WONDERFUL, WATERFUL WETLANDS

OBJECTIVES

The student will do the following:

1. List characteristics of wetlands.
2. Describe the functions of a wetland.
3. Observe a demonstration using a wetland model.

SUBJECTS:
Science, Language Arts

TIME:
60 minutes

MATERIALS:
glass lasagna pan (or clear plastic sweater box)
modeling clay
strip of indoor-outdoor carpet (3" [7.5 cm] wide by width of pan)
measuring cups
clear water
muddy water
pictures of different kinds of wetlands
construction paper (1 sheet per student)
student sheet (included)
teacher sheet (included)

BACKGROUND INFORMATION

Wetlands are areas of land that are wet at least part of the year. They are often transition zones between dry land and open water. Some wetlands are consistently covered with water, while others are flooded only at certain times. All wetlands do have water-soaked soil at some time, which affects the kinds of plants and animals that live there. Wetlands can be found in all parts of the world and are classified into many types. There are freshwater and saltwater wetlands. Some examples of freshwater wetlands are swamps, marshes, bogs, pasture ponds, and prairie potholes. Saltwater wetlands include mangrove swamps and saltwater marshes. Estuaries are the bodies of water found where rivers empty into the sea; they include saltwater wetlands. The water in estuaries is a mixture of fresh and salt (sea) water, and its salinity usually varies with its distance from the open ocean.

Terms

bog: a plant community that develops and grows in permanently water logged areas having a thick layer of peat (partly decayed organic material).

estuary: (EHS • choo • ehr • ee) the bay area of a river, where it widens to meet the ocean, that receives and mixes with tidal salt water.

mangrove swamps: saltwater wetlands located in tropical and sub-tropical areas and dominated by woody shrubs called mangroves.

marshes: wet areas sometimes found at the edges of ponds, lakes, and rivers, usually treeless and having plants with soft stems, grasses, rushes, and sedges.

pocosin: (peh • KOH • sehn) an inland swamp of the southeastern United States coastal plain.

prairie potholes: wetlands occurring in the North Central United States and South Central Canada that provide nesting grounds for waterfowl.

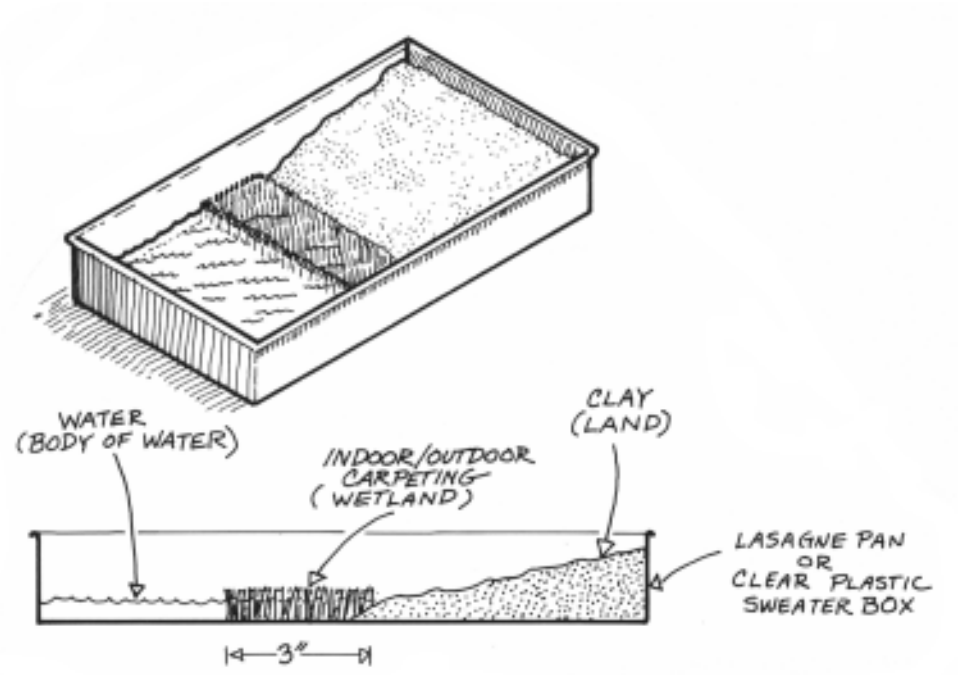
salinity: saltiness, or the amount of salt, in water or other liquids.

saltwater marshes: wetlands found in coastal areas; the transition zones between land and sea (the tide rises and falls in these marshes twice each day).

swamps: land (with saturated soils for some of the year) supporting a natural vegetation of mostly trees and shrubs.

ADVANCE PREPARATION

A. Spread a sloping layer of plasticene modeling clay in half of the lasagna pan or sweater box to represent land. Leave the other half of the pan empty to represent a lake or other body of water. Shape the clay so that it gradually slopes down to the body of water (see the diagram below). Smooth the clay along the sides of the pan to seal the edges.



B. Cut a piece of indoor-outdoor carpeting that will completely fill the width of the pan along the edge of the clay (see diagram). This will represent the wetland. Do not place the carpet into the model yet.

C. Use the enlargement capability of your school's photocopier to make copies of the small drawings on the teacher sheet "Wetland Pictures." Also, check your school or public library for books from which to get pictures. Travel or outdoor sports magazines are also good sources..

D. If you choose to do the word search puzzle in part IV. D, make a copy of the student sheet "Wonderful, Waterful Wetlands" for each student.

PROCEDURE

I. Setting the stage

A. Without giving the students a definition of wetlands, ask them to tell you what they think wetlands are. List their answers on the chalkboard and derive a definition from their answers.

B. Explain what a wetland is, comparing your definition with the students' answers. Stress that all wetlands have water-soaked soil, are covered with water at least part of the year, and support specialized plants that are adapted to life in wet conditions.

C. Show the students pictures of different kinds of wetlands and explain what they are. (NOTE: Use enlargements of those provided on the teacher sheet. If possible, get additional pictures from books or magazines.) Allow the students to compare the pictures (and definitions) to find the characteristics listed above.

II. Activity

A. Tell the students that until recently, most people did not consider wetlands to be important to our environment. Over the years, scientists have discovered that wetlands perform several vital functions for our environment.

B. Show the students the wetland model and explain what it and the clay represent. Explain to them that wetlands are complex systems and that no one yet knows exactly how they work. We do know, however, that there are three important functions wetlands perform; you will use your simplified model of a wetland to demonstrate these functions. (NOTE: For older students, you may adapt this procedure for cooperative groups. You may have them conduct it as an experiment.)

C. Begin the demonstration by pouring clear water slowly on the clay (this can represent rainfall, melting snow, drainage, etc.). Ask the students to describe what happens.

D. Drain the water back into the original container. Show the students the carpeting and, as you place it in the model, explain that it represents a wetland. Ask the students to predict what will happen when you pour the water onto the clay again.

E. Pour the same amount of water on the model again. Be sure to perform this exactly as you did before. Let the students describe what happens. (The water will drain more slowly into the body of water because it is now hindered by the wetland.) Explain that most wetlands are shallow basins that collect water and slow its rate of flow. Using the model, explain how this helps reduce flooding and prevent the deposition of eroded soil (sediment) in bodies of water. List these functions on the board.

F. Pour out the clear water. Leaving the carpet in place, pour some muddy water onto the clay. Ask the students to compare the water that flows through the wetland and into the body of water with the water left in the jar. Ask what happened. (Students should conclude that part of the soil in the muddy water was trapped by the wetland and that wetlands can act as a filter for sediment and some pollutants.) Add this function to the list on the board.

G. Remove the carpeting and repeat step F. Ask the students why all the soil particles end up in the body of water. The students should infer that without the wetland to act as a filter, most of the soil (and perhaps pollutants) flow directly into the body of water.

III. Follow-Up

A. Refer the students back to the list of wetlands characteristics written on the board. Review the definition of a wetland and the functions demonstrated. Ask questions such as "Why are wetlands important?" and "How can they help us?" Tell the students that wetlands are also important because they improve water quality, reduce erosion, provide habitats for a wide variety of wildlife and plants, help to store floodwaters, help to replenish groundwater during dry times, and provide recreation for many people to fish and hunt. They are also an important source of products such as seafood, rice, and timber.

B. Give each student a piece of construction paper. Have the students fold the paper in half, lengthwise. On one side of the fold, have them draw a picture of one of the demonstrations, and on the other side have them write a complete sentence telling what wetland function they have illustrated. For older students, you might want to reinforce paragraph writing by having them write a topic sentence about the important functions of wetlands and supporting sentences telling the functions that were demonstrated in Activity II.

IV. Extensions

A. If possible, take a field trip to a wetland near you. Include activities such as listing several types of plants or animals the students encountered, sounds they heard, and other observations. Back at school, extend these activities by having the students classify the types of animals, write a story or report about one of the animals, or illustrate one of the animals.

B. Divide the students into teams and provide each team with materials to create its own wetlands model. Have each team use measuring cups (NOTE: Canning jars with measurement marks work well for this) to measure an amount of water and add it to the model with carpet; then measure the amount of water that collects in the body of water. Have them repeat the experiment without the carpet, again measuring the water that runs off. They should repeat each step five times. Have them chart the measurements and compare them.

C. Acquire map(s) of wetlands in your area from the U.S. Geological Survey Earth/Science Information Center at 1-800-USA-MAPS (or the Canadian equivalent). Have the students research the type or types of wetlands most common in your area and report on the types of plants and animals found there.

D. To reinforce wetlands vocabulary, give each student a copy of the student sheet "Wonderful, Waterful Wetlands." Have the students find and circle the listed terms in the word search puzzle. A key is provided on the accompanying teacher sheet.

RESOURCES

"Wading Into Wetlands," NatureScope, Vol. 2, No. 5, National Wildlife Federation, Washington, DC, 1986.

"Wild About Wetlands," Nature Naturally (newsletter), Vol. 13, No. 3, Ida Cason Calloway Foundation, Pine Mountain, Georgia, 1990.


MARSH


BOG


LAKE OR POND


SWAMP


RIVER OR STREAM


COASTAL WETLAND

WONDERFUL, WATERFUL WETLANDS

Find these words in the word search puzzle below. As you find each word, circle it, and mark it off the list. The words may go across, up and down, diagonally, or backwards.

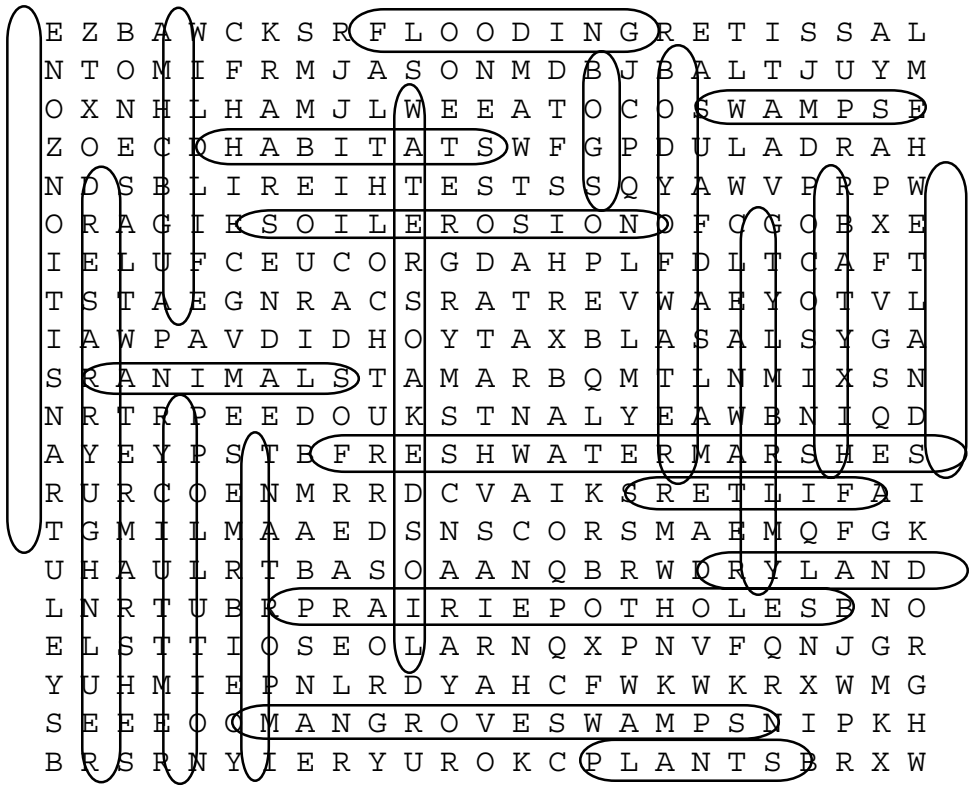
animals
body of water
bogs
clean water
dry land
filters
flooding
freshwater marshes
habitats
important
mangrove swamps
plants
pocosins
pollution
prairie potholes
saltwater marshes
soil erosion
swamps
transition zone
water soaked soil
wetlands
wildlife

E Z B A W C K S R F L O O D I N G R E T I S S A L
N T O M I F R M J A S O N M D B J B A L T J U Y M
O X N H L H A M J L W E E A T O C O S W A M P S E
Z O E C D H A B I T A T S W F G P D U L A D R A H
N D S B L I R E I H T E S T S S Q Y A W V P R P W
O R A G I E S O I L E R O S I O N O F C G O B X E
I E L U F C E U C O R G D A H P L F D L T C A F T
T S T A E G N R A C S R A T R E V W A E Y O T V L
I A W P A V D I D H O Y T A X B L A S A L S Y G A
S R A N I M A L S T A M A R B Q M T L N M I X S N
N R T R P E E D O U K S T N A L Y E A W B N I Q D
A Y E Y P S T B F R E S H W A T E R M A R S H E S
R U R C O E N M R R D C V A I K S R E T L I F A I
T G M I L M A A E D S N S C O R S M A E M Q F G K
U H A U L R T B A S O A A N Q B R W D R Y L A N D
L N R T U B R P R A I R I E P O T H O L E S B N O
E L S T T I O S E O L A R N Q X P N V F Q N J G R
Y U H M I E P N L R D Y A H C F W K W K R X W M G
S E E E O O M A N G R O V E S W A M P S N I P K H
B R S R N Y I E R Y U R O K C P L A N T S B R X W

WONDERFUL, WATERFUL WETLANDS
ANSWER KEY

Find these words in the word search puzzle below. As you find each word, circle it, and mark it off the list. The words may go across, up and down, diagonally, or backwards.

animals
body of water
bogs
clean water
dry land
filters
flooding
freshwater marshes
habitats
important
mangrove swamps
plants
pocosins
pollution
prairie potholes
saltwater marshes
soil erosion
swamps
transition zone
water soaked soil
wetlands
wildlife



HOME, WET HOME

OBJECTIVES

The student will do the following:

1. Identify components of a community.
2. Research an animal of a wetland community.
3. Illustrate an animal of a wetland community.

SUBJECTS:
Science, Art, Math, Language Arts

TIME:
1-2 hours

MATERIALS:
Between Cattails by Terry Tempest Williams
(or other similar book)
field guides or other books about animals
butcher paper
white paper (1 sheet per student)
crayons
scissors
glue or paste
teacher sheet (included)

BACKGROUND INFORMATION

All wetlands provide unique habitats for many plants and animals. Wetlands are busy communities with many specialized populations, all of which are uniquely adapted to living in an aquatic or semi-aquatic environment. Populations of wetlands creatures are displaced by the destruction of wetlands. Without their wet homes, these water-loving organisms cannot survive. Perhaps the first step to help make sure that we do not displace too many wetlands creatures is to be aware of their great numbers and variety and to appreciate the roles they each play in their wetland communities.

Terms

community: a related group of plants or animals living in a specific region under relatively similar conditions.

habitat: the area where an organism lives; the habitat supplies food, water, shelter, and space to live.

organism: a living being; plants and animals.

population: organisms of the same kind that live in the same place.

ADVANCE PREPARATION

A. From your school or local library, put together a classroom library of encyclopedic books about animals for the students to use to briefly research animals that live in the community you will study.

B. This lesson takes a "whole language" approach; it begins with the reading of a book. Obtain Between Cattails or one of the other books from the wetland habitat list in the Resource section. Read the book and make a chart listing the animal populations mentioned in the book.

C. Using white butcher paper, prepare a mural background appropriate for the habitat in the book you

choose. A suggested background for a marsh community to be used with Between Cattails can be found on the teacher sheet, "Mural Background" (included). (NOTE: You may want to involve students in this part.)

PROCEDURE

I. Setting the stage

A. Explain to the students what an organism and an organism's habitat are. Ask the students if they are organisms. (yes) Have them identify their habitats.

B. Define the terms *"population"* and *"community"* for the students. Ask them to identify their communities and the populations of plants and animals (and other organisms such as fungi and microbes) which are part of their communities.

II. Activity

A. Tell the students that you are going to read them a story about a wetland community. Ask them to listen for the populations which make up the community as you read.

B. Read Between Cattails or one of the other books from the list in the Resources section. Share the pictures as you read.

C. After reading, display the populations chart you made and discuss the various organisms and populations which make up the wetland community. (NOTE: Population charts will vary depending upon the resource used.)

D. Tell the students they are going to briefly research an animal from the community and then create a mural of the community.

E. Assign each student an animal. (NOTE: Depending on the size of your class, you may want to assign the same animal to more than one student.) Using the books in the classroom library, allow the students to look up their animals and briefly familiarize themselves with them. Ask them to look for one interesting fact about their animals. (You might require more of older students.)

F. Give each student a sheet of white paper. Allow 15 minutes for each student to draw, color, and cut out a picture of his/her animal. Be sure to stress to the students that their pictures need to be outlined with a dark crayon to facilitate cutting and to help it show up on the mural. While the students work, lay out the mural background on a large table or the floor.

G. As the students finish, have them paste their animals to the mural background.

III. Follow-Up

A. After the mural is completed, review the components of a community. Then allow time for each student to point out his/her animal, tell what it is, and share the interesting fact with the class.

B. As the students share with the class, jot down the names of the animals and the interesting facts. (NOTE: You might tape record the students as they share.) Later, on a chart tablet, record the names of the animals along with the interesting facts.

C. Display the mural, along with the chart, in the hallway for all to enjoy.

IV. Extensions

A. Explain to the students that plant and animal populations in the wetlands are threatened when wetlands are destroyed (for example, when people fill in wetlands to build things on them). Have each student design a bumper sticker or t-shirt showing his/her wetland animal and a slogan for protection of the animal and its habitat.

B. Divide the students into cooperative learning groups. Have them classify the populations of the mural community into mammals, reptiles, amphibians, insects, and birds. Make a bar graph showing the number of populations in each group.

C. Have the students extend their research about their animals, then write a story telling about a day in the life of the animals.

D. Borrow the book, Small Habitats (by Lilo Hess), from the library. It includes instructions for constructing a semi-aquatic or marshland terrarium. Gather the specified materials and allow the students to help you plan and construct the terrarium. Create a "Terrarium Maintenance Crew" of students on your helper list and give them the responsibility of caring for the terrarium.

E. Obtain a copy of the play Willa in the Wetlands from the Wetlands Division of the U.S. Environmental Protection Agency and let your class present it. This play tells about a wetlands community; a Teacher's Guide is available upon request.

RESOURCES

Hess, L., Small Habitats, Charles Scribner & Sons, New York, 1976.

Lewis, P., and R. Chalcroft, Willa in the Wetlands, Wetlands Division, U.S. Environmental Protection Agency, Washington, DC, 1991.

Wetland Habitat Booklist:

Cortesi, W. W., Explore a Spooky Swamp, National Geographic Society, Washington, DC, 1978.

Dewey, J. O., At the Edge of the Pond, Little, Brown and Company, Boston, 1987.

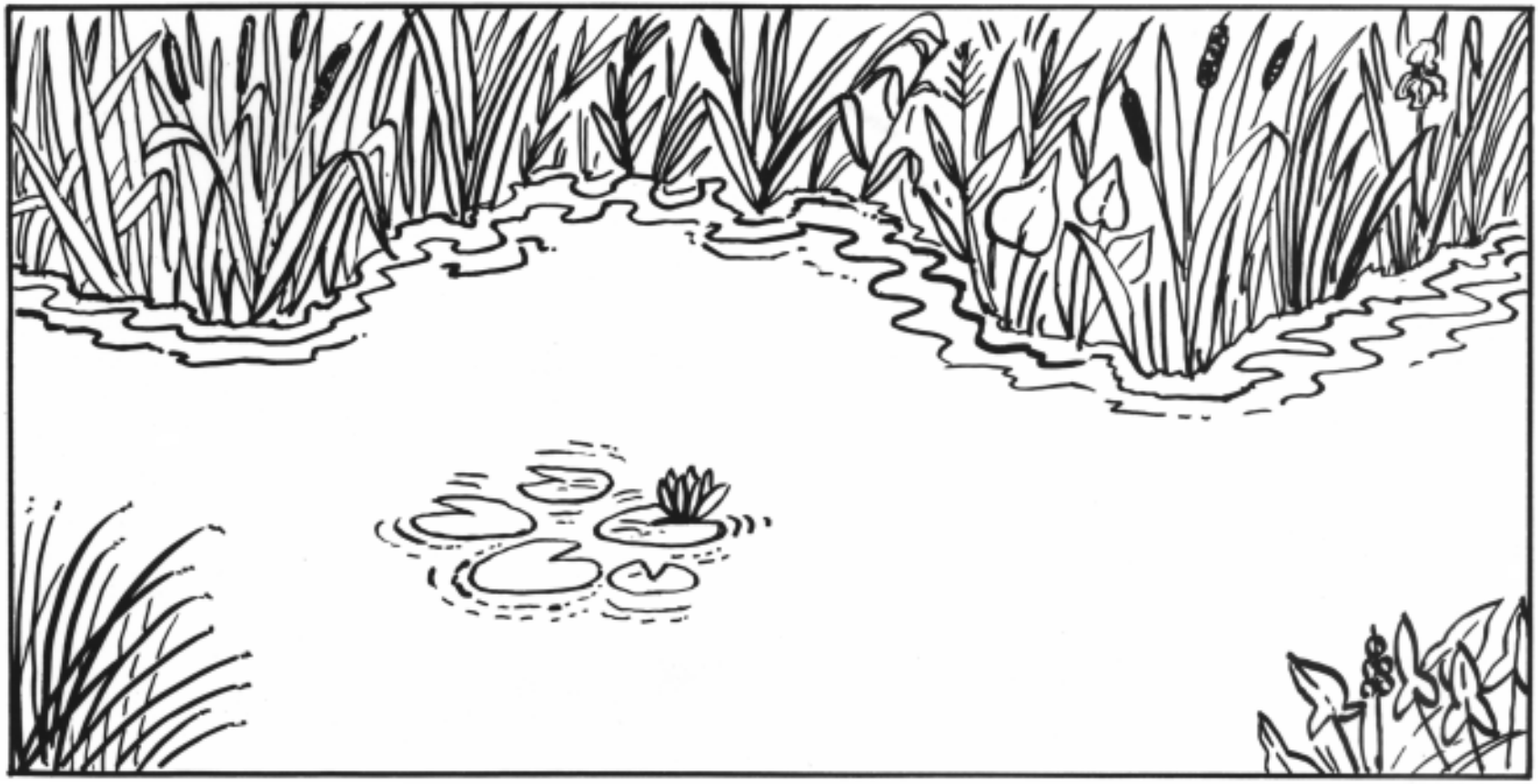
Hirschi, R., Who Lives in Alligator Swamp?, Dodd, Mead & Co., Inc., New York, 1987.

Lavies, B., Lily Pad Pond, E. P. Dutton, New York, 1989.

McClung, R. M., Green Darner, Wm. Morrow & Co., New York, 1980.

Williams, T. T., Between Cattails, Charles Scribner & Sons, New York, 1985.

MURAL BACKGROUND



TO WHOM IT MAY CONCERN

OBJECTIVES

The student will do the following:

1. Identify the importance of maintaining wetlands.
2. Identify the five parts of a letter.
3. Write a letter concerning the importance of wetlands.

SUBJECTS:
Language Arts, Social Studies, Science

TIME:
1 hour

MATERIALS:
Were You a Wild Duck Where Would You Go?
(by George Mendoza)
acetate sheets
overhead projector
teacher sheets (included)
writing paper
wipe-off transparency pen
pencils or pens
envelopes (optional)
stamps (optional)

BACKGROUND INFORMATION

At one time, many people looked upon wetlands as wastelands—no more than sources of mosquitoes, flies, and unpleasant odors. It is estimated that more than half of America's wetlands have been lost to development. Recently, however, we have begun to appreciate the importance of wetlands to our environment. Attitudes are changing. Scientists have discovered that wetlands are valuable natural resources that provide many important benefits to people and the environment. Among other things, wetlands help improve water quality, reduce flood and storm damage, reduce shoreline erosion, and provide important fish and wildlife habitats.

ADVANCE PREPARATION

A. This lesson is based on a "whole language" approach and, therefore, begins with the reading of a suggested book.

   1. Obtain the book Were You a Wild Duck Where Would you Go? from your local public or school library.

   2. If this award-winning book is not available, use the alternative method of reading a short encyclopedia article about a selected species of waterfowl (such as mallards). Check encyclopedia entries for "ducks, wild."

      a. After reading key information to the students, ask them to imagine that their class is a small flock of (your selected) birds on their long migration flight.

      b. Use a globe or wall map to show the students the migratory path of your selected bird.

c. Have the students identify when wetlands are important to the bird (such as nesting and raising young, resting during migration, and overwintering). Ask the students what things wetlands have that are important to your selected waterfowl. (land, water, plenty of food)

d. Have the students imagine that they are each waterfowl. Ask them what they would do if more and more of the wetlands along their flight path disappeared (were drained or filled and used for agriculture or real estate development). Have several students share what they think would happen. (What really happens is that fewer birds survive, thrive, and reproduce; numbers of the birds decrease over time.)

B. Prepare transparencies from the teacher sheets "10 Reasons Wetlands Are Important" and "Parts of a Letter."

C. Read the "10 Reasons Wetlands Are Important" (information) sheet and prepare to judge the summary statements formulated by the student teams. Write an appropriate version of each of the 10 reasons on an index card (one per card). For additional information on wetlands, check the factsheet chapter for the factsheets on wetlands.

PROCEDURE

I. Setting the Stage

A. Read the book Were You a Wild Duck Where Would You Go?" (by George Mendoza) to the class. Discuss Mallard's problem, making sure that students understand the main character, Mallard, is a wetland bird and his home has been destroyed. (NOTE: If this book is unavailable, and you use the alternative detailed above, your students will miss the lovely free verse of the book but will learn about a selected species of waterfowl. The lesson can proceed successfully.)

B. Explain to the students that many of our wetlands are being destroyed in various ways. Give examples of destructive practices, such as polluting the waters that empty into wetlands, draining wetlands for agricultural use, and draining and/or filling wetlands for housing development, shopping centers, factories or other real estate development purposes.

C. Display the "10 Reasons Wetlands Are Important" transparency. Tell the students they are going to help you fill in the spaces on the transparency.

1. Divide the class into 10 teams. Give each team an index card with an age-appropriate reason written on it.

2. Have each team read the reason and write their own version of the reason. Ask them to include all of the most important information but to put it in their own words. Tell them they will share this with the class.

3. Have each group share its reason. Write them in the spaces on the transparency. (NOTE: Use a wipe-off pen so you can re-use the transparency.)

II. Activity

A. Explain to the students that when they are concerned about something that affects them or their environment, one way they can express that concern is by writing a letter to a government official or agency. This will not always result in the actions requested but it lets the government know what

their concerns are. In some cases, the people in government will take notice and do something. Stress that the government is their government and this is one important way they can participate in it.

B. Tell the students they are going to write a letter to a government official or agency concerning the importance of protecting America's wetlands.

C. Display the "Parts of a Letter" transparency and explain the five parts of a letter. (NOTE: You may simplify this step by writing the information on the board.)

D. Supply the students with the addresses of local, state, or federal government officials or agencies to which they can write concerning wetlands. (NOTE: Addresses can be obtained from your local public library or by calling numbers in the blue pages of your phone book.) Ask the students to choose one person or agency to write to, or you may want to choose one address and display it on the transparency or board.

E. Distribute writing paper and do the heading and greeting of the letter as a group. Then have the students finish their letters by writing why they think wetlands are important and expressing their concerns about the destruction of wetlands. If you wish, you may display the transparency with the "10 reasons" at this time.

III. Follow-Up

A. After the students have completed their letters, collect them. If time allows, proofread and revise the letters with each student individually. Or, you may wish to have the students exchange letters with a partner for proofing and revising. You might proofread them yourself and hand them back for the students to rewrite.

B. After revisions have been made and the final copies are ready, collect the letters and share them with the class. As you share the letters, review the importance of wetlands and discuss why people need to get involved in the protection of wetlands.

C. Mail the letters and be sure to share any response with your students.

IV. Extensions

A. Refer the students to the story you read or the imaginative exercise they did at the beginning of the lesson. Ask them to imagine they and their families have been away on a long trip and they come home to find their homes are gone. Have each student write a story telling what it would be like and what he/she would do.

B. Divide the students into four groups. Assign each group the name of a wetland bird (ducks [different varieties], herons, hawks, eagles, etc.). Tell each group it is a family of wetland birds flying to its wetland habitat. Allow time for each group to prepare a role-play telling what happens when it finds its habitat has been destroyed.

C. Divide the students into cooperative learning groups. Have them research endangered species that might be further endangered by the destruction of wetlands. Have each group prepare a presentation on the species and the importance of wetlands to its survival. This can be done in the form of a commercial, a report, a play, or other method. Encourage creativity and let the groups go! Suggested species include the whooping crane, American crocodile, snail kite, Florida panther, red wolf, Pine Barrens tree frog, manatee, and pitcher plant.

D. Most of the wetlands lost in our country have been lost to agricultural development. By draining wetlands and cultivating them, farmers gain direct economic benefit from land that otherwise might have been an inconvenience or problem for them. (Imagine having to always cultivate around a prairie pothole or other wetland, or not being able to cultivate a sizeable tract of land along a river,) For many farmers, wetlands on their lands would seem to be more valuable if they were drained and used for crops. Government policies used to encourage this. Now regulations protecting wetlands are sometimes challenged by farmers as being too restrictive and too much interference with their rights as landowners. Have the students briefly debate this issue. (This may be especially appropriate in farming communities.)

RESOURCES

"America's Wetlands: Our Vital Link Between Land and Water," U.S. Environmental Protection Agency, Washington, DC, 1988.

Mendoza, George, Were You a Wild Duck Where Would You Go?, Stewart, Tabori, and Chang, New York, 1990.

"Wild About Wetlands," Nature Naturally (newsletter), Vol. 13, No. 3, Ida Cason Calloway Foundation, Pine Mountain, Georgia, 1990.

10 REASONS WETLANDS ARE IMPORTANT

(transparency)

1. Fish, wildlife, and plant habitats:

2. Critical habitats for endangered species:

3. Flood control and protection:

4. Water quality improvement:

5. Shoreline erosion control:

6. Reduction of storm damage:

7. Groundwater recharge:

8. Natural products:

9. Recreation and aesthetics:

10. Education and research:

10 REASONS WETLANDS ARE IMPORTANT

(information)

1. Fish, wildlife, and plant habitats: Wetlands are critical to the survival of a wide variety of organisms. For many, wetlands are the only places they can live. For others, wetlands provide important food, water, or cover.

2. Critical habitats for endangered species: A number of rare and endangered species depend on wetlands for their survival. The destruction of wetlands endangers these species even more.

3. Flood control and protection: Some wetlands store either flood waters or water that collects in isolated depressions. Trees and other wetland plants can help to slow the speed of flood waters. These functions help protect nearby property from flood damage.

4. Water quality improvement: Wetlands are good water filters. They can filter surface water runoff before it reaches an open body of water and help filter nutrients, waste, and sediment from flood waters.

5. Shoreline erosion control: Wetlands located between rivers and high ground can help to buffer shorelines against erosion. Wetland plants strengthen the sediment by binding soil with their roots; they also dampen wave action. Some states are recommending the planting of wetland vegetation to control shoreline erosion in coastal areas.

6. Reduction of storm damage: Wetlands serve as buffers between the winds and waves of storms and the areas beyond. Property located behind wetlands along the seashore or large lakes often fares much better during storms than those that are not located behind wetlands.

7. Groundwater recharge: Water sits in wetlands and is slowly released into the ground. The released water is filtered as it works its way down through the wetland, thereby improving the quality and quantity of the water which eventually reaches and replenishes our groundwater supplies.

8. Natural products: Wetlands produce a wealth of natural products, including timber, fish and shellfish, wildlife, blueberries, cranberries, and wild rice.

9. Recreation and aesthetics: Wetlands provide many opportunities for recreational activities, such as hunting, boating, and fishing. Many artists and photographers seek to capture the beauty of wetlands and wetland plants and animals each year.

10. Education and research: Although much more is known about the functions of wetlands today than in the past, researchers are still studying them to determine all the benefits and values they bring to people and the environment.

PARTS OF A LETTER

Date

Heading < Name

Return Address

Dear , < Greeting

Body

Sincerely, > Closing

> Signature

WHAT CAN YOU DO?

OBJECTIVES

The student will do the following:

1. Identify ways people can help protect wetlands.

2. Design a wetlands conservation poster.

SUBJECTS:
Science, Art, Language Arts

TIME:
1 hour

MATERIALS:
duck stamp
posterboard (1 sheet per group)
markers or crayons (one set per group)
Were You a Wild Duck Where Would You Go?
(by George Mendoza)
globe or world map

BACKGROUND INFORMATION

During the past 200 years, more than half of America's wetlands have been destroyed, mostly by draining and/or filling and using them for purposes such as agriculture or real estate development. As we learn more and more about the values and benefits wetlands provide to us and our environment, many people are taking steps to protect these valuable areas. However, we continue to lose between 300,000 and 500,000 acres of wetlands every year. Government legislation now helps reduce wetland destruction; several programs are currently being administered (see Terms), but it is still very important for all of us to be knowledgeable about and active in the protection of our wetlands.

Further information on wetlands protection can be obtained by calling the EPA Wetlands Hotline at 1-800-832-7828.

Terms

Federal Duck Stamp Program: Administered by the U.S. Fish and Wildlife Service, this program raises money to buy or lease wetlands for waterfowl habitats. It requires that all waterfowl hunters over 16 years of age purchase a duck stamp (sticker) to affix to their hunting licenses each year. The stamps are collectors items, and anyone can buy a stamp to help. (Check with local sporting goods stores or post offices.)

North American Waterfowl Management Plan: This plan includes a special fund established for enhancing, restoring, and acquiring important waterfowl habitats in Canada, Mexico, and the U.S.

Section 404 of the Clean Water Act: This legislation requires that proposed activities for wetlands be reviewed and approved by the Army Corps of Engineers and the Environmental Protection Agency.

ADVANCE PREPARATION

A. This lesson is based on a "whole language" approach and, therefore, begins with the reading of a suggested book.

   1. Obtain the book Were You a Wild Duck Where Would you Go? from your local public or school library.

2. If this award-winning book is not available, use the alternative method of reading a short encyclopedia article about a selected species of waterfowl (such as mallards). Check encyclopedia entries for "ducks, wild."

    a. After reading key information to the students, ask them to imagine that their class is a small flock of (your selected) birds on their long migration flight.

    b. Use a globe or world map to show the students the migratory path of your selected bird.

    c. Have the students identify when wetlands are important to the bird (such as nesting and raising young, resting during migration, and overwintering). Ask the students what things wetlands have that are important to your selected waterfowl. (land, water, plenty of food)

    d. Have the students imagine that they are each waterfowl. Ask them what they would do if more and more of the wetlands along their flight path disappeared (were drained or filled and used for agriculture or real estate development). Have several students share what they think would happen. (What really happens is that fewer birds survive, thrive, and reproduce; numbers of the birds decrease over time.)

B. Obtain a duck stamp from a sporting goods store or post office (or borrow a hunter's license with a duck stamp affixed).

C. Obtain the materials necessary for the group production of duck stamp prints.

D. If you choose to use the student sheet "Duck Stamp," photocopy it for your students.

PROCEDURE

I. Setting the Stage

A. (NOTE: If you have taught the lesson "To Whom It May Concern," skip this step.) Read the book Were You a Wild Duck Where Would You Go? by George Mendoza. Discuss the book, making sure that students understand the main character, Mallard, is a wetland bird and his home has been destroyed. (NOTE: If the book is unavailable, and you use the alternative detailed above, your students will miss the lovely free verse of the book but will learn about a selected species of waterfowl. The lesson can proceed successfully.)

B. Tell the students that many of our wetlands are being destroyed because pollution is being dumped into the waters that drain into them, they are being drained for agricultural use, or they are being drained and/or filled for housing development, shopping centers, office buildings, or factories, or other real estate development.

C. Briefly discuss the reasons for protecting wetlands. (NOTE: You may use the teacher sheet "10 Reasons Wetlands Are Important" from the previous lesson ["To Whom It May Concern"] to facilitate this discussion.)

D. Explain to the students that today they are going to learn about some things that other people are doing to protect our valuable wetlands, and they will discover things they can do to help.

II. Activity

A. Show the students a Federal Duck Stamp or show a copy of the brochure about the stamp. Discuss the stamp and the program. Tell the students that many people (even those who may not hunt) collect duck stamps because each year's design is a pretty picture by a famous wildlife artist. A duck stamp now costs about $15 (98 cents of every dollar goes to buying or leasing wetlands).

B. Share briefly the definitions (see "Terms") of Section 404 of the Clean Water Act and the North American Waterfowl Management Plan. Tell the students that these programs are some of the things their government is doing in an attempt to protect wetlands.

C. Discuss with the students the importance of getting individuals involved in the protection of wetlands. Divide the students into cooperative learning groups. Challenge the groups to brainstorm things they could do to get involved in protecting wetlands. Allow five minutes for the groups to work on this problem.

D. Call time, then have the groups share their ideas with the class. (NOTE: To save time, as one group shares its ideas, have the other groups cross off any they might have on their list.)

III. Follow-Up

A. Tell the students they are going to design and create a "Wetlands Conservation Poster." Briefly, review the importance of wetlands and why they should be protected. Break into small groups again and ask each group to decide upon one idea for getting involved that they think is best.

B. Distribute posterboard and markers to the groups. Before they begin, give them about five minutes to plan their poster. Stress that they should keep in mind the reasons wetlands are important to people and the environment, and remind them their posters should show things individual people can do to help protect wetlands. Afterwards, when they have a good idea of what they are going to do, have them work as a group to create their poster.

C. When the posters are complete, allow each group to present its poster to the class. When all posters have been presented, display them around the room for everyone to enjoy.

IV. Extensions

A. Give each student a copy of the student sheet "Duck Stamp" and have them create a design for the Federal Duck Stamp Program. (NOTE: You may save photocopies by having each student use a sheet of plain white paper.) Tell the students that each year there is a very involved contest to choose the painting for the Federal Duck Stamp. You might have a class contest.

B. Find out if there is a local organization active in wetlands protection. (Check to see if there is a local affiliate of Ducks Unlimited.) If there is, ask a member to speak to your class about what is being done to conserve wetlands in your area. An alternative is to invite a local agent of your state's wildlife agency. After the visit, have the students write a thank you letter to the visitor.

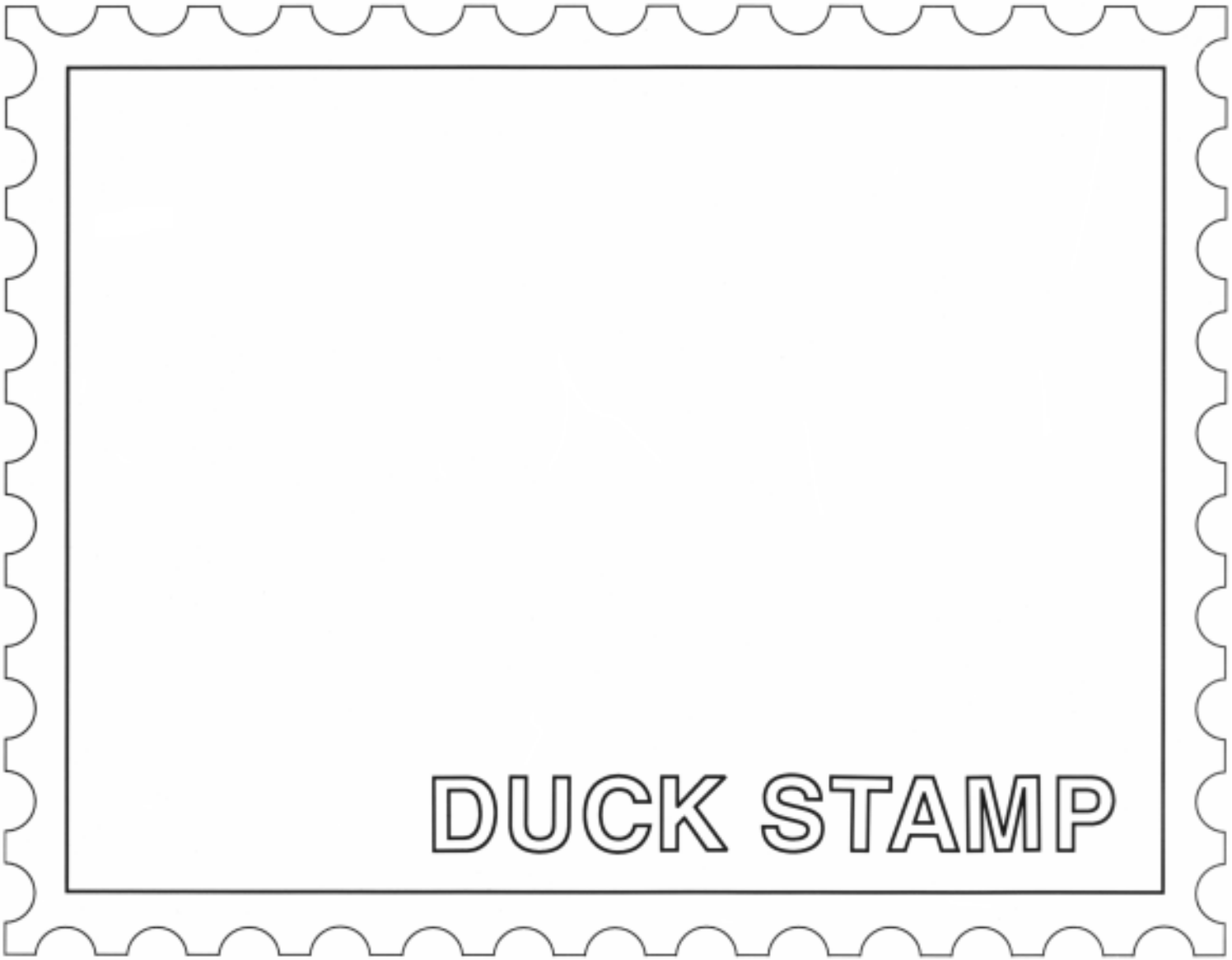
C. Have the groups research their community to locate wetlands near them. If possible, arrange a field trip to visit a wetland area. Afterwards, have groups design t-shirts or bumper stickers to promote conservation of wetlands in their community.

RESOURCES

America's Wetlands: Our Vital Link Between Land and Water, U.S. Environmental Protection Agency, Washington, DC, 1988.

Mendoza, George, Were You a Wild Duck Where Would You Go?, Stewart, Tabori, and Chang, New York, 1990.

"Wild About Wetlands," Nature Naturally (newsletter), Vol. 13, No. 3, Ida Cason Callaway Foundation, Pine Mountain, Georgia, 1990.


DUCK STAMP

WHERE DID IT WEAR?

OBJECTIVES

The student will do the following:

1. State two causes of beach erosion.

2. Demonstrate two ways used to prevent or reduce erosion.

SUBJECTS:
Science, Language Arts, Social Studies

TIME:
60-90 minutes

MATERIALS:
sand
trays for each student or team
safety goggles
water
measuring cups or cylinders
gravel
art paper
pencil
rye grass seed (small handful)
atlases
teacher sheets (included)
acetate sheet
overhead projector
graduated cylinder or measuring cup for each student
student sheet (included)

BACKGROUND INFORMATION

Beach shifting is natural. Over a period of time, coastlines change because of erosion and shifting. Sand washed away from one stretch of coast is deposited further up (or down) the coast. Beach erosion is the loss of beach soil (e.g., sand), due mostly to water (wave action) and wind. This is a problem chiefly because of human uses of beaches and adjacent lands. For example, beaches may erode out from under beachfront homes and wide, sandy beaches enjoyed by tourists are important to coastal communities' economies.

A tremendous effort is now under way to halt the severe erosion of our coasts. We can take action to modify where beaches are eroded or built up; this includes building barrier structures to lessen the force of waves or other structures to anchor the beach or to catch shifting sand. We can control development so that people do not build things where erosion will damage them later on. And we can stop human actions that speed up erosion, like the taking of naturally growing seagrasses (that help anchor sand dunes) or the unwise use of all-terrain vehicles on fragile beaches.

Terms

beach: a nearly level stretch of land near a sea, lake, or ocean; often washed by high water.

coastline: the line that forms the boundary between the land and the water, especially of an ocean or sea.

erosion: the removal and transport of earth materials usually by wind or water.

ADVANCE PREPARATION

A. Make a transparency of the teacher sheet, "A Changing Coastline," showing change in a coastline.
B. Sow rye grass seeds in a tray of sand to demonstrate how grasses help slow erosion. (Rye grass is a common lawn grass. Check at a garden shop, lawn service, or farmers cooperative.) The seeds

should germinate in four to seven days.

C. Make copies of the student sheet, "'Wear It Out' Wordfind."

D. Trays of any size can be used as long as they have sides. Perhaps trays from the cafeteria could be used for the lesson. Play sand and gravel can be purchased at variety and pet supply shops.

E. Safety goggles are needed to protect the students from getting sand in their eyes.

PROCEDURE

I. Setting the stage

A. Show the students the transparency.

1. Point out the change in the coastline over time.

2. Define "erosion" for the class.

3. Explain that erosion has played a major role in changing our coasts.

B. Ask the students to predict some effects of coastline erosion. What do they think the future might hold if we do not do what we can to control it?

II. Activity

A. Pass out white art paper. Have the students fold the sheet in half. On one half, they will draw a beach scene. On the other half, they will draw what they think the coastline would look like if erosion continued for a long time.

B. Distribute trays to students or teams of students. Have the students measure one cup (250 mL) of sand. They are to pour the sand onto each tray and shape it into a mound. (CAUTION: Have the students wear safety goggles to protect their eyes.) Instruct the students to blow on the sand. Ask them to tell you what happened. Point out that this is a demonstration of wind erosion.

C. Repeat activity B, only have the students measure 1/4 cup (63 mL) of water and pour the water in a of water over the sand instead of blowing on it. Explain that coastal erosion acts much in the same way. (NOTE: If you do not have enough cups or cylinders for each student, let them use any small container that holds water.)

D. Using a tray, mound sand at one end of tray. Build the sand up to represent a beach area. Put water in the tray. Rock the tray back and forth to create a wave action. Point out that wave action at the beach also causes erosion.

E. Ask the students to remound the sand.

1. Pass out the gravel to the students.

2. Instruct them to cover the sand thoroughly with gravel.

3. Have the students blow on the sand. Tell the students that gravel, rocks, and boulders can be used to hold sand in place (to slow erosion).

4. Ask the students to compare what happened to the sand with and without gravel.

F. Show the students the tray of seeded grass.

1. Point out that roots of grass help hold the soil in place.

2. Stress that grass planted in masses helps cut down on wind erosion.

3. Have the students take turns blowing on sand or pouring water on sand, continually pointing out how the sand does not move as much.

G. Tell the students that we can also build structures that protect beaches from erosion. Sometimes fence-like structures on the beach are effective. Sometimes we can build big barriers out in the water to take some of the force of the waves. We can even build wall-like structures from the beach out into the water to catch sand as it is being washed away from a stretch of coastline.

III. Follow-Up

A. Have the students write two causes of beach erosion and two ways it can be prevented.

B. Divide the students into teams. Give each team an atlas. Have students write down the names of states that have a coastline. (Or, write the countries which have a coastline.) Tell them not to forget to include Alaska and Hawaii.

C. Have the students complete the wordfind on the student sheet, "'Wear It Out' Wordfind." Ask the students to use each word in a sentence.

IV. Extension

If your school has an embankment, remove a small area of grass from it. Pour water daily over the embankment. Have the students observe and record the changes in the area of the embankment. Then reclaim the area by planting new grass and covering it with mulch. Be sure to get permission from the school administrator.

RESOURCES

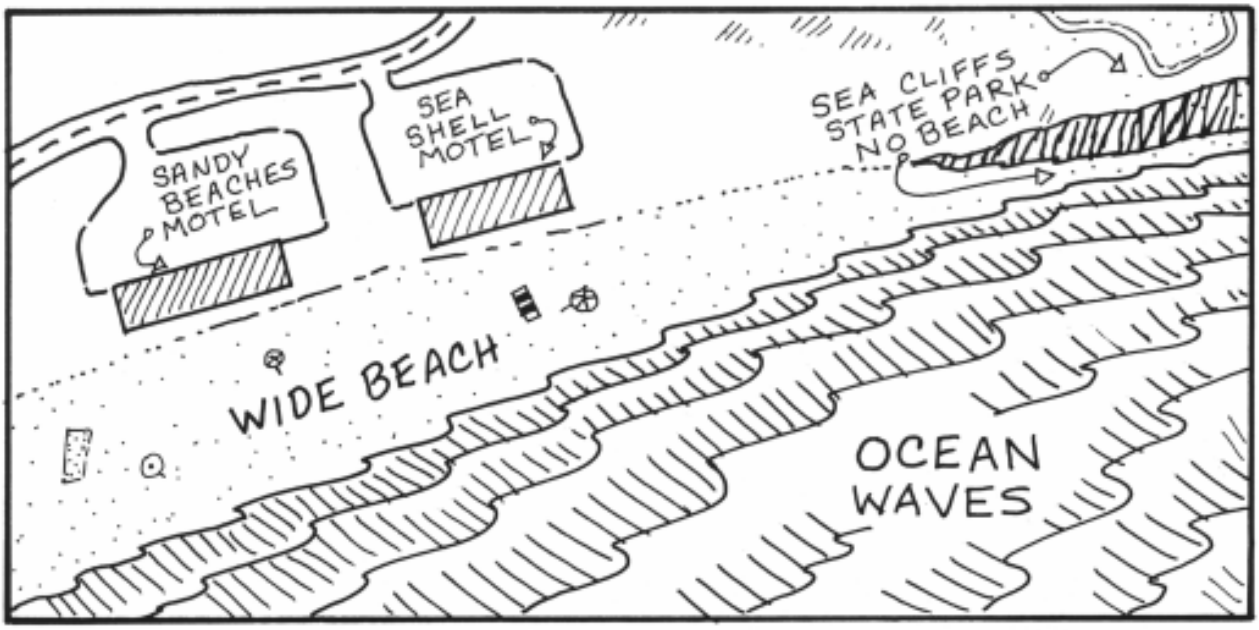
King, D. C., et al., Environments, American Book Company, New York, 1979.

Namowitz, S. N., et al., Earth Science, D.C. Heath and Co., Lexington, Massachusetts, 1989.

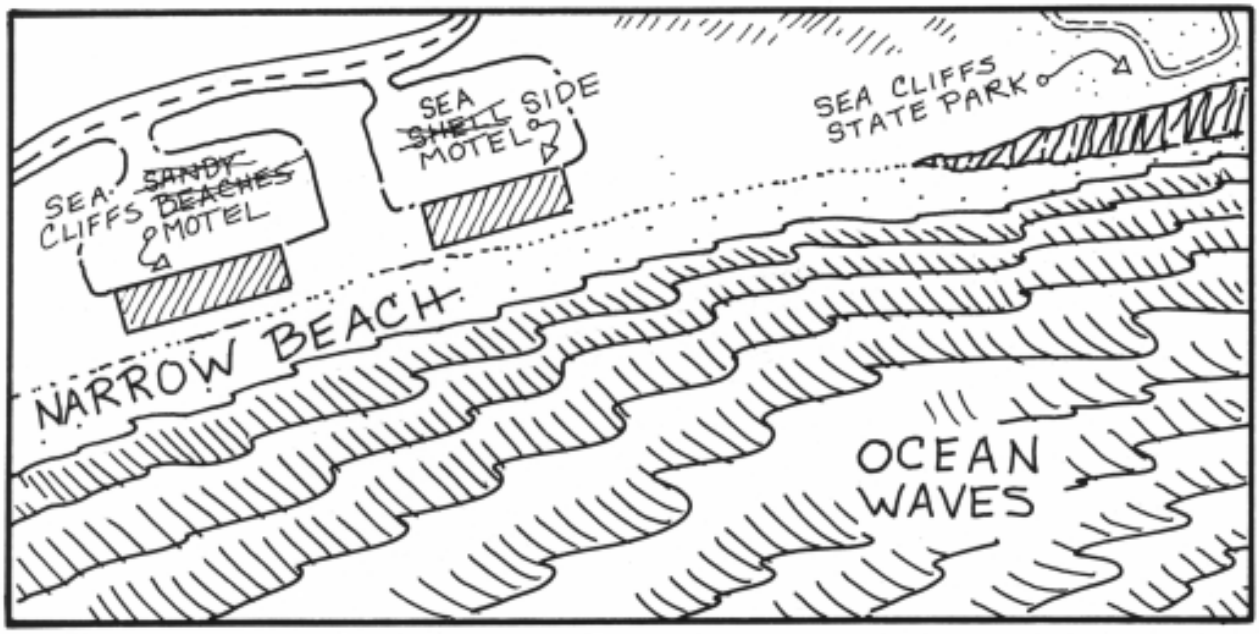
Teacher Sheet

Student Sheet

A CHANGING COASTLINE



A FEW YEARS LATER....



"WEAR IT OUT" WORDFIND

Find these words in the wordfind puzzle below. (Optional: Look for other words not in the list.)

atlas
beach
coast
coastline
embankment
grass
gravel
plants
prevent
rainfall
sand
water
waves
wind

A T L A S B C D A S B E A C H M O O N C
A R A I N F A L L R A I J O W A S P T O
L O O K H A R D F O R S E A L M N S A A
S A L T P R E V E N T L E S G R O G D S
T L W L I N C O L N A B E T R O O K E T
N A A D A L L A S O N O O L N R S T E L
A B V E G R A V E L O R J I A B S C D S
L O E M I C K E Y L O E D N A B S C E A
P O S T L W I N D J R T E E O R A M E N
L K A B E C C A K E M A O P R E R V A D
E M B A N K M E N T S W G O O D G L E N

Teacher Sheet

"WEAR IT OUT" WORDFIND
ANSWER KEY

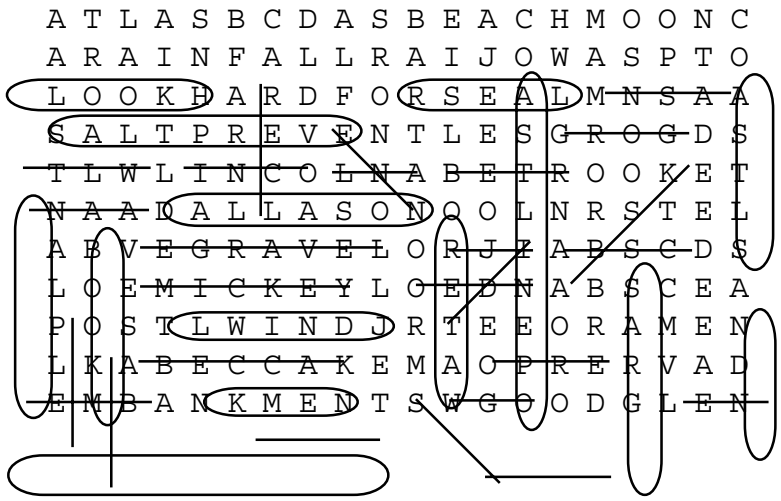
Find these words in the wordfind puzzle below. (Optional: Look for other words not in the list.)

atlas
beach

(These words are circled.)

coast
coastline
embankment
grass
gravel

plants
prevent
rainfall
sand
water
waves
wind



Other words not in list: (These words have lines through them.)

Band
Base
Bet
Book
Bred
Cake
Care
Dallas
Deed
For
Good
Hard
Lincoln
Look
Loon
Lot
Men
Mickey
Moon
Rag
Rook
Rot
Salt
Seal
Soon
Tee

YOU MUST HAVE BEEN A BEAUTIFUL "BAY-BEE"

OBJECTIVES

The student will do the following:

1. Identify bays on a world map.

2. Distinguish between point and nonpoint source pollution.

SUBJECTS:
Science, Geography, Art, Language Arts

TIME:
30-60 minutes

MATERIALS:
wall map of world
pins with colored heads
pictures of different bays
sand
water
tray
powdered drink mix or instant coffee
watering can
old magazines
scissors

BACKGROUND INFORMATION

A bay is a large body of water around which the land forms a curve. Bays are similar to gulfs, but are smaller. The Chesapeake Bay is an example.

Bays are much more than just points of entry for water travel and areas of recreation. They are homes to many unique and important plants and animals. Some of our bays, however, have become polluted and unsafe for human and other animal use.

Much of the pollution comes from boats and ships, liquid and solid waste dumping, dredging, and runoff from cities, suburbs, and farms. As a result, not only has the water become unsafe, but many marine animals have become threatened because their habitats have been greatly changed.

Terms

bay: a large body of water around which the land forms a curve, usually smaller than a gulf, but of the same general character.

effluent: a liquid discharged as waste.

gulf: a large body of water of the same general character as a bay, only larger.

nonpoint source pollution: pollution which comes from many widespread sources, such as runoff from cities, suburbs, and farms.

point source pollution: pollution which comes from a specific source, such as effluent from waste water treatment plants.

ADVANCE PREPARATION

Collect old magazines (e.g., travel, outdoor sports, or nature magazines or National Geographic) from which to cut out the pictures of bays. Make sure that the pictures include over-developed bays as well as unspoiled bays. (NOTE: You may find all the pictures you need in geography texts. If you do, make black and white or color photocopies from the books.)

PROCEDURE

I. Setting the stage

A. On a wall map of the world locate major bays and place pins with colored heads at their locations. Use a different color for each bay. Call on the students to find the specific color pin as you call them out. When the pin is located, ask the students to name the bay. (NOTE: You might modify this to be a small group activity.)

B. Define the term "bay." Point out to the students the difference between a bay and a gulf. Have the students locate gulfs on the map and compare gulfs and bays. Ask them which gulfs and bays they have heard of.

C. Show the class pictures of bays. Ask them to identify items in the pictures which make up a "bay" environment. Ask the students to suggest animals which we might find in a bay. Point out that many cities have developed around bays and that this has added to the pollution woes of our bays.

II. Activity

A. Tell the students that some of the water pollution affecting our bays is nonpoint source pollution. The following steps will help demonstrate nonpoint source pollution.

1. Fill one side of a tray with sand which has been mixed with powdered drink mix or instant coffee. Pack tightly. Make sure you use enough drink mix or instant coffee.

2. At other end of the tray, pour water to create a pool of water. (If sand continues to absorb too much of the water, separate the sand from the water by inserting a ruler or other object to use as a "wall" to hold back the sand.)

3. Using a watering can, gently pour water over the sand. Ask the students to observe the pool of water. (The water will begin to change color.)

4. Point out to the students that simulated pollution (drink mix or coffee) was in the sand. The pollution was not put directly into the water; it came from the land and wound up in the water. This is an example of nonpoint source pollution.

B. The following activity demonstrates point source pollution.

1. Use more of the same materials from activity A above, except do not mix the drink mix with the sand. Pour the powder directly into water.

2. Ask the students to tell you what happened to the water. Explain to the students that when pollution is placed directly into water, it is called point source pollution.

III. Follow-Up

A. Have the students pretend to be “Pollution Detectives” working to solve a mystery. The mystery is how pollution from a farm (20 miles inland) can end up in a bay (20 miles away). They can use the library or ask their parents to help solve the mystery. Other adults or students can also help.

B. Ask the students to draw a picture of a bay that shows point source pollution. (You may need to suggest several ideas to the class, such as effluent from factories, dumping of garbage in water, etc.)

C. Using old travel, outdoor sports, and nature magazines, have the students search through them for pictures of bays and animals we find in bays. Make a bulletin board collage of the pictures. (NOTE: This may also be an excellent group activity.)

D. Ask the students to list the things we throw away in our bays that we could recycle to help reduce solid waste pollution in our bays.

IV. Extensions

A. As a class project, construct a bay environment model featuring appropriately scaled model houses, trees, buildings, and so on. (Cardboard is plentiful and cheap.)

B. Have the students write stories to go with the bay collages they made. These might be about real or imaginery trips to bays or simply descriptive pieces.

RESOURCE

Slattery, B. E., WOW! The Wonders of Wetlands, Environmental Concern, Inc., St. Michaels, Maryland, 1991.

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THE INSIDE ON RED TIDE

OBJECTIVES

The student will do the following:

1. Identify the cause of red tide.

2. Construct a bulletin board showing how red tide poison passes from animal to animal.

SUBJECT:
Science

TIME:
60-90 minutes

MATERIALS:
2 clear glass jars or 2 liter bottles with the tops cut off
red food coloring
coffee
algae (directions for growing algae can be found in extension activity)
fishbowl or aquarium
water
sponge animals
trays with sides
reference books on marine life
student sheet (included)

BACKGROUND INFORMATION

Algae can be found in most waters in the world. Certain microscopic algae in our coastal waters, known as dinoflagellates, are red-pigmented; when these algae flourish, the water turns reddish. This is commonly referred to as a "red tide." These algae produce a toxin. When there is an abundance of the algae, great amounts of this toxin are produced.

At times, this toxin can become concentrated in marine animals such as clams and mussels. Clams and mussels are filter feeders. As they filter the water to obtain their food, the toxin is taken in by these animals. Sometimes red tide toxin kills shellfish (and other fish); sometimes it does not. If toxin-loaded clams and mussels are eaten, the toxin can fatally poison the consumer. Also, ocean spray containing the toxin can cause respiratory problems in humans.

Algae that can produce red tides multiply rapidly in water which has been enriched by nutrients from treated sewage or by runoff from fertilized soil. The algae can become so thick that it can actually damage or destroy the marine environment. The multitude of tiny algae may even block the sunlight needed by many coastal plants and animals.

Terms

algae: a major group of single-celled or multicellular plants, chiefly aquatic, having no roots or stems.

red tide: a term which applies to water tinted red due to a heavy growth of red-pigmented algae called dinoflagellates.

toxin: a poisonous substance that is secreted by certain organisms.

ADVANCE PREPARATION

A. Make copies of the student sheet.

B. Begin growing algae four or five days before doing the lesson (see extension).

C. Animal-shaped sponges can be purchased at most toy stores.

D. A disposable pie or cake pan can be used as the tray.

E. Make sure red food coloring does not stain. (You might use very thin red tempera paint.)

F. Add water and red food coloring to a jar. Mix in a little coffee for a brownish tint.

G. Collect a supply of reference books like field guides or topical books (like those for coastal animals and plants).

PROCEDURE

I. Setting the stage

A. Hold up the jar with clear water and show the jar to the class. Next, hold up the jar that has been colored brownish red with red food coloring and coffee. Ask the students which water would probably be safer for marine animals to live in. Explain to the students that there is a certain type of microscopic algae that produces a reddish pigment and that this algae colors the water just as the dye colored the water in the jar. This algae also produces a toxin which is released in the water, making the water toxic or poisonous. This algae is found in our oceans.

B. (NOTE: You may show the students the algae you have grown in an aquarium or fishbowl.) Stress to the students that algae are lower plants. Algae are found in most waters. Many kinds of algae have large forms, such as kelp or seaweed. Some form "pond scum." Some algae, like those responsible for red tides, are microscopic; they become noticeable only when there are so many of them that there are literally hundreds of thousands (even up to two million) of them per liter of water. Emphasize that not <u>all</u> algae produce toxins, only certain types.

II. Activity

A. Pass out trays to each student or team of students. Fill each tray with water. Give each student a foam or sponge animal. Instruct the students to put his/her sponge animal in the water. Point out to the students that the animal has absorbed some of the water. (NOTE: If you have studied tidal pools, let each group make a model of a tidal pool.)

B. Repeat the activity above, but color the water with the red food coloring. (NOTE: Make sure the amount of food coloring is sufficient to remain noticeable when the sponges are squeezed.) Tell the students to put the sponge animals in the water again.

1. Have the students remove the animals and gently squeeze out the water. Ask them what color the water is that came from the sponge animals.

2. Review the term "toxin." Explain to the students that animals in the ocean can absorb the poison from the "red tide" similar to the way the sponge animals absorbed the dye.

C. Pass out the student sheet. Have the students use marine life reference books and encyclopedias to identify the plants and animals. They should write the names of the plants or animals in the boxes on the sheet. (The answers vertically down the left, then the right column are as follows: Blue Crab, Salt Marsh Cord Grass, Atlantic Ribbed Mussel, Northern Puffin, Horseshoe Crab, Lined Seahorse,

Sting Ray, Brown Pelican, Fiddler Crab, Sea Lavender, Shrimp, and Eel Grass.) Which of them could be affected (i.e., are shellfish and are likely to be of special concern) when a red tide occurs? (mussels, crabs, and shrimp) Emphasize that when other animals eat animals that have accumulated the poison, they consume the poison.

III. Follow-Up

A. Have the class make a list of ocean animals that might be poisoned by "red tide."

B. As a class project, construct a bulletin board showing how poison can travel from animal to animal in the ocean, ultimately ending with humans.

C. Have the students draw an ocean food chain and ask each student to share with the class their individual food chain. Relate this to the previous item showing how the toxin can be passed from one organism to another.

IV. Extension

Grow your own algae! In a glass fishbowl or an aquarium, simply add tap water which has been dechlorinated, or better yet, water from a local pond. Keep it in a sunny location. Have the students monitor it each day to observe the algae growing. Add about a teaspoon of detergent with phosphate to the water to encourage faster algae growth.

RESOURCES

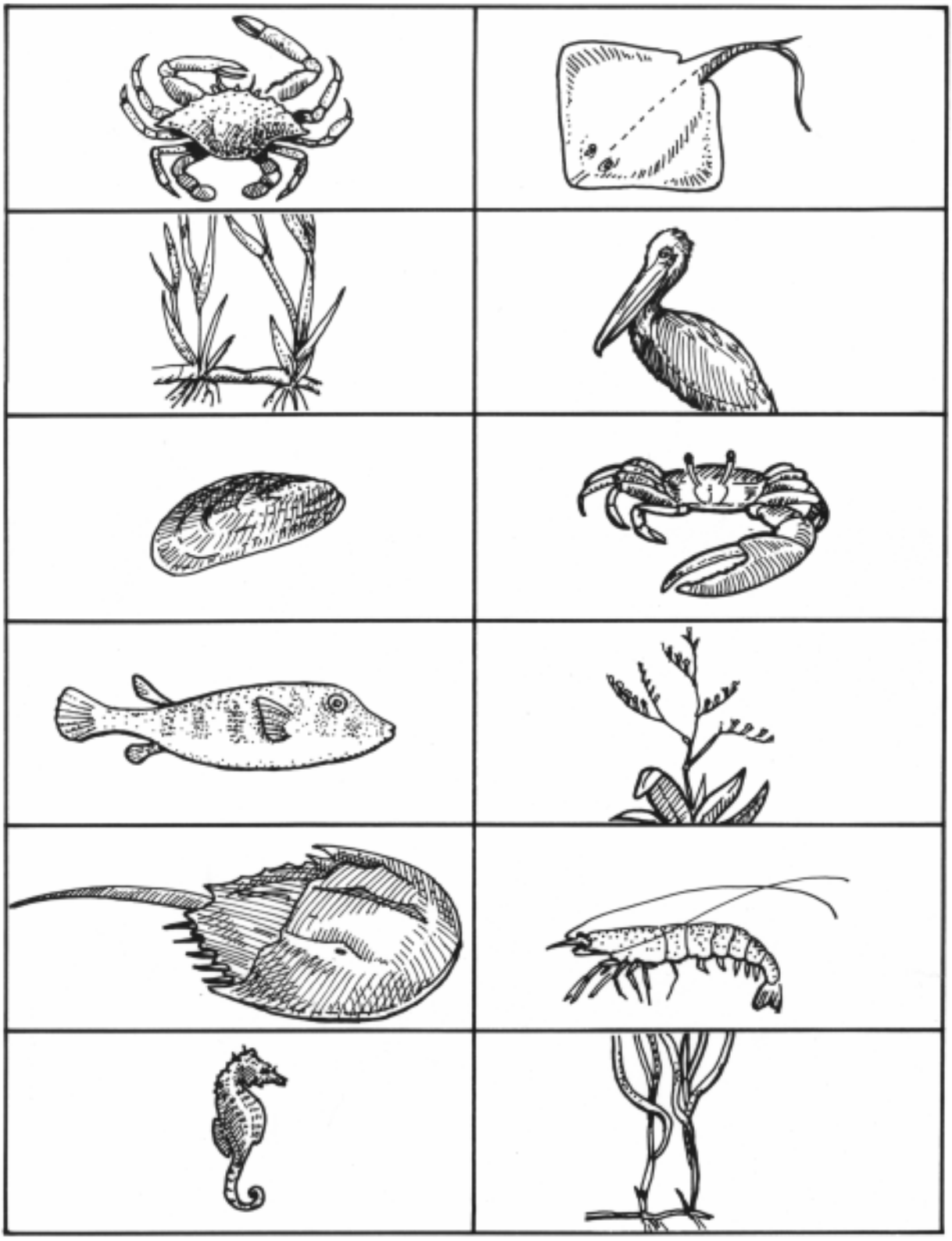
Goodman, H. D., et al., Biology Today, Holt-Rinehart-Winston, New York, 1990.

Oram, R. F., Biology-Living Systems, Merrill Publishing, Columbus, Ohio, 1989.

"Water Education Lesson Plans (K-12)," Water and Man, Inc., Salt Lake City, Utah, 1987. (Address: 220 South Second East, Salt Lake City, Utah 84111.)

MARINE LIFE

Look these coastal creatures up to find out what their names are. Write their names in the boxes with their pictures.



TREES BY THE SEA

OBJECTIVES

The student will do the following:

1. Compare a natural, undeveloped coastline to a seawalled coast.

2. Compute and graph shoreline lengths.

3. Identify ways that mangrove forests are important.

SUBJECTS:
Science, Math, Social Studies

TIME:
60 minutes

MATERIALS:
acetate sheet
overhead projector
measuring stick
string
scissors
student sheets (included)
teacher sheet (included)

BACKGROUND INFORMATION

Mangrove forests are coastal wetlands dominated by varieties of mangrove trees. These mangrove forests are very valuable ecologically. They also protect the coast from erosion and provide storm protection for inland communities. Coastal states are now also recognizing the economic value of these wetlands, saving them from real estate development and oil exploration. In the past it was common to clear the forests, straighten the coastline, and build seawalls along the beach to develop beachfront real estate.

In the past, mangrove forests were viewed as smelly waste places that bred mosquitoes and had no value. Biological research has shown them to be critically valuable breeding grounds for fish and shellfish and vital to almost every form of wildlife in the coastal ecosystem.

The formation of mangrove forests required thousands of years. People can clear a mangrove forest, fill in low-lying areas, and begin building housing developments and streets within a matter of weeks. The coastline will never be the same, and although the people enjoy living on beachfront property, they now face the hazards of coastal life, such as hurricanes and other storms.

Terms

estuary: the lower course of a river where its current is met and influenced by the ocean tides, producing water of varying salinity.

mangrove forest: a tropical or subtropical marine swamp distinguished by the abundance of low to tall trees, especially mangrove trees.

salinity: salt, or the amount of salt, in a liquid.

seawall: a wall built to protect beachfront areas from erosion and high water in storms.

ADVANCE PREPARATION

A. Photocopy the student sheets, “Mangroves to Seawalls” (one per pair of students) and “Shoreline Graph” (one per student).

B. Cut one piece of string approximately 18 inches (45 cm) long for each pair of students.

C. Make a transparency from the teacher sheet "Mangrove Forest."

PROCEDURE

I. Setting the stage

A. Discuss the background information with the students, emphasizing the ecological importance of natural wetlands, such as mangrove forests. Use other examples of local wetlands to make the topic more relevant. Examples may include local bogs, floodplains of creeks or streams, marshy areas around ponds, and spring-fed marshes.

B. Use the transparency "Mangrove Forest" to show students some of the common resident species found in this habitat. Point out that the open ocean lies to the left and the forest land lies to the right on the figure.

II. Activity

Have the students compare a natural coastline with mangrove forest to a developed coastline with a seawall.

A. Divide the students into pairs. Give each pair an 18-inch (45 cm) piece of string, one copy of the “Mangroves to Seawalls” student sheet, and two of the “Shoreline Graph” student sheets. Each student will complete his/her own graph.

B. Have the students look at the diagrams on the “Mangroves to Seawalls” student sheet.

1. Explain to them that these are like maps of a coastline. In 1960 (the first diagram), the coastline was natural. There was a dense, swampy mangrove forest all along the beach. Then people decided they wanted to build houses and businesses at the beach. Because people do not like to live in mangrove forests, they cleared them, straightened out the coastline, and built a seawall to protect their houses from the ocean. By 1980, the original coastline was replaced by a housing development. The forest was pushed back and a seawall kept the ocean away from the houses.

2. Ask the students to think about the differences in the undeveloped coastline and the later, seawalled coast. For example, what about the plants and animals that live at the coast? Can they live where people have built their houses? What happens when a storm (e.g., a hurricane) comes? Ask them to describe what they see in the 1990 diagram (storm damage). Point out that mangrove forests along a coast would be damaged by storms, but that the forests protect houses built away from the beach from storms and erosion. Talk with the students about the advantages and disadvantages of living along a coast. (For example, beach houses are fun to live in, but storms are dangerous and costly.)

C. Have the students work together to place the string on the “mangrove line” for 1960. After the string

has been placed over the entire line, they are to hold it at the point that marks the length of the coastline. They will then measure the length of the string with the "mile ruler" at the bottom of the "Shoreline Graph" page. (Explain that one inch [2.5 cm] of string represents one-half mile [.08 km] of coastline.)

D. Have each student record the length of the 1960 shoreline and make a bar for this number on the Shoreline Graph.

E. Have the students repeat the measuring and graphing procedure for 1970 and 1980.

III. Follow-Up

A. Have the students answer the following questions. (NOTE: These may be used before and after the activity as a pre- and post-test.) Read the questions and have the students answer "true" or "false."

1. Mangroves are coastal trees that live in coastline areas. (true)

2. Mangroves cause erosion of our shorelines. (false)

3. When a shoreline is seawalled the length of the shoreline is increased. (false)

4. Mangroves are important to the economy of an area. (true)

5. More plants and animals live in a mangrove forest than along a seawalled coast. (true)

B. After measuring shorelines and recording the data, have the students answer and discuss the following:

1. How much was the shoreline shortened from 1960 to 1980?

2. If a storm occurred, how would the presence of a mangrove forest help people? What might happen to beachfront homes behind a seawall in a storm?

IV. Extensions

A. Have the students report on some specific ways that mangrove forests are productive biologically and economically. Can they list fish and shellfish that people eat that rely on breeding grounds along mangrove coastlines?

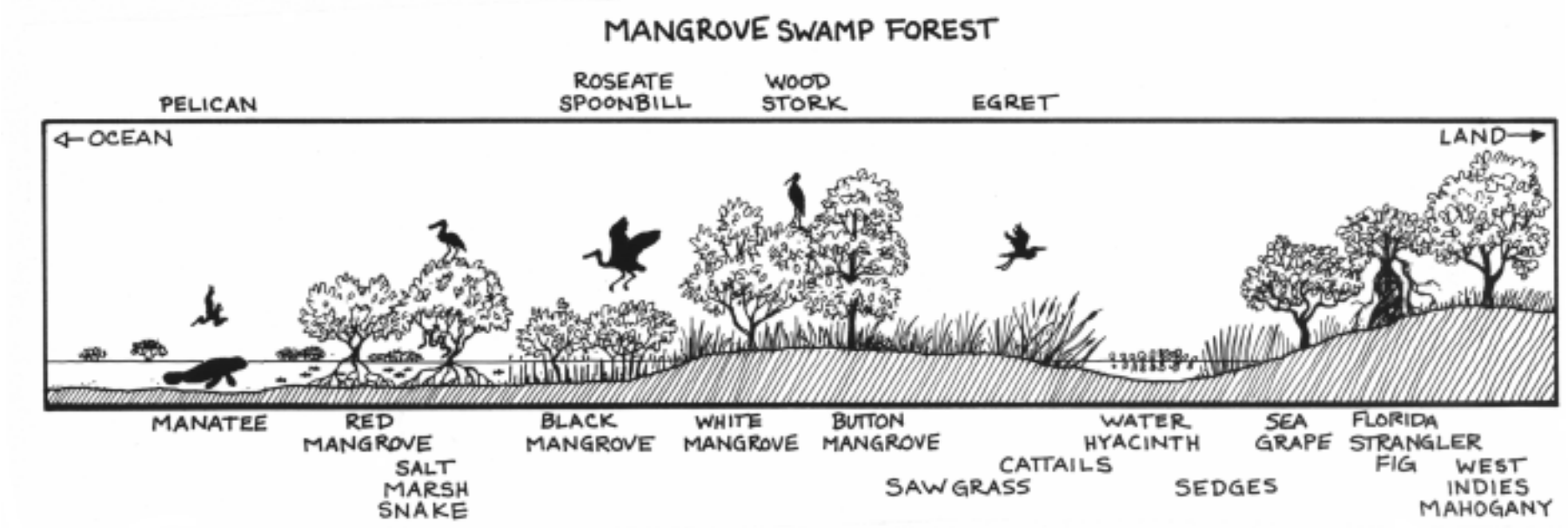
B. Have the students research how states are trying to convert some of their developed coastal areas back to their natural state.

C. Let the students study detailed physical maps of coastal states to determine where mangrove forests may be found.

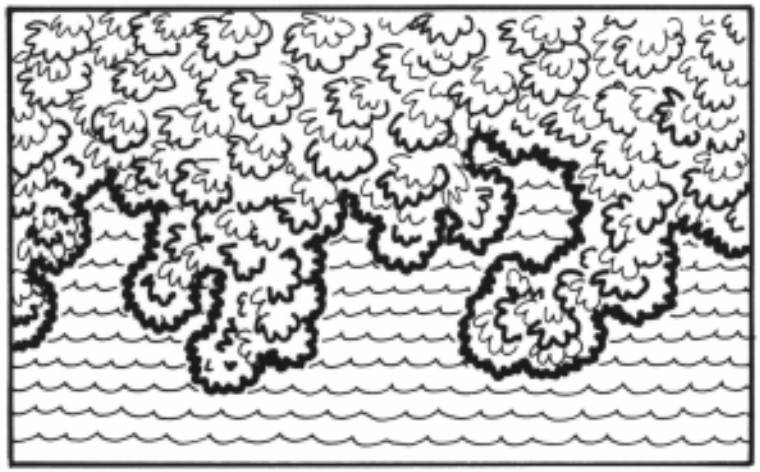
RESOURCES

Frank, James, Mangroves & Seawalls, Lee County Board of Public Instruction, Fort Meyers, Florida, 1983,

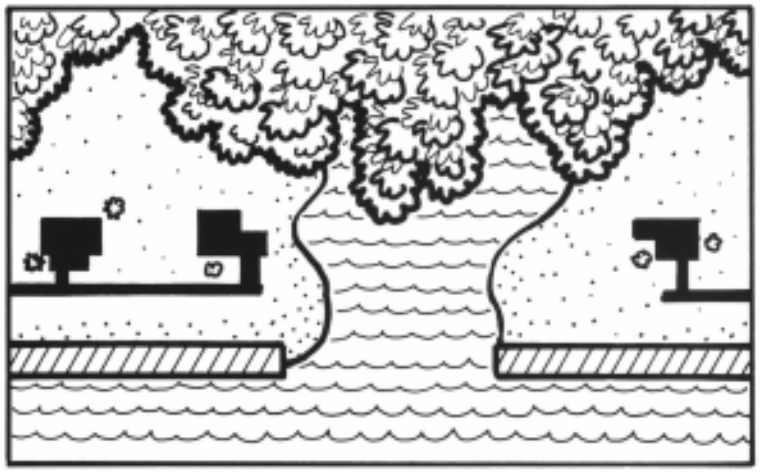
"Saltwater Wetlands," Ranger Rick's NatureScope: Wading Into Wetlands, National Wildlife Federation, Washington, DC, 1986, pp. 18-32.


MANGROVE SWAMP FOREST
PELICAN
ROSEATE SPOONBILL
WOOD STORK
EGRET
OCEAN
LAND
MANATEE
RED MANGROVE
SALT MARSH SNAKE
BLACK MANGROVE
WHITE MANGROVE
BUTTON MANGROVE
SAW GRASS
CATTAILS
WATER HYACINTH
SEDGES
SEA GRAPE
FLORIDA STRANGLER FIG
WEST INDIES MAHOGANY

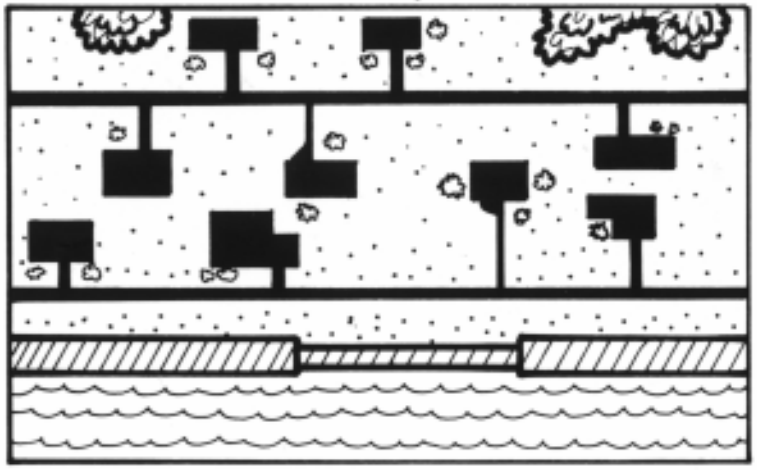
1960



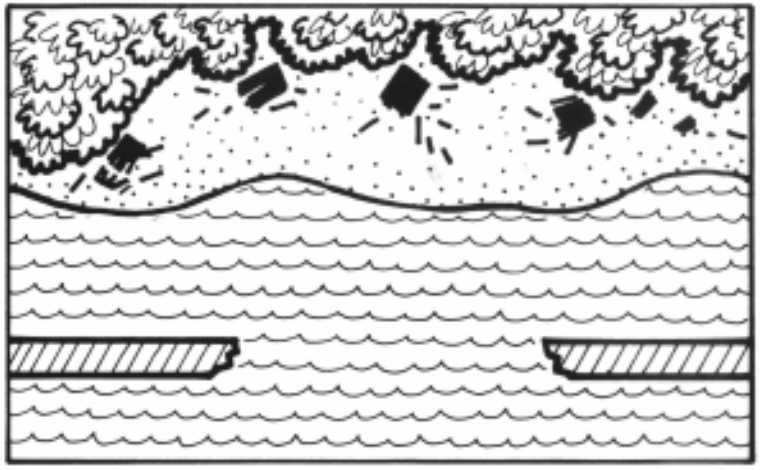
1970



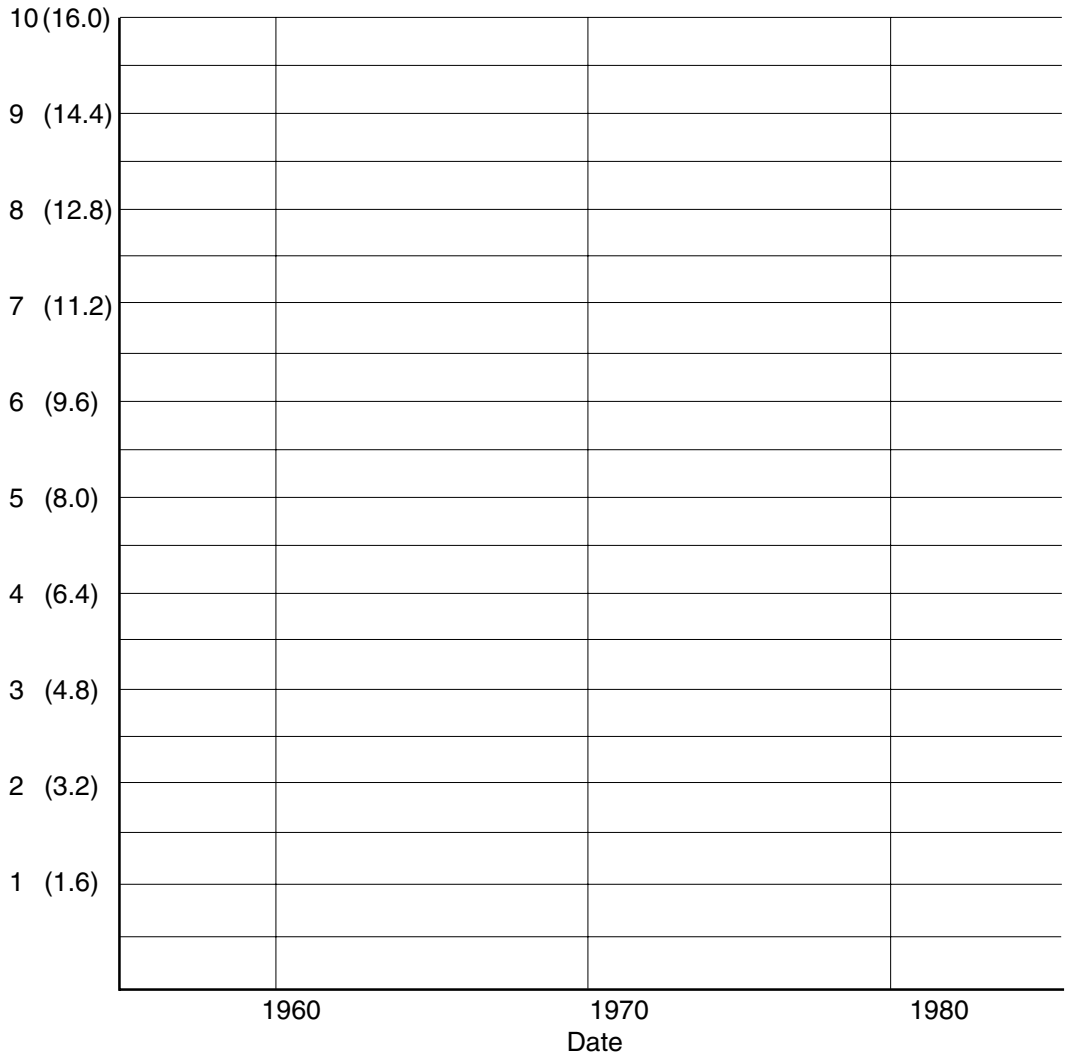
1980



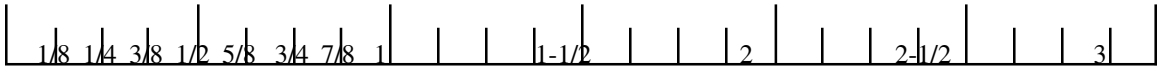
1990



SHORELINE GRAPH



MILE RULER
1" (2.5 cm) = 0.5 mile (0.8 km)



ESTUARY WATER

OBJECTIVES

The student will do the following:

1. Observe the effects of varying concentrations of salt on the aquatic plant Elodea.

2. Define estuary and describe why estuaries are important.

3. Draw conclusions about Elodea and its ability to tolerate different concentrations of salt.

SUBJECT:
Science

TIME:
1 hour + observation time

MATERIALS:
four 2-liter bottles
three 1-liter bottles
test tubes or small baby food jars
test tube rack or plastic cups to hold test tubes
pond water
salt (NaCl)
gram scales or balance
Elodea
1-liter measuring cup or bowl
masking tape
student sheet (included)

BACKGROUND INFORMATION

Estuaries are defined as partially enclosed bodies of marine water fed by freshwater sources, such as where a river flows into a bay. Their water is mixed with sea water. Salinity can vary with distance from the inflow of fresh water and other factors. Estuaries form a fragile boundary between marine and freshwater habitats. They are very valuable as breeding grounds for thousands of species of aquatic animals and plants, as recreational areas, as shipping lanes, and as commercial fisheries.

Estuary water will range from low salt concentrations where rivers empty into bays to high concentrations near the bay's opening to the sea. The aquatic plants present in different areas of estuaries also vary with these changing concentrations of salt. Elodea ("eh-loh-DEE-uh") is a common freshwater plant which can be found in estuaries where freshwater is abundant. It is often used in biological studies.

Terms

estuary (EHS-choo-ehr-ee)**:** an arm of the sea that extends inland to meet the mouth of a river.

ppt: parts per thousand; e.g., salt water having 10 parts salt per 1000 parts water has a concentration of 10 ppt.

salinity: salt, or the amount of salt, in a liquid.

ADVANCE PREPARATION

A. Obtain water from a pond, lake, or stream. Fill four 2-L bottles about three-fourths full so that you will have plenty.

B. Prepare a set of stock solutions:

1. Dissolve 10g NaCl (salt) in 1000 mL pond water for 10 ppt salt water.
2. Dissolve 20g NaCl in 1000 mL pond water for 20 ppt salt water.
3. Dissolve 30g NaCl in 1000 mL pond water for 30 ppt salt water.
4. Pond water (control) (NOTE: Use water from a river, lake, or stream; do not use tap water.)

Measure the salt on a balance.

C. Obtain Elodea at a local aquarium shop. If you must order it from a science supplier, allow for shipping time.

D. Have four test tubes or small jars for each team of students (baby food jars work fine).

E. Copy the student sheet "Elodea observations."

PROCEDURE

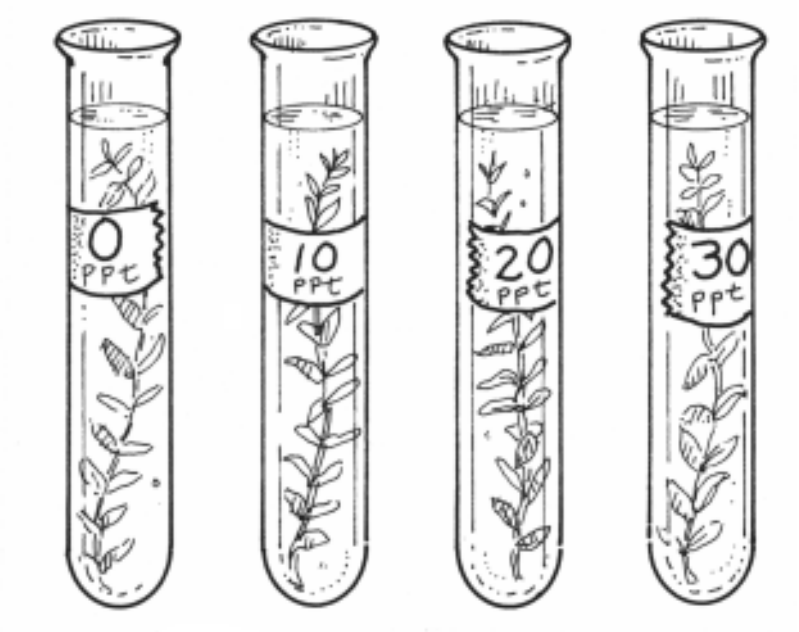
I. Setting the stage

Share the background information with the students. Write the word "estuary" on the board. (For more information, check the factsheets on wetlands.)

II. Activity

Have the students investigate the effects of various salt concentrations on a freshwater aquatic plant.

A. Divide the students into teams of four and provide four test tubes or jars per lab team.



B. Fill each test tube or jar with a different concentration of salt water. Have the students label each with a piece of masking tape and mark it with the salt concentration (ppt). Fill one jar with pond water. Remind the students of why it is important to have a control group in an experiment.

C. Put a short length of Elodea in each tube or jar.

D. Give each student a copy of the student sheet "Elodea Observations."

1. Have each student write down his/her prediction of the experiment's outcome.

2. Have the students observe the plants for four days and record their observations. Keep the test tubes in racks, or place the jars where they will be undisturbed.

E. Have the students answer and discuss the questions on the student sheet, "Elodea Observations."

III. Follow-Up

A. Have the students continue to observe the Elodea clippings each day for several days.

B. Each student should write a paragraph stating his/her conclusions and the reasons for it.

IV. Extension

A. Have the students research and report on members of estuary plant and animal communities.

B. Have the students investigate other components of salt water and report on its minerals and nutrients and their effects on marine plants and animals.

C. Have the students investigate how many seafood species live in estuaries for at least part of their life cycles..

RESOURCES

"Chesapeake Bay: Introduction to an Ecosystem," U.S. Environmental Protection Agency, Washington, DC, 1982.

"Estuaries and Tidal Marshes," U.S. Fish and Wildlife Service, Washington, DC, 1985.

ELODEA OBSERVATIONS

I predict that _____

	Observations			
Tube	Day 1	Day 2	Day 3	Day 4
Control 0 ppt				
#1 10 ppt				
#2 20 ppt				
#3 30 ppt				

Questions

1. Which of the four containers had the healthiest looking plants?

2. Describe in a paragraph what happened over four days to the other containers of Elodea.

3. Based on the experiment, how much salt can Elodea tolerate and still remain healthy?

4. What would this mean about where you would find Elodea in an estuary?

COASTAL CONSERVATION SCAVENGER HUNT

OBJECTIVES

The student will do the following:

Gather information from a variety of sources on coastal habitats and the importance of conserving coastal ecosystems.

SUBJECTS:
Science, Social Studies

TIME:
1 week project

MATERIALS:
student sheets (included)

BACKGROUND INFORMATION

This lesson outlines a scavenger hunt project in which students will employ interesting methods of obtaining information about conserving coastal ecosystems. The information could then be used in either written reports or oral reports to the class.

ADVANCE PREPARATION

A. Prepare to display the information gathered; provide space on walls or bulletin boards.

B. Students may also suggest additional projects that do not appear on the scavenger hunt list. In this case, teams should get your permission and have you assign a point value for their suggestions. (NOTE: You may modify this lesson's approach for younger students.)

C. It is helpful to post each team's point total goal and a project chart (such as filling a bar graph). This provides a running total and checks progress. (This is also a great motivator!)

D. Photocopy the student sheets, one copy of each for every student.

E. Enlist the help of your school librarian. The teams will need his/her help in library research.

PROCEDURE

I. Setting the stage

A. Explain to the students that they will be working in teams to accumulate as much information and performing as many activities as their team decides upon. All information/activities will contribute to their understanding of the need to protect coastal areas.

B. Prepare the teams for the scavenger hunt.

1. Divide the class into teams of four. Tell the teams they will have a week to gather information and create their products. (NOTE: You may adjust the time for your students.)

2. Hand out the student sheet, "Items to Collect and Create."

3. Give the teams 10 minutes to go over the list and plan the team strategy. Stress the importance of developing a team strategy. Suggest steps to the completion of the activity, such as assigning individual duties and deciding their point total goal.

II. Activity

A. Share with the students the following:

Pollution of our coasts and oceans is a serious problem. Our oceans are being used as giant garbage cans with humans putting in thousands of tons of garbage each year. There are many things people can do to help our oceans. Learning about the problem along our coasts and in our oceans is a good first step. This scavenger hunt will help you find out much about this complicated problem.

B. Share with the students the rules of the scavenger hunt:

1. Work is done in teams with each person helping equally.

2. You can go anywhere appropriate to get what you need. Cameras and tape recorders can be used. Notes on TV shows and hand-drawn maps and diagrams are acceptable.

3. Write down where you find all the information.

III. Follow-Up

After the scavenger hunt is complete, give each student a copy of the student sheet, "Evaluation Sheet for Scavenger Hunt." Allow 5 minutes for teams to discuss the questions, then 10 minutes for each student to complete the evaluation individually. (NOTE: An oral review is recommended.)

IV. Extensions

A. Have the students develop a list of actions to address some of the issues about which they have learned.

B. Have the students write letters to politicians or others in decision-making positions.

RESOURCES

A Citizen's Guide to Plastics in the Ocean, Center for Marine Conservation, Washington, DC, 1988.

McRae-Campbell, Linda, The Ocean Crisis, Zephyr Press, Tucson, Arizona, 1990.

ITEMS TO COLLECT AND CREATE

1. Collect two magazine articles that explain efforts to slow or stop development on the coastline. Have written summaries. (15 points)

2. Create a chart that lists reasons to keep coastal areas natural. (10 points)

3. Watch a TV show about the problem of ocean pollution. Create a chart or poster that shows what you learned. (10 points per program)

4. Make a chart that lists organizations that help fight ocean pollution. Include the names, addresses and phone numbers. (10 points)

5. Choose one of these problems. Write a poem or song that includes at least five facts about the problem. Mention in the song the need for finding ways to solve the problem. (20 points)

   A. overgrowth of algae

   B. contamination of shellfish

   C. destruction of food chains

   D. overfishing

   E. filling in coastal wetlands

6. Create a time line that shows the development of the U.S. coastline from 1950 to the present. (15 points)

7. Design a poster that informs others about ocean pollution. (15 points)

8. Make a list of five kinds of dangerous chemicals that are dumped into the ocean. Explain how the chemicals are used. (10 points)

9. Design a bumper sticker which shows the need for protecting the oceans. (10 points)

10. Design an art project which would show garbage washing up on our beaches. (10 points)

11. Read and summarize (3 paragraphs) an article on the effects of plastics in the ocean. (15 points)

12. Make a mosaic of pictures showing the effects of ocean pollution. (10 points)

13. Make an “Ocean Alphabet Book” that describes the problem. Find one coastal fact for each letter of the alphabet. (25 points)

14. Prepare and perform a skit for your class that includes at least 10 facts about ocean pollution. (15 points)

15. Create your own item for a scavenger hunt on ocean pollution. Get teacher approval and point value.

EVALUATION SHEET FOR SCAVENGER HUNT

Name _____ Date _____

Team Members _____

_____

1. What information did you discover that was most important?

_____

2. What was the most interesting thing you discovered? Why?

_____

3. `Which item or activity gave you the most useful information? Why?

_____

4. What did you like best about this activity?

_____

5. What would you change about this activity?

_____

6. While I was working on the scavenger hunt, _____ helped me by . . .

_____

7. If I were evaluating my scavenger hunt, I would say I have earned _____ because . . .

_____

8. If I were evaluating my team's scavenger hunt work, I would say we have earned _____ because. . .

_____

_____

COASTAL FOOD WEB

OBJECTIVES

The student will do the following:

1. Identify members of the coastal food web.
2. Label food web members as plants or animals (herbivores, carnivores).
3. Construct coastal food chains and webs.

SUBJECTS:
Science

TIME:
90-120 minutes

MATERIALS:
student sheets (included)
index cards
masking tape (or pins)
marker
string or yarn
teacher sheet (included)

BACKGROUND INFORMATION

All life systems depend on green plants which use the energy of sunlight to produce sugars, fats, and proteins. They are the ultimate food sources for all life. Green plants produce food. Animals must obtain energy from either plants or other animals. Animals that eat plants are herbivores. Animals that eat other animals are carnivores. Even organisms that break down dead plants and animals get their food directly or indirectly from plants.

Plants and animals are linked by food relationships and form food chains. Food chains are linked together into food webs. Decomposers are members of the web because when animals and plants die their decomposed forms are broken down into essential nutrients that are used by green plants.

Terms

carnivore: a meat-eating organism.

food chain: animals and plants which have direct food relationships; energy passes through the food chain.

food web: interrelated food chains; shows direct and indirect food relationships.

herbivore: a plant-eating organism or first level consumer.

ADVANCE PREPARATION

A. Write the name of each organism on the student sheet "Coastal Food Web Questions" separately on index cards.

B. Photocopy the student sheets, one for each student.
C. Compile a small reference library so that the students can look up coastal plants and animals.

PROCEDURE

I. Setting the stage

Share the background information with the students.

II. Activities

A. Review food chains with the students. Have them suggest some simple food chains, and let volunteers role-play several food chains.

B. Give each student an index card with a coastal organism's name on it.

1. Have each student cut out a picture of the organism (from the "Coastal Organisms" student sheet) and glue it to the back of the index card.

2. Use masking tape or pins to attach each student's card to his/her clothing.

C. Have the students make coastal food chains.

1. Tell all the students with plant names to form a group.

2. Tell all the students with animal names to form a group.

3. Have the "animal" group divide itself into plant-eaters and meat-eaters. Tell the plant-eaters they are "herbivores." Tell the meat-eaters they are "carnivores."

4. Have the students link hands with other students to form food chains.

D. Have the students make a coastal food web.

1. Have all the students stand in a circle.

2. Hold up a ball of yarn or string and tell them that it will represent the links in a food web—many related food chains. Give the yarn to a student.

3. Have the student tell what organism's name and picture is on his/her card, then throw the yarn to a classmate. He/she must hold on to the end of the yarn.

4. The classmate will share the name and picture on his/her card and tell how the organism is related to the first one. (NOTE: You may have to help with this.) He/she will hold onto the yarn and throw the ball.

5. Repeat the process until all the students are holding onto the yarn and a large web has been created. This illustrates the interrelationships in the coastal ecosystem.

E. Have the students examine the student sheet "Coastal Food Pyramid." The pyramid illustrates the transfer of energy and other resources from food through food chains. Relate this to the activities above.

III. Follow-Up

A. Give each student a copy of the student sheet, “Coastal Food Web Questions.” Have them answer the questions, then discuss the answers with them.

B. Give each student a copy of the student sheet, “Coastal Crossword.” Have them complete the puzzle and let them check each other’s papers.

IV. Extensions

A. Have students report on groups of these organisms and make sketches of lower members of the food web, especially planktonic organisms.

B. Have a seafood festival and invite a grocery store to donate seafood items for a tasting party.

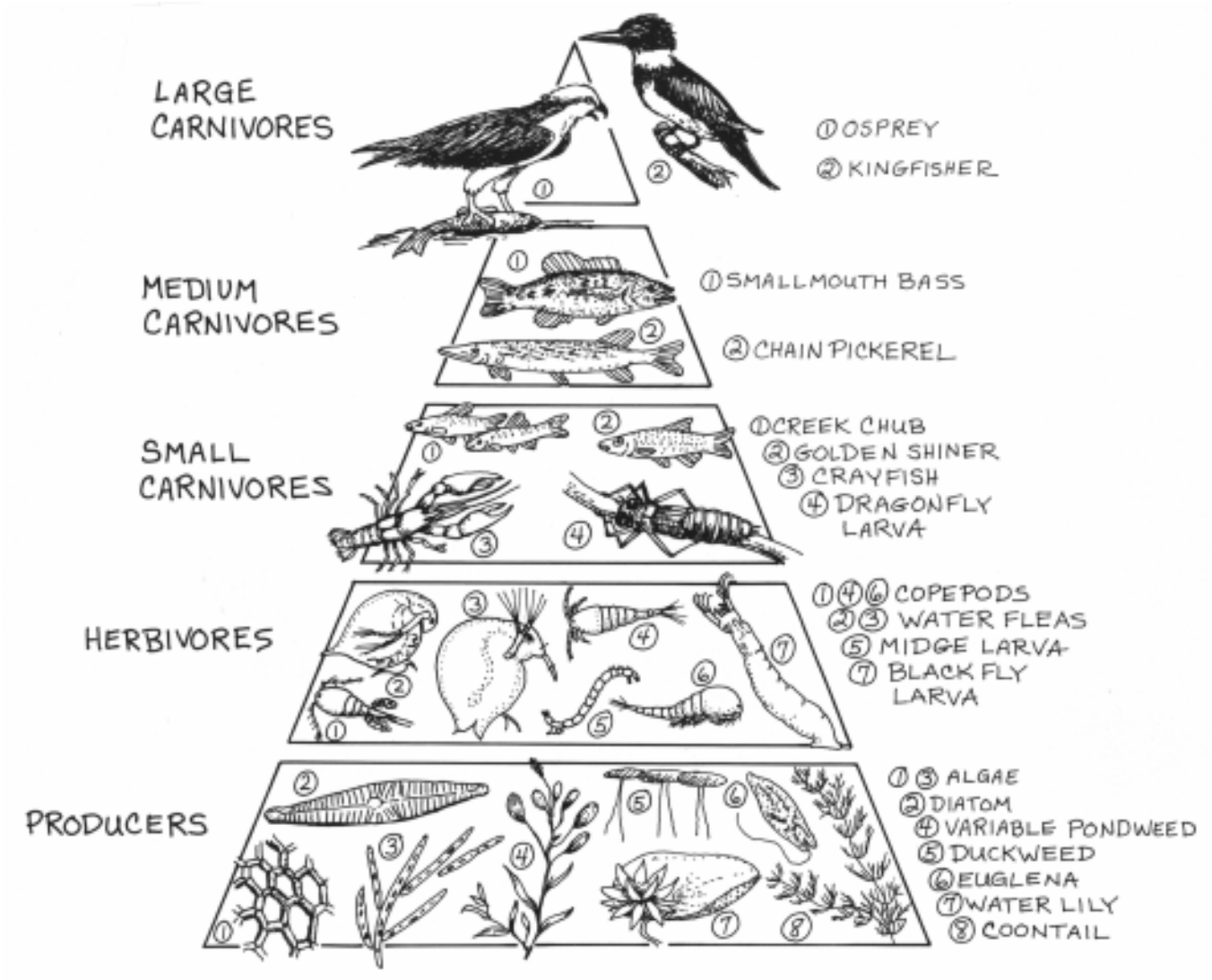
C. Give each student a copy of the student sheet, “Coastal Word Search,” and have them find the hidden words. The answers are provided on the accompanying key. (NOTE: You might let the students look up definitions of unfamiliar terms for extra credit or enrichment.)

RESOURCES

“Estuaries and Tidal Marshes,” U.S. Fish & Wildlife Service, Washington, DC, 1985.

Marine and Estuaries Ecology: Man and the Gulf of Mexico, Mississippi-Alabama Sea Grant Consortium, University Press of Mississippi, Oxford, Mississippi, 1984.

COASTAL FOOD PYRAMID



COASTAL ORGANISMS

COASTAL FOOD WEB QUESTIONS

1. Do plants make their own food? YES NO

2. Do animals make their own food? YES NO

3. Each of the following lists has one organism that differs from the rest. Cross off the one in each list that does not belong. Then label the list "plants" or "animals."

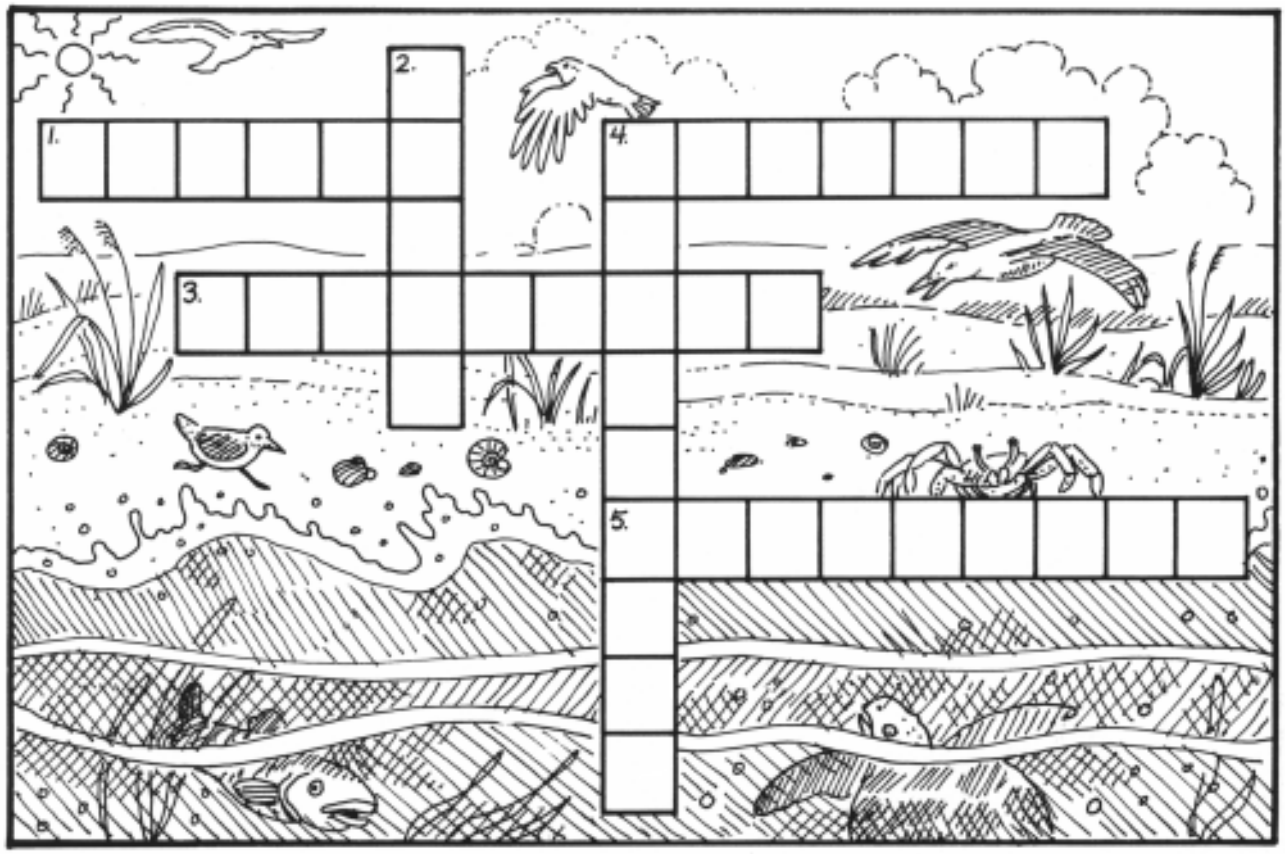
_____	_____
bald cypress	algae
crabs	eel grass
oyster	mangrove tree
osprey	alligator
_____	_____
sea bass	beach grass
harbor seal	wild rice
poison ivy	sea oats
killer whale	muskrat

4. In these lists there are plants, herbivores, and carnivores. Cross off the organism that does not belong and label the list.

_____	_____
red fox	wild celery
bald eagle	palmetto
person	deer
palm tree	cattail
_____	_____
marsh hawk	grasshopper
pelican	rabbit
manatee	mouse
blue heron	turtle

5. Make up two food chains using some of the organisms above. Each food chain must begin with a plant and must have two animals. Write the words and draw arrows between them to make the food chains.

COASTAL CROSSWORD



ACROSS

1. If you can't make your own food, you must be an _____.
3. The animal that eats meat.
4. A _____ _____ shows how food chains are related.
5. An animal that eats plants. _____

DOWN

2. If you make your own food, you must be a _____.
4. A _____ _____ shows what plant is food for what animal and so on.

COASTAL WORD SEARCH

Can you find the following terms associated with food chains?

biotic	zooplankton	snakes	detritus
estuary	radiant	disease	salinity
water	tides	carnivores	herbivores
producers	benthic	decomposers	marsh
algae	striped bass	crabs	oyster borer
swans	mink	ducks	oyster
catfish	owls	geese	muskrat
food	clam	omnivores	copepods

D H A S N M A B K D E U C F H J I E K R C O K T M B Q R Z
C L O P H I T L L B K T S K B H X S Q M O E K G B L G F W
W D C T M N C F H J P R A D I A N T Q B N C K E F J H N T
K L A T P H R H O B G M L N R C Z U F D S J E O I L M S R
H E R B I V O R E S Z F G L T Q R A B F U A H J K Q X A L
B X T D G L T M U S K R A T P R R R D H M F J N D Z Q W C
T O M M P Y T W B P T F E C Y A F Y D B E N T H I C B L N
T P H H B R K Y E S R F C K C Q N D H S R H J K S Q X A L
D T X Z F O O D Q F E R H Z A L G A P T B C K X E U I M M
C N R C F G Y D H X K I O R R Z A Z O Y T L O X A R W D N
M C A T F I S H U T A T X L N M O M B X M L D P S H J F T
T M X G R H T P L C I X M M I H Z A U J F F G K E P A E I
S D A D G J E K L M E N O P V Q B R C M P Q F H J P X T X
K F B D E T R I T U S R X Z O W L S D P P D Q U N L O F B
P G C O U F G I X K M Q S T R P O H M M M P C B M J Y D B
A O Z K L P H I M C D B Q O E O M O I D W X W S B H S C S
R B C O M N I V O R E S T F S A L I N I T Y A T S E T C H
H D I G O L E K U F C Q S B X N J S K Z I Z Z R X E E F W
W Z O O P L A N K T O N D P M L T C Q B D T B I Q F R R S
Q S W R T B C K Z V M T U Y V D B P A K E V I P U T B J K
C B P C Q I T F J W P Z S P J S N A K E S A Z E W Q O L X
T B I O T I C H M G O C L V K W O T B G R H T D F F R J G
A F O F W M K R H J S N T O O A E M N G L X H B B P E M O
E T V O V L N T A X E B T V M N F U Z G H K W A T E R L G
X C M G Y J G M V B R I K B T S Q V W Y J O J S L X D G P
Z F K R B C D U C K S Q R H C L M H H J G E E S E L C R X

COASTAL WORD SEARCH
ANSWER KEY

Can you find the following terms associated with food chains?

biotic	zooplankton	snakes	detritus
estuary	radiant	disease	salinity
water	tides	carnivores	herbivores
producers	benthic	decomposers	marsh
algae	striped bass	crabs	oyster borer
swans	mink	ducks	oyster
catfish	owls	geese	muskrat
food	clam	omnivores	copepods