and includes such trees as the alder (*Alnus serrulata*), cottonwood (*Populus deltoids*), and sycamore (*Platanus occidentalis*), all of which are found also along rivers in the Piedmont.

Piedmont

Humans have played the major role in determining the floral complex that we see in the Piedmont today. Native North Americans occupied Piedmont South Carolina for thousands of years, and eighteenth-century travelers and botanists passing through the area described the stands of hardwoods and short leaf pines (*Pinus echinata*) that then constituted the mature forest. Not until the nineteenth century and the introduction of cotton and the plantation was the vegetation markedly changed.

As late as 1945, over 2 million acres (810,000 ha) of the piedmont were in crop-land. The 1950s saw a sharp decline in this acreage, and fewer than 700,000 acres (283, 500 ha) were planted by the mid-1970s. As these lands were abandoned, a succession of vegetational changes began. This succession expectedly would lead through various stages to a mature oak-hickory forest like that which existed before the initial clearing. Biogeographers refer to this vegetation assemblage as a "climax forest," and it includes the trees and plants that normally occur under the prevalent conditions of climate, soil, topography, etc. Successions vary in length, but more than a century is necessary before a mature climax-forest stage can be reached in the Piedmont.

The Piedmont landscape today comprises fields and woods at different stages of this succession. Because most land has been taken out of cultivation only within the last 40 years, the climax forest has been reached in a very few areas. After a field is abandoned, it becomes an ecologic vacuum. Taking advantage of the open field and abundant sunlight, plants such as dog fennel (*Eupatorium compositifolium*) and rabbit tobacco (*Gnaphalium obtusifolium*) become the initial occupants. They create an ecologic setting that allows the grasses, and specifically broomsedge (*Andropogon virginicus*), to establish themselves. A few pine seedlings also appear along with red cedar (*Juniperus virginiana*) and wild cheery (*Prunus serotina*). After about 35 years, pines are the principal trees, but beneath them grow the seedlings of the hardwoods. The oaks (*Quercus spp*), hickories (*Carya spp*), dogwoods (*Cornus florida*), and red maples (*Acer rubrum*) slowly begin to dominate the forest floor. This is the stage that has been reached by most fields taken out of cultivation and not replanted by timber companies or pulp and paper companies.

Both the hardwoods and pines will reach maturity within about 70 to 75 years after a field's abandonment. The tops of the pines will rise above the forest, but few pine seedlings will be found on the forest floor. They need the sun that has been blocked out by the hardwoods' leafy canopy, and either the seeds cannot germinate or the pines do not survive the seedling stage. A century after the field's abandonment, the pines will begin to die off, and the forest will be dominated by an oak-hickory canopy with an understory of dogwood, red maple, and sourwood (*Oxydendrum arboreum*). Only in areas of poorer lands or where the forest canopy is opened by lightning, fire, or some other destructive event would we find pines.

Two plants of special interest in the Piedmont are the loblolly pine (*Pinus taeda*) and the kudzu vine (*Pueraria lobata*). Both occur throughout the area today and contribute to the Piedmont's characteristic floral landscape. Interestingly, though, neither is native to the immediate area. The loblolly pine was called "old field pine" because of is widespread presence in the succession stage of abandoned agricultural fields. Today, it is the most common tree in the Piedmont, and it has been and is being planted widely by paper companies and state foresters. The loblolly pine was not mentioned by eighteenth- and early-nineteenth-century travelers and botanists who journeyed through the Piedmont (they noted the short-leaf pine as the native pine). It therefore must have been introduced from the Coastal Plan sometime during the nineteenth century.

A bit more is known about the kudzu vine. This plant is native to Japan but was introduced into the United States during the last decades of the nineteenth century. Known initially as the "porch vine," it was used as a garden ornamental and also was grown on the sides of porches to provide shade during the summer. The 1930s and 1940s saw its widespread use for erosion control and soil restoration. South Carolina agricultural agents especially encouraged the planting of kudzu, and perhaps 50,000 acres (20,250 ha) of the vine were growing across the state by 1950. The

plant lost its popularity during the 1960s and thereafter was considered a weed. Kudzu's tendency to climb trees and seemingly smother them made it undesirable as forestry became an increasingly important economic activity. The plant still is widespread, covers acres of land and trees, and creates eerie scenes of long, hanging vines. But probably fewer than 10,000 acres (4,040 ha) of it remain in the state today, and none is being planted.

Sandhills

Sandhills vegetation is as unique as the landform region itself. In an area that annually receives about 45 in. (114 cm) of rain, we encounter a floral regime that is xerophytic, or adapted to dry conditions. This aridity results from the excessive internal drainage of the sandy soils. The vegetation complex is distinguished by a broken canopy, a dispersed distribution of plants, and expanses of bare soil. Predominant in the natural forest cover are the long leaf pine (*P.palustris*) and the turkey oak (*Q. laevis*), a stunted and gnarled lower-story tree. Despite their unsuitability for crops, the Sandhills have been burned, cleared, and cultivated, and now are planted to loblolly pine and slash pine (*P. elliottii*), neither of which is native to the area. Although modified by human activity, much of the Sandhills maintains its distinctive flora. A number of shrubs and plants, including species of sparkleberry (*Caccinium spp*), the wild rosemary (*Ceratiola ericoides*), and the rare wooden goldenrod (*Chrysoma paucifloscul*osa), and the sand myrtle (*Leiophyllum buxifolium*), give character to this distinct vegetation complex.

Stands of long leaf pines once dominated the Sandhills, but now that fire is controlled, they share their dominant role with the scrubby oaks. The pines are pyrophilious-that is, they are not harmed by fire-but the oaks would be removed if the area were subjected, as it once was, to periodic burning. Fire is a natural event, caused by lightning throughout the Southeast, but for millennia it has also been used by humans. Native Americans used fire to hunt and to increase browse for deer and other game animals, and early settlers burned the forests to provide grazing for their livestock. Perhaps this frequent burning over of areas was the basis of an apparent symbiotic relationship between fire and plants. The vegetation of the Sandhills seems to have been selected by fire, as evidenced by the predominance of the long leaf pine; similar relationships between fire and plants may be found in other parts of the state.

Coastal Plain

Travelers crossing the Coastal Plain commonly complain of the seemingly endless miles of pines. Pines do constitute an important component of the Coastal Plain landscape, but many other plants contribute to the region's vegetation. On higher ground in the Inner Coastal Plain, especially on the bluffs overlooking the rivers, a pine-hardwood community is dominated by loblolly pine, hickory, and various oaks, including post oak (*Q. stellata*) and southern red oak *(Q. falcate*). On lower slopes, the wetter conditions are preferred by white oak (Q. alba), sweet gum (*Liquidambar syraciflua*), willow oak (*Q. phellos*), and black gum (*Nyssa sylvatica*). In the river floodplains, on the other hand, we find sweet gum, laurel oak (*Q. Laurifolia*), water hickory (*Carya aquatica*), overcup oak *(Q. lyrata*), cypress, and tupelo.

Distinctly characteristic of the Coastal Plain are the thousands of Carolina bays that dot the landscape. Red bay (*Persea borbonia*), sweet bay (*Magnolia virginiana*), and loblolly bay (*Gordonia lasianthus*) typically are found along their edges. The centers of the large bays are usually swamps dominated by bald cypress (*Tasodium distichum*) and water tupelo (*Nyssa aquatica*). The standing water that forms the swamp limits the depth of the root systems. Swamp trees, as a result, have buttressed or flared bases for support, and the cypress develops its characteristic knees. These trees also occur in low bottomlands, cut-off lakes, and deep swamps through much of the Outer Coastal Plain.

Although the Coastal Plains are largely forested, there are scattered zones of open grasslands called savannas. Dominated by various grasses (*Aristda spp, Androgpogon* sp, *Panicum spp*) and long leaf pines, savannas are usually associated with a high water table. Besides excess moisture, another factor contributing to savanna formation and perhaps the most important is the

occurrence of fires. For thousands of years, humans have used fire in the Coastal Plain for various purposes. Fire destroyed competing vegetation and encouraged the growth of grasses and pines that characterize the savannas today. Widespread planting of both slash pines and long leaf pines for pulp mills and the use of controlled burning to manage these tree plantations are also responsible for today's pine-dominated Coastal Plain forest.

Coast

Except along the Grand Strand, South Carolina's coast does not form a sharp break between land and water, and inlets, marshes, and barrier islands characterize the shore from Georgetown to Turtle Island. To simplify the diversity of landforms and plant types, we can group the coastal vegetation into four zones-fresh marshes, maritime forests, salt marshes, and sand dunes (moving from the most inland Coastal Zone vegetation type shoreward-each of which is characterized by a specific botanic complex.

Fresh marshes are inundated by fresh water and are protected from salt-water intrusion by old beach ridges. They support a marsh vegetation dominated by rushes and, in contrast to swamps, contain no trees or bushes. This complex includes bulrush *(Scirpus validus*), cattail (*Typha spp*), and various black rushes (*Juncus spp*), although the last are more common to brackish marshes.

Old beach ridges reflect the dynamic character of the coast. Active dunes at one time, they were left behind as the ocean retreated or the coast built seaward. Once stabilized, they were occupied by a specific floral complex. Located away from the beach and surrounded by fresh and salt marshes, their distinct vegetation results from their elevation. The plants are not inundated by fresh or brackish water and thus are different from those in the surrounding marshes. This complex is referred to as a maritime forest because, in contrast to the marshes, trees and shrubs are dominant. Although located at a distance from the shoreline, the vegetation still is affected strongly by salt spray and coastal winds. Certain trees, such as the live oak (Q. *virginiana*) and the palmetto (*Sabal palmetto*), are particularly tolerant of these conditions and typify the maritime forest. The live oak is native to the coast but has been planted as an ornamental throughout the state. Other trees and shrubs of the maritime forest include slash pine, magnolia, holly, wax myrtle (*Myrica cefifera*), and wild olive (*Osmanthus Americana*). With Spanish moss hanging from the oaks and light filtering through the canopy, the maritime forest creates an image of solitude and beauty.

Closer to the ocean and inundated at high tide are the salt marshes. Cordgrass (*Spartina spp*) and black rushes (*Juncus spp*) cover some 90 percent of the tidal areas. Other plants include the glasswort (*Salicornia virginica*) and sea oxeye (*Borrichia furtescens*). These marshes, doted with oyster beds, play a major role in the life of cycle of many species of marine life, including all the commercially and recreationally caught fish and shellfish. The marshes remain a major resource for South Carolina and the nation, and their economic and ecologic importance increasingly has been realized. Both the state and federal government have sponsored legislative restrictions on the rampant destruction and loss of these valuable areas, a fate that has befallen salt marshes on the coastline of neighboring states.

On the shoreline itself are the sand dunes, created by the interaction of land, waves, and wind. Dominating the fore dune, or that nearest the ocean, and anchoring it are sea oats (*Uniola paniculata*). These beautiful grasses, whose waving heads virtually symbolize the coast, are protected by law in most coastal communities. Also common on the fore dune is the marsh elder (*Iva imbricata*), and on the dune's protected backslope are the pennywort (*Hydrocotyle bonariensis*) and sandspurs (*Cenchrus tribuloides*), the latter making barefoot walks to the beach so painful. In the depression behind the fore dune is an area protected from the salt spray; here we find yaupon (*Ilex vomitoria*), wax myrtle, dwarfed live oak, Spanish bayonet (*yucca aloifolia*) and other plants. The secondary dunes, though somewhat protected by the fore dune, have a similar arrangement of vegetation

The Coast is a dynamic merger of land and water and is characterized by wide beaches, barrier islands and marshes. Tides, currents and storms are constantly remolding its morphology, and it is a diverse region. The topography is flat and elevation ranges from sea level to a few feet above sea level. Soils consist of sand and organic material. The area receives an average annual rainfall of about 48 to 50 inches. The average temperature in January is between 46 and 50 degrees Fahrenheit. The average temperature in July is between 80 and 81 degrees Fahrenheit.

Other SC Symbols, Official Recognitions (click and press enter on underline selection when on the web to get an image or information)

- Nickname for South Carolina – Palmetto State
  Earlier nickname – Iodine State
- Nickname for South Carolinians – Sandlappers
- State flag – Note: No one knows for sure what the crescent on the caps of Moultrie's troops represented
- State seal
- State motto – South Carolina has two state mottoes
- State songs
- State music – The Spiritual
- State opera – Porgy and Bess
- State popular music – Beach music
- State dance – The Shag
- State folk dance – Square Dance
- State waltz – Richardson Waltz
- Current poet laureate – Marjory Wentworth
- All SC poet laureates – past and present
- State tree – Palmetto
- State flower – Carolina or Yellow jessamine (pronounced "JES-uh-min" or "jaz'min")
- State grass – Indian grass
- State fruit – Peach
- State beverage – Milk
- State hospitality beverage – Tea
- State amphibian – Spotted salamander
- State animal – Whitetail deer
- State bird – Carolina wren
- State butterfly – Eastern tiger swallowtail
- State dog – Boykin Spaniel
- State fish – Striped bass
- State game bird – Wild turkey
- State insect – Carolina mantid
- State reptile – Loggerhead turtle
- State spider – Carolina wolf spider
- State gem – Amethyst

- State shell – Lettered olive
- State stone – Blue granite

Fast Facts of South Carolina

State Capital
Columbia

Motto
Dum Spiro Spero (While I breathe, I hope)

Nickname
The Palmetto State

Admitted to the Union
May 23, 1788 - the 8th State

Land Area
31,113 square miles - ranked 40th

Coastline
187 miles of coastline

Highest Point
Sassafras Mountain - 3,560 feet above sea level

Lowest Point
Sea level on the coastline

Highest Waterfall
Raven Cliff Falls - 400 feet

Population
About 4 million - according to the 2000 Census

South Carolina Borders
Atlantic Ocean, Georgia, North Carolina

Longest River
Savannah River - 238 miles

Oldest College
College of Charleston, est. 1785

Counties
46 counties

State Parks
46 state parks

11Largest Counties by Area
1) Horry County 1,133 square miles
2) Orangeburg County 1,105 square miles
3) Berkely County 1,099 square miles
Smallest County by Area
McCormick County

Largest County by Population (1999 estimate)
1) Greenville County 358,936
2) Charleston County 319,921
3) Richland County 307,279

Smallest County by Population (1999 estimate)
McCormick County 9,606

Largest South Carolina Cities by Population (1998 estimate)
1) Columbia 110,840
2) Charleston 87,044
3) North Charleston 68,072
4) Greenville 56,436
5) Rock Hill 46,218

Top Agricultural Crops**
1) Tobacco
2) Cotton
3) Soybeans

Annual Visitation
28.2 million visitors (1999 estimate)

Visitor Spending
$7.1 billion (1999 estimate)

How South Carolina Got Its Name
King Charles I of England granted the land on which South Carolina is located to Sir Robert Heath in 1629. The region was named Carolina, a word derived from the Latin form of Charles, in reference to King Charles. His son, King Charles II, changed the spelling of the regions name to Carolina in 1663, when he gave the land to the eight Lords Proprietors. During the 17th century the land to the south, in this grant, came to be called South Carolina and the area to the north, North Carolina. The two sections remained a single colony until they separated in 1710. The name of the land located to the south remained South Carolina.

South Carolina License Plate
The official South Carolina state license plate includes the logo of the South Carolina Department of Parks, Recreation and Tourism, 'Smiling Faces. Beautiful Places.' A palmetto tree, the state tree, is located in the center of the license plate. The palms of the tree are colored green and the tree trunk is brown. The background of the license plate consists of a border of blue mountains.

Historical Firsts

- First independent government formed among American colonies, March 1776
- First state to secede from the Union, December 20, 1860
- First shot fired in Civil War on Fort Sumter in Charleston Harbor, April 12, 1861
- First municipal college - College of Charleston, opened April 1, 1838
- First public museum - Charleston Museum, organized January 12, 1773
- First building to be used solely as a theater - Dock Street Theatre in Charleston, constructed in 1736
- First opera performed in America - Charleston, February 18, 1735
- First fireproof building built - Charleston, 1822
- First ship built in America to cross the Atlantic Ocean - Port Royal, 1562
- First steam locomotive built in the United States to be used for regular railroad service - "Best Friend of Charleston," 1830
- First cotton exported to England, 1764
- First tea planted - Middleton Barony, 1802. First commercial tea farm - Summerville, 1890
- First indigo planted, 1671
- First cotton mill built - James Island, 1789
- First slave insurrection - Stono area near Charleston, 1739
- First Black Baptist Church established - Silver Bluff, 1773
- First Medal of Honor awarded to a Black recipient- W. H.Carney (Army), July 18, 1863
- First Black Associate Justice of a state supreme court - J. J. Wright, February 2, 1870
- First mutual fire insurance company - Friendly Society for the Mutual Insurance of Houses Against Fire, 1735
- First business publication - South Carolina Price Current in Charleston, 1774
- First textile school established in a college - Clemson, 1899
- First U.S. Senator elected by a write-in vote - Strom Thurmond, November 2, 1954
- First woman lawyer in South Carolina - Miss James M. Perry of Greenville was admitted to practice on May 4, 1918
- First free library established - Charleston, 1698
- Golf was first played in the United States in the city limits of Charleston. The South Carolina Golf Club was formed in 1786 - this was the first golf club
- The Charleston Chamber of Commerce was the first city Chamber of Commerce in this country - 1773
- The first time a British flag was taken down and replaced by an American flag was in Charleston in 1775
- The first submarine ever used in warfare was Hunley's boat used by the Confederates in 1863 in Charleston Harbor

State Animal
Whitetail Deer

The whitetail deer (odocoileus virginianus) is South Carolina's State Animal (designated by Act No. 1334 in 1972). This species of deer is one of the greatest game animals in North America and our State's most sought after game. The whitetail deer is quite plentiful in South Carolina and some areas of the State have the longest deer-hunting season and most liberal bag limit in the United States. Every county in South Carolina features an open season on deer.

State Bird
Carolina Wren

The Carolina Wren is a member of the family Troglodytidae. It is present in all areas in South Carolina from the coast to the highest mountain. The song; which may be interpreted as " *tea-ket-tle, tea-ket-tle, tea-ket-tle;*" may be heard the year-round, day and night, in all kinds of weather.

The Carolina Wren is slightly smaller than an English Sparrow and has a conspicuous white stripe over the eyes. The back of its body is rufous-red with underparts somewhat lighter in color. The tail, which is finely barred with black, is held erect when the bird is excited.

Note: Prior to 1939 "The Carolina Wren" had been unofficially recognized as the State Bird of South Carolina. In 1939 the General Assembly passed an Act (No.311) designating the Mockingbird as the official Bird of the State. Act No. 693, 1948 (1962 Civil Code, Sec.28-2) was passed repealing the 1939 Act and designating the Carolina Wren as the official State Bird instead of the Mockingbird.

State Game Bird
Wild Turkey

The wild turkey (Meleagris Gallopavo) - designated by Act No. 508, 1976) is South Carolina's official State Wild Game Bird. The wild turkey is a bird of the deep woods and hardwood forests. It is a prized game bird and is considered a table delicacy. Wild turkeys are hunted only during the spring season and are found throughout the State, primarily on game management lands.

State Fish
Striped Bass

South Carolina's State Fish, the striped bass (Act No. 1333, 1972), is the State's most famous game fish. Its large size and aggressive nature make it an angler's favorite. The Santee Cooper Lakes were the original home for the landlocked striped bass. Some of the best striped bass fishing in the world can be found in these lakes, with many stripers weighing 30 to 40 pounds. These great game fish have also been stocked in all of the State's major reservoirs.

State Reptile
Loggerhead Turtle

Loggerhead Sea Turtle, Caretta Caretta, was designated as the official reptile of the State by the General Assembly on June 1, 1988, by Act No. 588. Loggerhead Sea Turtles are recognized as a threatened specie and the destruction of their nesting habitat further threatens them with extinction. They perform extended migration between their feeding grounds and rookeries, and South Carolina is considered to have some of the most pristine nesting areas used by Loggerhead Sea Turtles on the eastern coast.

State Insect
Carolina Mantid

The Carolina mantid, Stagmomantis carolina (Johannson), a praying mantis, was designated the State Insect by the General Assembly by Act No. 591 of 1988, for the following reasons: it is a native, beneficial insect that is easily recognizable throughout the State; it symbolizes the importance of the natural science of entomology and its special role in all forms of agriculture in helping to control harmful insects; and it provides a perfect specimen of living science for the children of this State.

State Butterfly
Eastern Tiger Swallowtail

The Eastern Tiger Swallowtail, Pterourus Glaucus, was designated the official butterfly of the State by Act No. 319, 1994. The first known painting was done in 1587 by John White, a commander in Sir Walter Raleigh's Expedition to the colonies. The Garden Club of South Carolina has identified the Tiger Swallowtail of particular interest to South Carolinians because it serves as a pollinator in orchards and gardens. It can be seen in deciduous woods, along streams, rivers and wooded swamps and in towns and cities throughout South Carolina.

State Dog
Boykin Spaniel

The Boykin Spaniel (designated by Act No. 31, 1985) is the official dog of the State. The Boykin Spaniel is the only dog which was originally bred for South Carolina hunters by South Carolinians and has developed into a breed of superb hunting instincts and mild temperment. They are highly regarded as pets and hunting dogs.

State Shell
The Lettered Olive

The Lettered Olive, Oliva Sayana, was designated the official shell of the State by Act No. 360, 1984. Dr. Edmund Ravenel of Charleston, South Carolina, an early pioneer in concholgy, found and named the Lettered Olive shell which is quite prolific along the South Carolina Coast.

State Amphibian
The Spotted Salamander

The Spotted Salamander, Ambystoma maculatum, was designated as the official State Amphibian by Act No. 79, 1999. The Spotted Salamander is a stout-bodied species of 150 to 249 millimeters in length, identified by bright yellow round spots in two irregular rows on a dark background. The species inhabits deciduous forests with semipermanent pools about one meter deep. The Spotted Salamander is the only amphibian indigenous to the whole State and survives by avoiding bottomlands subject to regular flooding and permanent ponds containing fish.

State Spider
Carolina Wolf Spider

The Carolina Wolf Spider, Hogna carolinensis, was designated as the official State Spider by Act No. 389 in 2000.

State Stone
Blue Granite

The General Assembly by Act No. 345 of 1969, adopted the Blue Granite as the official stone of the State. The Act stated that "the blue granite stone of this State has been widely used to beautify all areas of South Carolina.

State Gem
Amethyst

The Amethyst was designated as the official State Gem Stone by the General Assembly June 24, 1969 (Act No. 345). "S.C. is one of three states where the gem stone Amethyst of good quality is found in the U.S.; the curator of mineralogy for the Smithsonian Institute has graded one of the largest early specimens from this State as the finest seen in this country; such stone now holds first place in the Amethyst section in the institute...is the most prized type of quartz for its wide use and various shades and hue from deep orchid color."

State Fruit
Peach

The General Assembly declared by Act No. 360, 1984, the peach as the official fruit of the State. South Carolina is the nation's leading peach producer and shipper east of the Mississippi River

State Beverage
Milk

Milk was designated as the official State Beverage by Act No. 360, 1984

State Flower
Yellow Jessamine
Officially adopted by the General Assembly on February 1, 1924, for the following reasons: it is indigenous to every nook and corner of the State; it is the first premonitor of coming Spring; its fragrance greets us first in the woodland and its delicate flower suggests the pureness of gold; its

perpetual return out of the dead Winter suggests the lesson of constancy in, loyalty to and patriotism in the service of the State. The "Carolina or Yellow Jessamine" is defined by the New International Encyclopedia as "A climbing plant which grows upon trees and fences and bears a profusion of yellow, funnel-shaped flowers an inch in diameter, with a fragrance similar to that of the true Jasmine." Its odor on a damp evening or morning fills the atmosphere with a rare and delicate sweetness.

THE STATE TREE
The Palmetto
Adopted as the "Official State Tree of the State of South Carolina" by Joint Resolution No. 63, approved March 17, 1939.

The South Carolina Palmetto is classified by the U.S. Department of Agriculture as "Inodes Palmetto (also called Sabal Palmetto) and commonly known as the Cabbage Palmetto." It has long been closely associated with the history of South Carolina, being represented on the State Flag as well as on the State Seal, where it is symbolical of the defeat of the British fleet by the fort, built of Palmetto logs, on Sullivan's Island.

The Palmetto is an attractive feature of the coastal areas of South Carolina and is also found in Georgia, Florida and North Carolina. The large leafbud is highly prized as a salad vegetable for use in making pickles or relishes, and in Florida some use has been made of the fibers from the leaf bases. Such uses, however, are wasteful since the palm must be destroyed in either case and years must lapse before it can be replaced

THE STATE HOSPITALITY BEVERAGE
Tea

South Carolina grown tea was designated the official Hospitality Beverage of the State by Act No. 31, 1995. South Carolina is the first place in the United States where tea was grown having been planted in the Lowcountry outside of Charleston in 1799 at what is now Middleton Place. Now the direct descendants of those very plants have been restored to their former grandeur at the Charleston Tea Plantation, a lush, subtropical tea farm, nestled on a serene sea island near the historic City of Charleston.

FUN FACTS

- The largest remaining virgin stand of bald cypress and tupelo trees in the world is located in the Francis Beidler Forest near Charleston, SC.
- The nation's only commercial tea farm, American Classic Tea, is located on Wadmalaw Island near Charleston.
- Brookgreen Gardens is the world's largest collection of outdoor sculpture.· The Peachoid water tank in Gaffney is the only water tank of its kind in the world; it holds one million gallons of water.
- Middleton Place Gardens are the oldest landscaped gardens in America.
- The oldest brickworks in America were found in Columbia.
- Columbia is the boyhood home of President Woodrow Wilson.
- Fort Jackson, located in Columbia, is the largest military training base in the country.
- The Lake Murray dam is the second largest earthen dam in the world.
- The town of Abbeville is known as “the birthplace and deathbed of the Confederacy.”

- The combined cascades of the Upper and Lower Whitewater Falls near the NC/SC border creates one of the highest series of waterfalls in the eastern United States.
- The Edisto River is the longest black water river in the world.
- Bob Jones University in Greenville is the largest, non-denominational Christian liberal arts college in the world.
- Horry County is the largest county east of the Mississippi River.
- The 1920's dance craze, the Big Apple, originated in Columbia.
- Riverbanks Zoo is rated one of the top 10 zoos in the nation.
- There are more than 300 public and private golf courses in South Carolina.
- South Carolina is the nation's largest producer of peaches for the fresh market.
- Only four cites in the USA have more interstate highways intersecting than in Columbia.
- Greenwood, SC has the widest main street in the world.
- The National Wild Turkey Federation is headquartered in Edgefield, SC.
- The Pendleton District is one of the largest national historic districts in America.
- Honea Path is the only place in the world with this name.
- Campbell's bridge is the only covered bridge remaining in South Carolina.
- The Town Clock in Winnsboro is believed to be the longest continuously running town clock in the USA.

Information compiled from the South Carolina Official Tourism Website,
http://www.discoversouthcarolina.com/scfacts/index.asp

More South Carolina Facts and Trivia

1. Campbell's Covered Bridge built in 1909, is the only remaining covered bridge in South Carolina. Off Hwy 14 near Gowensville.

2. The salamander was given the honor of official state amphibian.

3. The walls of the American fort on Sullivan Island, in Charleston Harbor, were made of spongy Palmetto logs. This was helpful in protecting the fort because the British cannonballs bounced off the logs.

4. The City of Myrtle Beach is in the center of the Grand Strand, a 60-mile crescent of beach on the South Carolina coast. In the last 25 years, Myrtle Beach has developed into the premier resort destination on the East Coast.

5. South Carolina entered the Union on May 23, 1788 and became the 8th state.

6. David Robert Coker (1870-1938) conducted his early crop-improvement experiments on the family plantation in Hartsville. Beginning with 30 experimental cotton selections and methodically applying the latest techniques in the scientific breeding of crops, the work of Coker Experimental Farms played a great role in the agricultural revolution in the South.

7. The state dance of South Carolina is the Shag!

8. The first battle of the Civil War took place at Fort Sumter.

9. South Carolina is the nation's leading peach producer and shipper east of the Mississippi River.

10. Before being known as the Palmetto State, South Carolina was known as, and had emblazoned on their license plates, the Iodine State.

11. The only major league baseball player to wear the name of his hometown on his uniform was pitcher Bill Voiselle. He wore number 96.

12. The Thoroughbred Racing Hall of Fame features champion thoroughbred flat racers and steeplechase horses trained in Aiken.

13. The Black River Swamp Preserve is located near Andrews. This slow-moving river is characterized by high concentrations of organic carbon, which accounts for the tea-colored water and gives rise to the diverse habitats in its widespread floodplain.

14. Batesburg-Leesville is home to the annual South Carolina Poultry Festival held in early May.

15. South Carolina's smallest county is McCormick at 360 square miles while the largest county is Horry at 1,134 square miles

16. A noble Catawba Indian who befriended early Camden settlers, King Haiglar is often called "The Patron Saint of Camden." Today, he reigns over Camden in the form of a life-sized weather vane which graces the tower of what once was the circa-1886 Opera House.

17. Chapin is known as the Capital of Lake Murray.

18. Sumter has the largest Gingko farm in the world.

19. Stretching 60 miles from Little River to Georgetown, South Carolina's Grand Strand is one of the most popular tourist destinations in the United States.

20. The Stumphouse Mountain Tunnel was started in 1856 by a railroad company and is bored for more than a mile into the granite heart of fabled Stumphouse Mountain. The coming of the Civil War in 1859

ended the work on the project. Some years ago, Clemson University made Blue Mold Cheese in the tunnel successfully for the first time in the South.

21. Tyler Brothers Work Shoe and Boot Company in Wagener produces 8 major brands of OSHA approved safety footwear, including such famous brands as Redwing, Georgia, Northlake, and Wolverine.

22. The Board of Public Works in Gaffney built an elevated water storage tank in the shape of a peach in 1981.

23. The Edisto River Canoe & Kayak Trail covers 66 miles of the river for which it's named. The Edisto is reputed to be the world's longest free-flowing "blackwater" stream. "Blackwater" is a term that not only describes the color of the tannin-rich water, but also refers to the peaceful rate of flow that characterizes such rivers.

24. The Argent train Engine No. 7 was donated to the town of Hardeeville upon the closing of the Argent Lumber Company. This narrow gauge train is a rarity and attracts many people from across the nation.

25. The first boll weevil found in South Carolina is on display at the Pendleton District Agricultural Museum.

26. Duncan Park Baseball Stadium in Spartanburg is the oldest minor league stadium in the nation.

27. Every few years, Irmo has a sighting of some kind of water monster that inhabits Lake Murray. The monster first 'surfaced' in 1973 when residents of Irmo and Ballentine saw a cousin of the Loch Ness Monster. It was described in The Independent News in 1980 as "a cross between a snake and something prehistoric."

28. A 24-mile motorcycle trail and a 26-mile horse trail are unusual features of Parsons Mountain Park in the Sumter National Forest.

29. The Isle of Palms was originally named Hunting Island and then Long Island, it's thought to be at least 25,000 years old, and was first inhabited by the indigenous Seewee Indians.

30. Johnston is called The Hub of the Ridge because it is located at the meeting place of the three river systems which flow away from the Ridge, a fertile plateau about thirty miles long between clay hills to the north and sand hills to the south.

31. Johnston is known as the Peach Capital of the World.

32. The Lake City tobacco market was established in 1898, and has grown to become one of the two largest markets in South Carolina today.

33. Sweetgrass basket making has been a part of the Mount Pleasant community for more than 300 years. Basket making is a traditional art form that has been passed on from generation to generation.

34. Bomb Island on Lake Murray each spring and summer is the home of a very unusual event. Each year thousands of Purple Martins return to this island to roost for the summer. The island has been declared a bird sanctuary and it is quite a sight to watch these birds return to Bomb Island each day around sunset.

35. At the Riverbanks Zoological Park in Columbia more than 2000 animals thrive in recreated natural habitats with no bars or cages.

36. Little River is the Gateway to the Grand Strand. Giant moss-covered oak trees, that are centuries old, line its waterfront and many streets!

37. There is an old saying in Marion that anyone who drinks water from Catfish Creek becomes infatuated with the area and wishes to remain there.

38. In February 1852 William Burkhalter Dorn discovered the second richest vein of gold in SC history on the site of the present town of McCormick.

39. Red Spider Lilies were first planted in the US, in the Willington-Mt. Carmel area when Dr. James Morrow sent them and other plants from the Orient while he served as surgeon with Commodore Perry's expedition to open trade with Japan.

40. The introduction of tobacco in 1894 rocketed Mullins into the Tobacco Capital of South Carolina. As many as 200 tobacco barns sprang up throughout the community. Warehouses were also constructed and the first tobacco sale took place on August 28, 1895.

41. Housed in a 100-year-old freight depot, the Cowpens museum is a showplace for relics belonging to the crew of the USS Cowpens, a famous World War II aircraft carrier.

42. Orangeburg is known as the "Garden City" because of its beautiful Edisto Memorial Gardens. The Edisto Memorial Gardens displays past and current award winning roses from the All-American Rose Selections.

43. The Spartanburg Downtown Memorial Airport was the first airport in South Carolina opening in October 1927.

44. Summerville's beauty is mirrored in her motto, "The Flower Town in the Pines." Since the early 1900's day tourists have flocked to the town during early spring to enjoy millions of spring blossoms, particularly azaleas, in private and public gardens, including the mid-town Azalea Park.

45. Fountain Inn is proud of the town's most famous native son. Clayton "Peg Leg" Bates lost his leg in a cotton gin accident at the age of 12; he overcame his tragedy to become a famous dancer. His signature step was the "Imitation American Jet Plane," in which he would jump five feet in the air and land on his peg leg, with his good leg sticking out straight behind him. During his career, Bates performed more than 20 different times on the Ed Sullivan television show more than any other artist.

46. The Upper Whitewater Falls is the highest cascade in eastern America; it descends for nearly 411 feet.

47. On Nov 2, 1954 Strom Thurmond became the first US senator elected by write-in vote. Thurmond received 139,106 write-in votes to win his seat. He defeated Democratic nominee Edgar Brown, who received only 80,956 votes.

48. Beginning Labor Day and running through the following weekend, the South Carolina Apple Festival celebrates the beginning of apple harvest season in Oconee County, the largest apple-producing area in the state.
49. The Columbia City Ballet, South Carolina's oldest dance company, has developed into one of the most broadly supported performing arts organizations in the state.

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South Carolina
Our Amazing Coast

Web Resources

Curricula, Lesson Plans, and Other Teacher Resources

Bridge - Ocean Sciences Education Teacher Resourse Center
http://web.vims.edu/bridge/?svr=www

Center for Ocean Sciences Education Excellence – SouthEast
http://www.scseagrant.org/se-cosee/teacher/resources.htm

COASTeam Aquatic Workshops Curriculum
http://oceanica.cofc.edu/coasteam/AquaticWorkshops/home.htm

Longleaf Pine Fireforest, The Longleaf Alliance
http://www.auburn.edu/academic/forestry_wildlife/clpe/ecosystem/ecosystem.htm

Ocean Literacy Network
http://www.coexploration.org/oceanliteracy/

Project Oceanica
http://oceanica.cofc.edu/

Reptiles and Amphibians of South Carolina and Georgia, Savannah River Ecology Lab Herpetology Program
http://www.uga.edu/~srelherp/

South Carolina Aquarium Online Curriculum
http://www.scaquarium.org/curriculum/index.html

South Carolina Sea Grant Consortium
http://www.scseagrant.org/

SC Life Virtual Fieldtrip of Cove Forest, Salt Marsh, and Swamp Forest
http://www.knowitall.org/sclife/

Professional Organizations

Environmental Education Association of South Carolina
http://www.eeinsc.org

National Marine Educators Association
http://web.vims.edu/nmea/

South Carolina Marine Educators Association
http://www.scmarineed.org/