

**WHERE LAND**

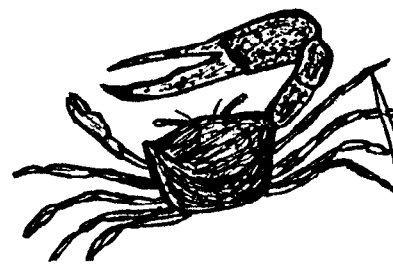
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**MEETS**

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**THE SEA**

**EXPLORING A COAST**  
ACTIVITY BOOK 3-4 GRADE



# EXPLORING A COAST

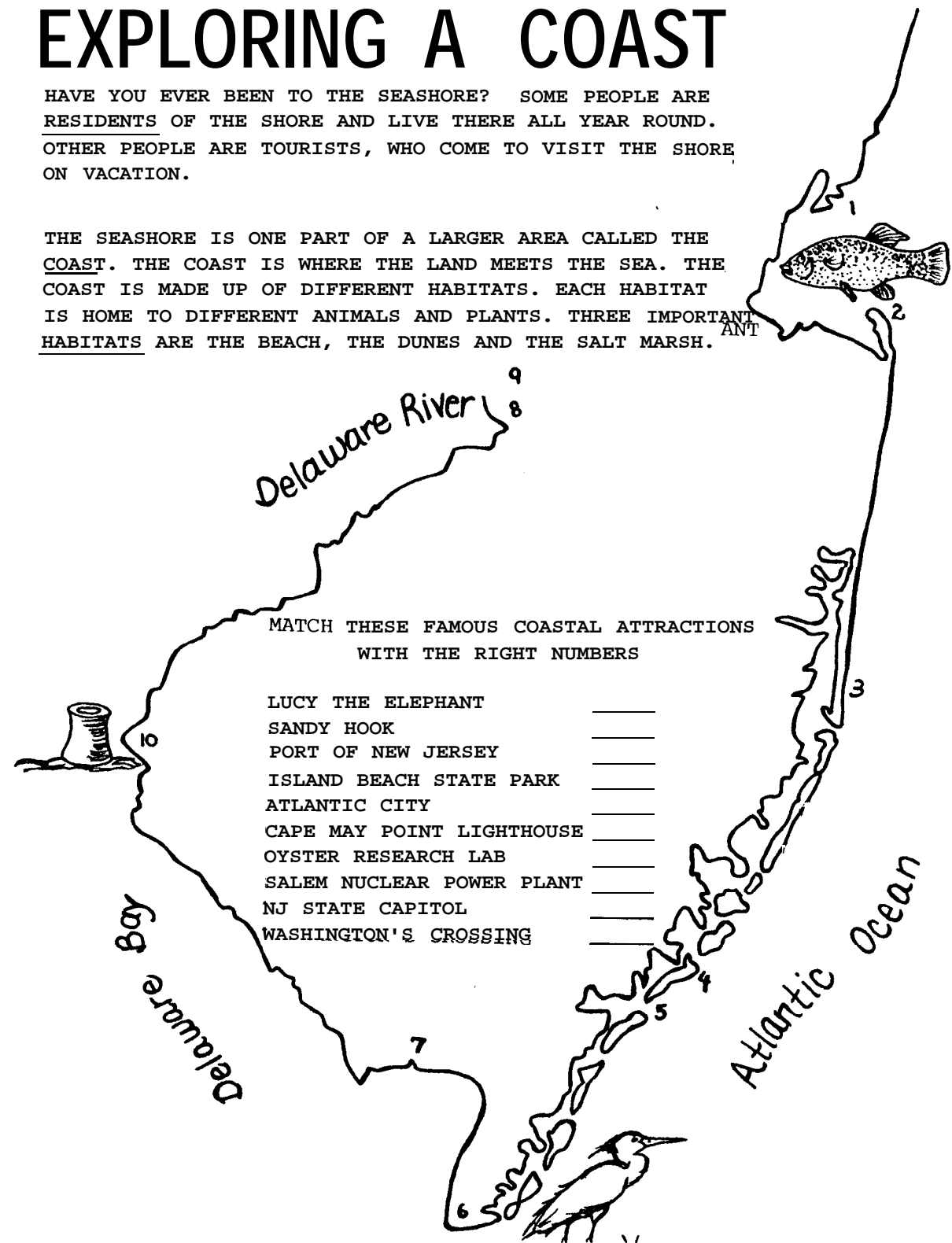
HAVE YOU EVER BEEN TO THE SEASHORE? SOME PEOPLE ARE RESIDENTS OF THE SHORE AND LIVE THERE ALL YEAR ROUND. OTHER PEOPLE ARE TOURISTS, WHO COME TO VISIT THE SHORE ON VACATION.

THE SEASHORE IS ONE PART OF A LARGER AREA CALLED THE COAST. THE COAST IS WHERE THE LAND MEETS THE SEA. THE COAST IS MADE UP OF DIFFERENT HABITATS. EACH HABITAT IS HOME TO DIFFERENT ANIMALS AND PLANTS. THREE IMPORTANT HABITATS ARE THE BEACH, THE DUNES AND THE SALT MARSH.

This project was sponsored by the New Jersey Sea Grant Program under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce.

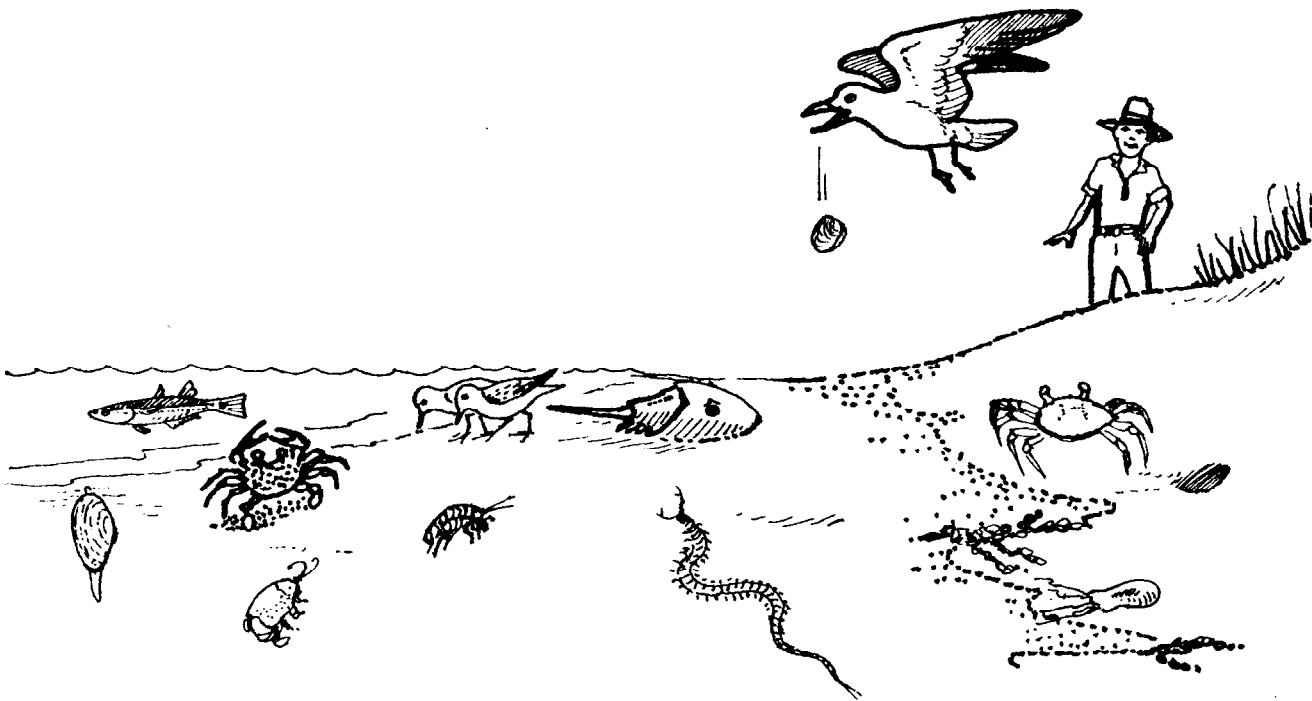
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THE BEACH IS THE EDGE OF THE OCEAN. IT IS A HARSH HABITAT. WAVES AND WIND KEEP THE SAND MOVING. TIDES MOVE THE SEAWATER ON AND OFF THE BEACH TWICE EACH DAY. THE CHANGE IN TIDES ALSO CAUSES CHANGES IN TEMPERATURE AND LIGHT. ANIMALS THAT LIVE ON THE BEACH MUST BE ABLE TO SURVIVE THESE CONSTANT CHANGES.

PLANTS CAN NOT LIVE ON THE BEACH BECAUSE THE TIDES AND WAVES WASH THEM AWAY. ONLY A FEW ANIMALS CAN LIVE HERE. THEY DIG BURROWS IN THE SAND TO PROTECT THEMSELVES FROM THE WAVES AND TIDES. OTHER ANIMALS WHICH ARE SEEN ON THE BEACH DO NOT LIVE HERE. THEY ARE JUST LOOKING FOR FOOD AND A PLACE TO REST.

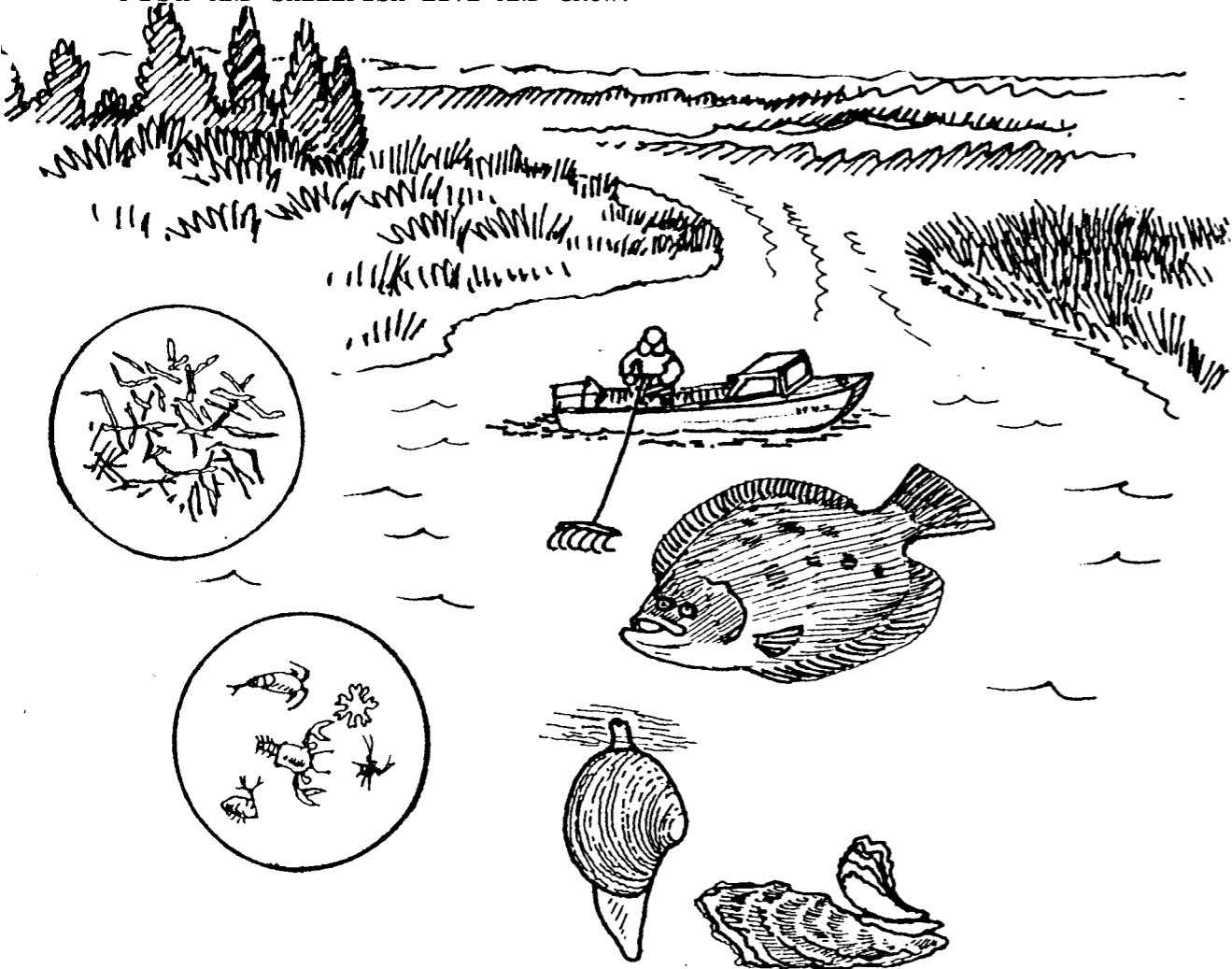


BEHIND THE BEACH ABOVE THE HIGH TIDES ARE THE DUNES. DUNES FORM WHEN PLANTS TRAP AND STORE SAND WHICH HAS BLOWN OR WASHED AWAY FROM THE BEACH. DURING A HURRICANE OR SEVERE STORM, THE BEACH IS SOMETIMES WASHED AWAY AND WATER MOVES THROUGH THE DUNES. THE DUNES ABSORB OR TAKE IN THE ENERGY OF THE STORM. THE SAND STORED IN THE DUNES BY NATURE IS LATER PUT BACK ON THE BEACH BY WIND AND WAVES.

MANY PLANTS AND ANIMALS LIVE IN THE DUNES. THEY ARE MADE (ADAPTED) TO SURVIVE IN A SANDY, WINDY HABITAT WHICH, ONCE IN A WHILE, IS SWEEPED AWAY.

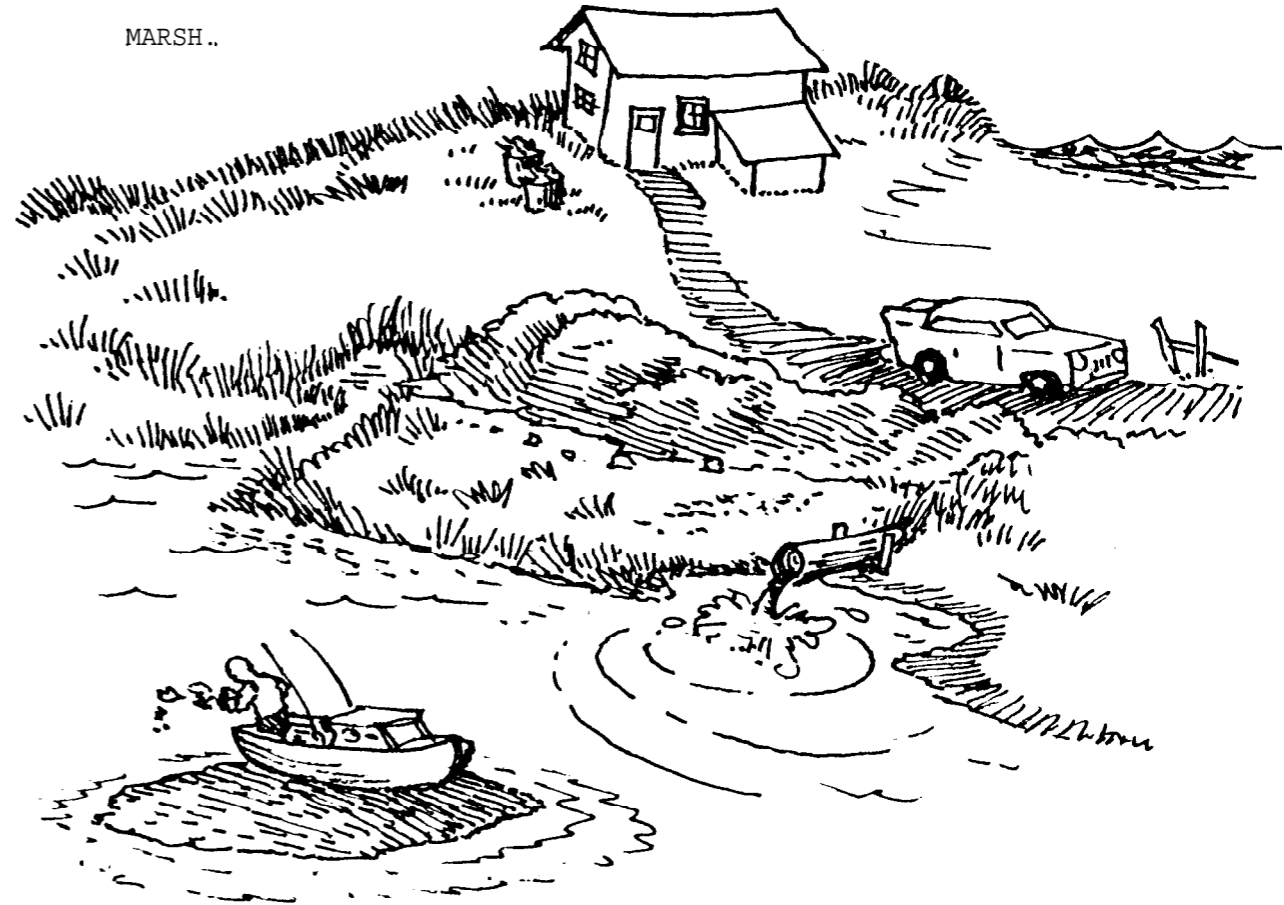


SALT MARSHES GROW ON LOW, WET GROUND ALONG PROTECTED BAYS AND INLETS WHERE THE WATER IS QUIET. HERE FRESHWATER FROM THE UPLAND MEETS SALTWATER FROM THE SEA. SAND AND SILT SETTLE OUT, FILLING CREEKS AND BUILDING MUDFLATS. SALT MARSHES ARE COVERED BY GRASS CALLED CORD GRASS. WHEN THE GRASS DIES IT BECOMES FOOD FOR MANY ANIMALS. BECAUSE SALT MARSHES ARE WELL PROTECTED AND THERE IS A LOT OF FOOD, THE MARSHES ARE THE NURSERY GROUND WHERE MANY YOUNG FISH AND SHELLFISH LIVE AND GROW.

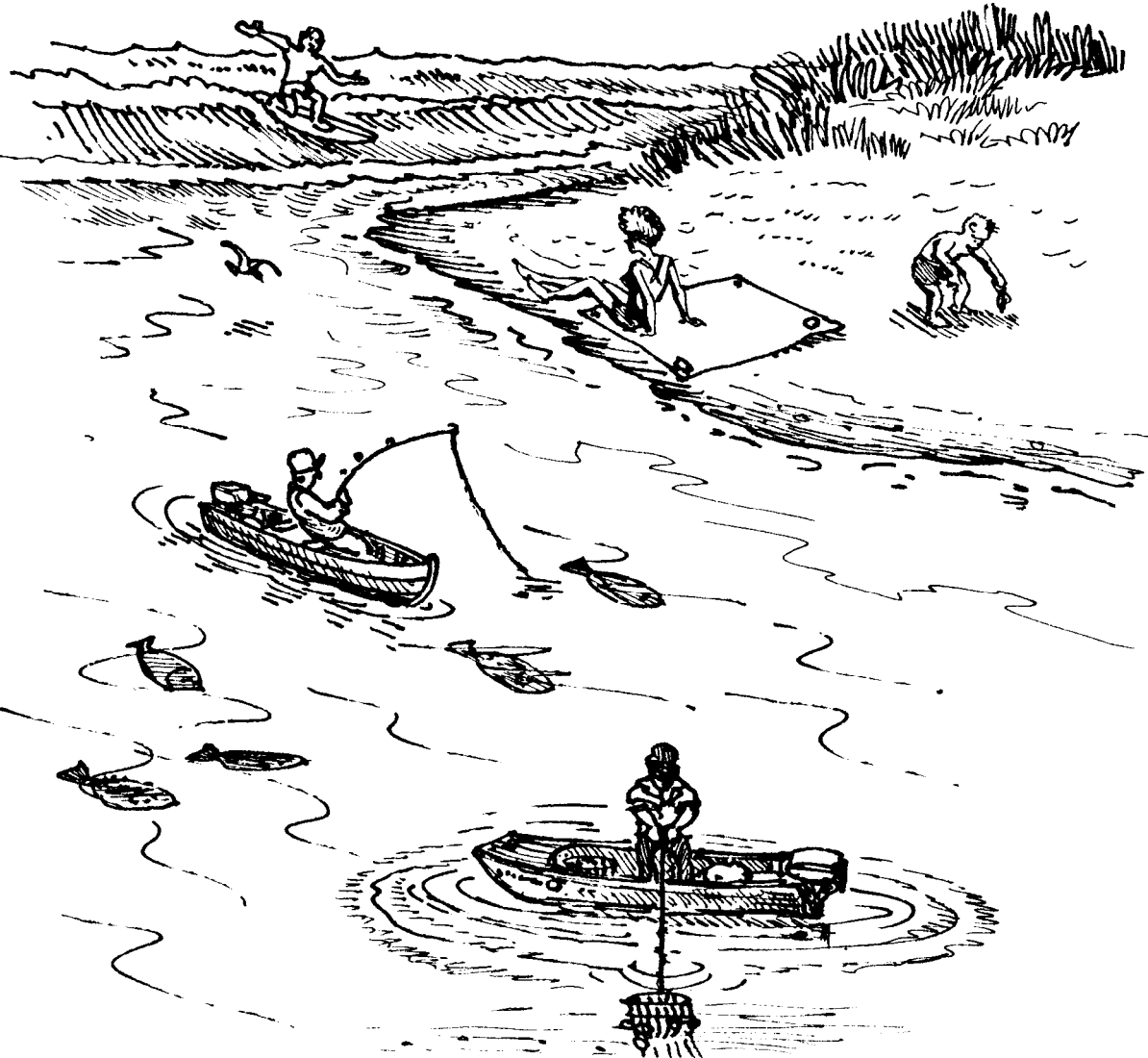


MORE AND MORE PEOPLE LIVE ALONG THE COAST. THEY LIKE TO BE NEAR THE BEACH. SOMETIMES THEY BUILD HOMES ON THE OCEAN SIDE OF THE DUNES OR WHERE THERE ARE NO DUNES. WHEN STORMS COME THE BEACH OFTEN WASHES AWAY. SOMETIMES THE HOMES WASH AWAY TOO BECAUSE THEY ARE TOO CLOSE TO THE BEACH AND THERE ARE NO DUNES TO PROTECT THEM FROM THE HIGH OCEAN WAVES.

PEOPLE USED TO THINK THAT SALT MARSHES WERE WASTE LANDS AND FILLED THEM IN WITH SAND OR USED THEM AS A PLACE TO DUMP CHEMICALS. WHEN BOAT CHANNELS AND CREEKS BECAME TOO FULL OF SAND, BLOCKING THE BOATS, THE SAND WOULD BE DUG OUT OR DREDGED AND PILED ON THE MARSH. THIS KILLED THE MARSH GRASS AND HARMED THE ANIMALS LIVING IN THE MARSH..



PEOPLE ARE NOW STARTING TO UNDERSTAND HOW THE BEACH, DUNES AND SALT MARSH WORK. THEY SEE THAT THE COAST HAS MANY NATURAL RESOURCES WHICH HELP MAN. LAWS HAVE BEEN MADE TO SAVE THE SALT MARSHES, REDUCE POLLUTION, REBUILD THE DUNES AND HELP KEEP THE BEACHES FROM WASHING AWAY. GOOD LAWS WILL HELP US TO USE THE COAST WISELY. WE SHOULD BE ABLE TO ENJOY SWIMMING, BOATING, FISHING AND SURFING. IF WE TAKE GOOD CARE OF OUR COAST IT WILL CONTINUE TO PROVIDE JOBS AND FOOD AND FUN FOR US ALL.



## THINGS TO KNOW ABOUT HURRICANES

WHAT IS A HURRICANE ?

A hurricane is a rainstorm with winds of 75 miles an hour or more, as fast as a speeding car on the highway. Hurricanes start in the tropics and sometimes come north to our coast.

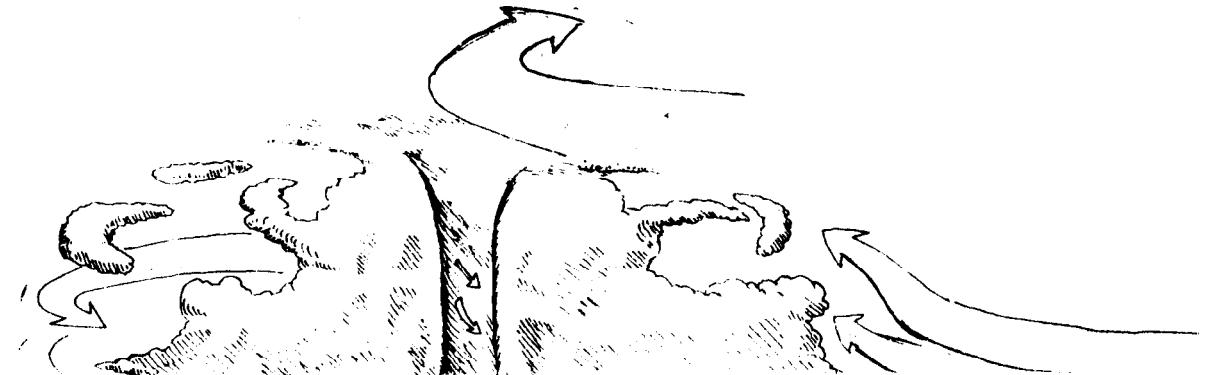
HOW ARE HURRICANES FORMED ?

When warm ocean water touches cooler air just above the ocean surface, the cool air becomes warm air. Because it is lighter than the cool air around it, this warm, moist air begins to move upward in a spiral or circular pattern. The cool air from the top of the spiral is pulled downward through the center of the circle to replace the rising warm air. High in the atmosphere above, the warm, moist air mixes with cooler air and releases its moisture, forming dense clouds filled with rain. Forming clouds releases heat, so the rising air gets still hotter and lighter, causing it to rise higher and higher. More and more warm, moist air is sucked in at the bottom of the storm to replace this rising air. The circular air motion becomes faster, forming a giant swirling doughnut of clouds. Heavy rains and strong winds, up to 200 miles per hour (airplane speed!) form a ring around the eye, or calm, cloudless center of the storm. The eye can be 14 to 25 miles wide, and the entire storm can be 100 or more miles wide.

When hurricanes strike land, flooding, loss of homes and lives can result. These losses can be reduced if people are prepared. The National Weather Service issues a warning called a "hurricane watch" when a hurricane is 24 hours away from striking land.

MAKE A LIST OF WHAT YOU WOULD DO IN THE EVENT OF A HURRICANE WATCH.

LABEL THE PARTS OF A HURRICANE. USE THE UNDERLINED WORDS ABOVE.



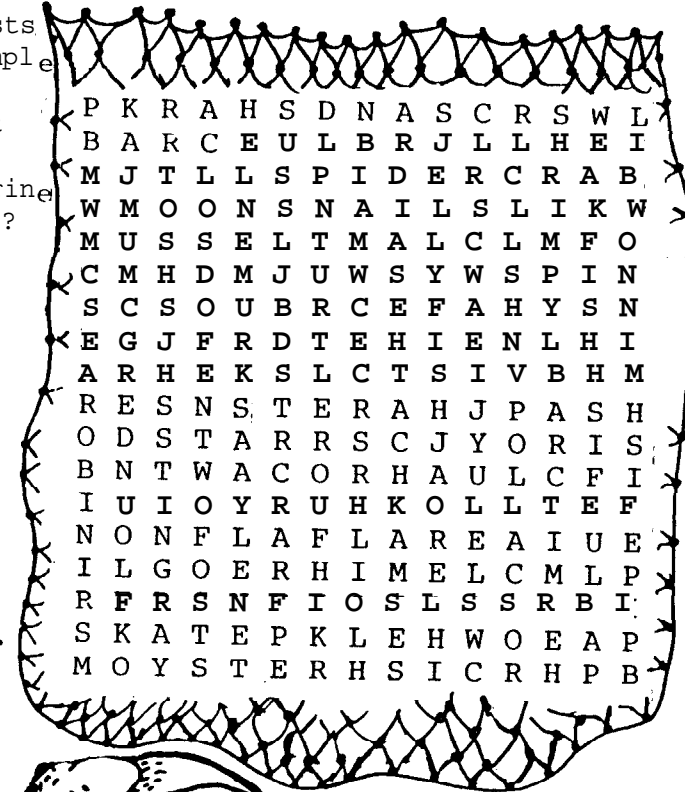
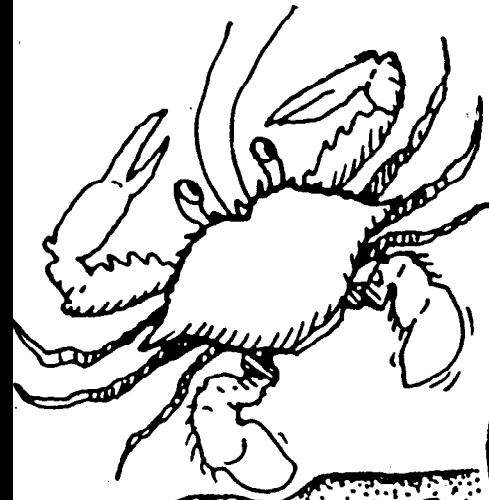
# CAN YOU FIND ME?

# CROSSWORD PUZZLE

Three young marine biologists decide they need to take a sample of what lives in a salt marsh creek. They load up their boat with a trawl net and set out.

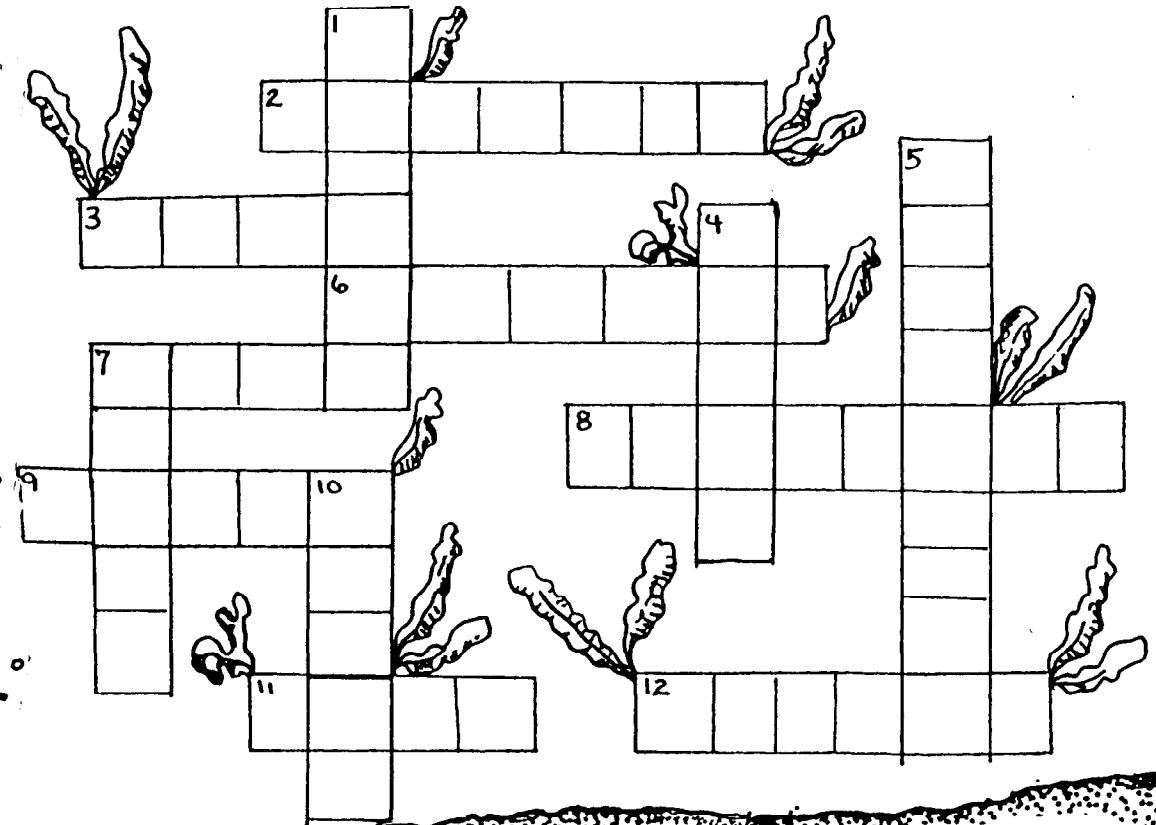
Can you pick out the 24 marine animals they caught in the net?

The words can go up, down, diagonally and backwards.



## WORD LIST:

PIPEFISH BLUE CRAB SPIDER CRAB ° JELLYFISH SHRIMP ° BLUEFISH  
 MOON SNAIL MUSSEL HORSESHOE CRAB STARFISH STINGRAY OYSTER  
 SEAROBIN TURTLE HERMIT CRAB SEA URCHIN SAND SHARK CLAM  
 FLOUNDER ° SCALLOP ° SKATE MINNOW WEAKFISH SEAHORSE



## DOWN

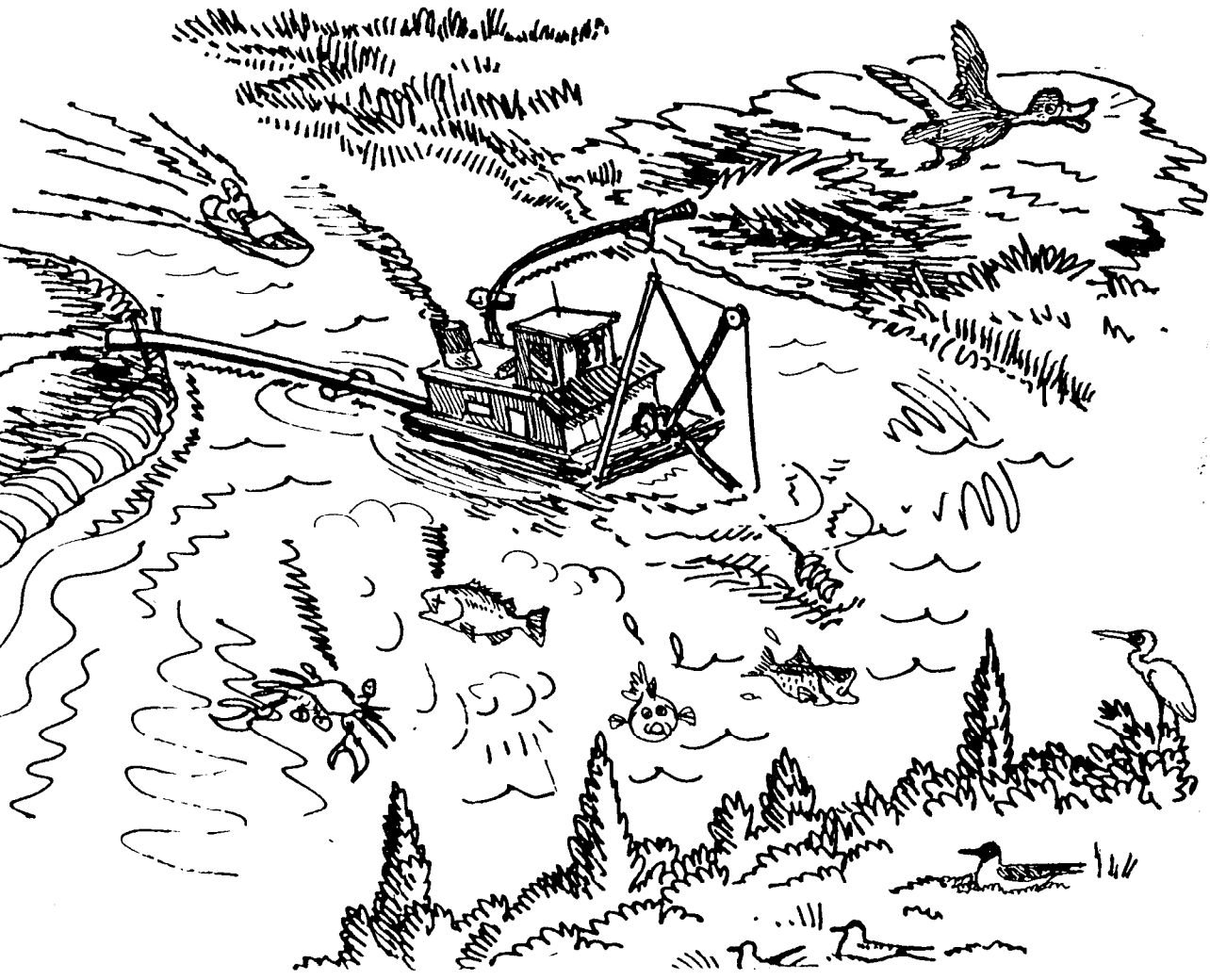
## ACROSS

- The \_\_\_\_\_ crab lives in another animal's shell.
- A plant that grows in the sea.
- We eat this shelled animal in chowder.
- The Atlantic is one.
- A storm that starts over warm waters.
- Another name for a bug.
- The kind of water in the ocean.
- Five-armed marine animal
- A grassy habitat near the bay.
- Where a boat ties up.
- A bird with a long neck and long legs.
- An animal that makes a pearl.

MAN'S ACTIVITIES OFTEN ALTER OR CHANGE THE ENVIRONMENT.

SOMETIMES THESE ACTIVITIES ARE DAMAGING TO THE ENVIRONMENT AND LAST A LONG TIME. AT OTHER TIMES THE ENVIRONMENT CAN RECOVER AND SOMETIMES THE CHANGES CAN ACTUALLY BENEFIT THE ENVIRONMENT.

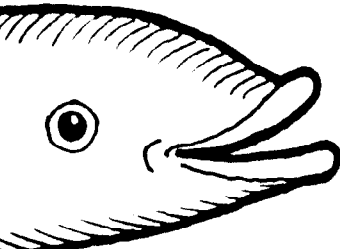
THE ILLUSTRATION BELOW SHOWS A DREDGE DIGGING SAND FROM A SALT MARSH CREEK SO THAT THE BOATS CAN GET THROUGH. LOOK CAREFULLY AT THE PICTURE. HOW IS THE DREDGING HELPFUL TO MAN? TO THE ENVIRONMENT? IS IT HARMFUL IN ANY WAY? CAN YOU THINK OF A DIFFERENT WAY TO GET THE SAND OUT OF THE BOAT CHANNEL?



## WORDS OF THE COAST


ADAPTATION	- A specialization of an animal or its parts that make it easier for the animal to survive.
BAY	- A wide, open body of water with land around part of it.
BEACH	- The area of shore where the sand is always being moved by wind, waves or tide.
COAST	- An area where land meets the sea.
DREDGING	- A process of clearing out or deepening channels, harbors, salt marshes, etc...by removing the mud, gravel or sand.
DUNE	- A hill of sand built up by the wind.
HABITAT	- An area where a plant or animal lives (its home).
HURRICANE	- A tropical rainstorm with winds of 75 miles an hour or more.
INLET	- An opening between islands which allows a flow of water from one body to another (i.e., ocean to bay).
NURSERY GROUND	- The quiet or protected area where young animals are born and/or grow.
RESIDENTS	- People who live in an area year round.
RESOURCES	- A supply of natural things in our environment which man can use to help him survive.
SALT MARSH	- A low grassy coastal area flooded by tides. It is habitat for many plants and animals.
SEASHORE	- An area washed by tides where land and sea meet.
SILT	- Material consisting of fine particles of rock, sand and soils which can be carried or deposited by water.
TIDE	- Twice daily rise and fall of the surface waters of oceans and bays.
TOURIST	- People who visit an area for vacation.

# FISHY RIDDLES



WHAT IS THE BEST WAY  
TO KEEP A FISH FROM  
SMELLING?

• CUT OFF ITS NOSE!



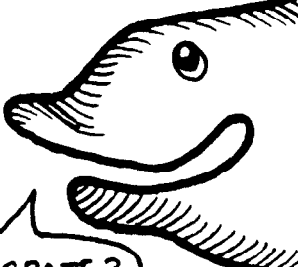
WHAT DO YOU GET WHEN YOU CROSS  
A MATH TEACHER WITH A CRAB?

• SNAPPY ANSWERS



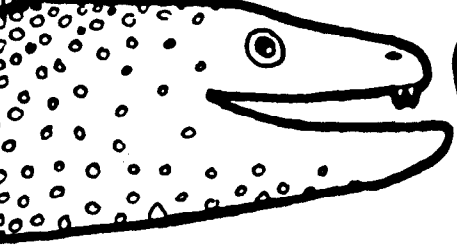
WHAT ARE SIX DUCKS IN A CRATE?

• A BOX OF QUACKERS!



CAN YOU DRIVE A  
CAR OVER WATER?

• OF COURSE, JUST  
USE A BRIDGE.



WHY DOESN'T THE OCEAN GO  
ALL OVER THE LAND?

• BECAUSE ITS TIDE.







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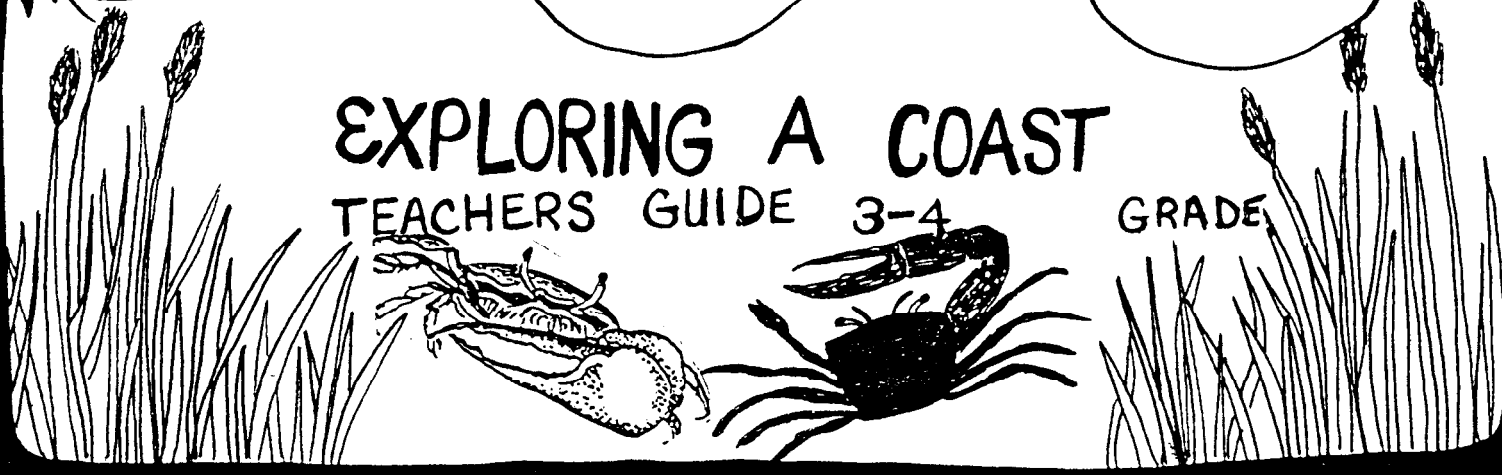
# MEETS

# THE SEA

## EXPLORING A COAST

TEACHERS GUIDE 3-4

GRADE



OVERVIEW

Some of the most critical problems facing shore communities today are:

- 1) The problems of erosion of the beach and subsequent loss of property and the expense involved in the construction of beach protection devices.
- 2) The dispute over whether or not dunes should remain intact or be used as valuable beach front real estate.
- 3) The growing potential, as the result of an ever increasing number of citizens living along and visiting the coast, for catastrophic property damage and loss of life due to hurricanes and severe storms.
- 4) The conflict between the boating community which requires passable waterways and inlets and those who oppose dredging, on environmental and economic grounds, as a technique of maintaining those waterways.

While these problems are too complex for the average 3-4 grader to deal with they can nevertheless understand the basic, underlying geological, biological and social concepts. This activity booklet is designed to help students and teachers explore these concepts. The activities suggested can be easily integrated into existing curricula because they involve both humanities and science and relate to many children's summertime experiences at the shore.

Above all, children should be helped to realize that they are a part of the natural world and not apart from it.

HOW TO USE THIS PACKAGE

The first 4 pages of the student activity book contains an illustrated text. The teacher's guide contains activities to supplement the narrative. The second part of the student book contains puzzles and games which enlarge upon the concepts of the text. Answers to the puzzles are in the teacher's guide.

In addition the teacher's guide contains four fact sheets which provide a background of information on the four critical problems mentioned above. A list of additional readings - one for teachers, one for students - completes the teacher's guide.

EXPLORING A COAST - page 1

The second most important industry in New Jersey is tourism. Each year millions of people visit the coast to enjoy not only the beach and swimming but also other landmarks.

The map in the student activity book focuses on only 10 coastal attractions. Have your students locate the landmarks on a regular road map. Then, comparing the road map with the outline in the book, match the landmarks with the proper location number.

You may wish to expand this activity by adding other attractions to the list and asking each student to write for information and present a report.

Answer Key - Exploring a Coast

Lucy the Elephant	4	A national historic landmark in Margate, NJ, a six-story wood and tin building shaped like an elephant with a museum inside.
Sandy Hook	2	Northern tip of Monmouth County, part of Gateway National Recreation Area: beaches, lighthouse, historic fort.
Port of New Jersey	1	One of the largest and busiest seaports; ships and goods coming from all over the world
Island Beach State Park	<u>3</u>	A seven mile long state park of untouched dune habitat.
Atlantic City	<u>5</u>	One of the state's oldest and largest seashore resorts.
Cape May Point Lighthouse	6	One of several lighthouses along the New Jersey coast; at the southernmost tip of the state, overlooking Delaware Bay.
Oyster Research Laboratory	7	Located in Bivalve; home of Rutgers University scientists who study oysters and other shellfish.
Salem Nuclear Power Plant	<u>10</u>	The largest nuclear power complex in the country on "Artificial Island".
New Jersey State Capital	9	Trenton. Tidal influence on the Delaware River extends all the way to here.
Washington's Crossing	8	Site of the Christmas 1776 crossing of the Delaware River; now a state park.

THE BEACH - page 2

- Ask your students to:
- 1) place a circle around the animals that actually live on the beach
  - 2) place a square around the animals that are only visiting.

Residents

ghost crab  
 mole crab  
 coquina clam  
 sand hopper  
 worm  
 silversides  
 lady crab

Visitors

sandpipers  
 laughing gull  
 horseshoe crab  
 person  
 jellyfish  
 seaweed



THE DUNES - page 3

Hurricanes: Please refer to Shore Protection fact sheet at back of book.  
See page 7 of student activity book for additional activity.

- Activity:
- 1) Have your students make a list of the precautions they should take in the event of a hurricane page 7
  - 2) Divide students into groups of four. Have each group create a hurricane warning flag. You may obtain information on flags and warning signals from the U.S. Coast Guard Auxilliary nearest you.
  - 3) Have the students find out who in their town takes care of the hurricane watch and what they do to warn people.

THE SALT MARSH - page 4

- Activity: 1) Encourage your students to create a food chain by drawing lines connecting the plants and animals in the illustration.

The links in the food chain are as follows:

- 1) Salt marsh cord grass - the basic producer in the marsh
- 2) Detritus - formed when the cord grass dies and decays
- 3) Zooplankton - microscopic animals which feed on detritus
- 4) Filter feeders - Animals such as clams, oysters, mussels which feed on the microscopic plants and animals
- 5) Fish - such as the flounder which feed on shellfish.
- 6) Man - who harvests fish, shellfish, birds and mammals from the marsh

- 2) Students may wish to create their own food chains as many other animals live in the salt marsh, including:

muskrat	fiddler crabs	grasshoppers	herons
black duck	blue crab	weakfish	geese
gulls	otter	raccoon	eels
mosquitoes	osprey	starfish	grass shrimp
greenhead flies	snails	seahorse	meadow vole

THE DISTURBED ENVIRONMENT - page 5

See activity on page 8 - dredging explained in fact sheet in back of teacher's guide.

HOW CAN YOU HELP - page 6

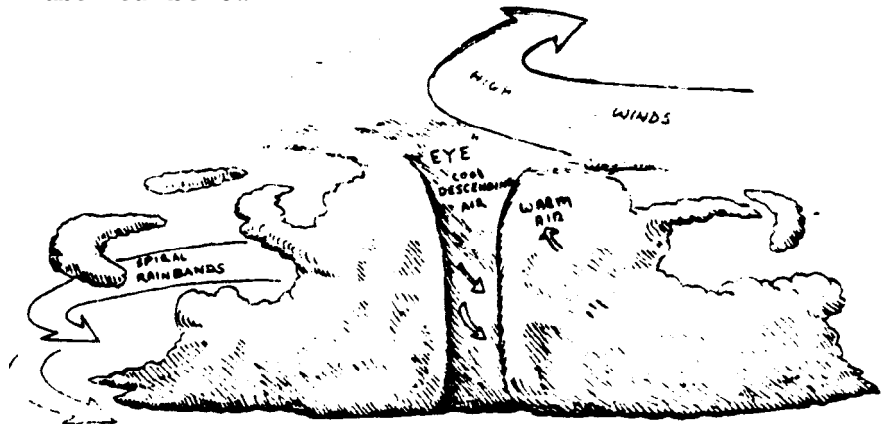
Activity: Man is a part of nature. Therefore his activities impact on the environment. Have your students discuss ways that man can improve the coast and what each student can do himself to assure the future of the coast.



THINGS TO KNOW ABOUT HURRICANES - page 7

Activity: For list of precautions to take in the event of a HURRICANE see factsheet.

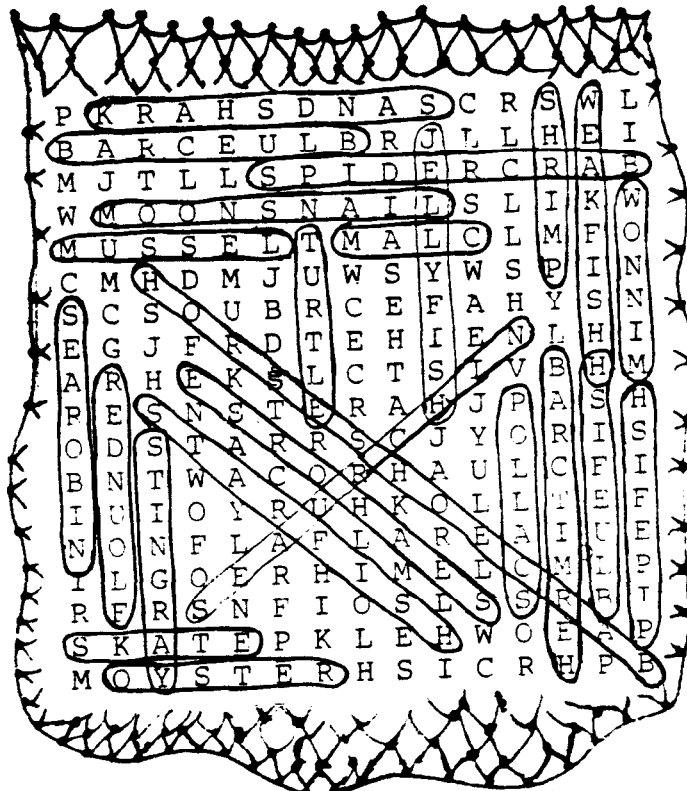
Hurricane diagram labelled below:



CAN YOU FIND ME? page 8

CROSSWORD PUZZLE - page 9

	H		
	S E A W E E D		
	R		H
C L A M		O	U
	I N S E C T		R
S A L T		E	R
N		S T A R F I S H	
M A R S H		N	C
I		E	A
L		R	N
	D O C K		O Y S T E R
		N	



MAN'S ACTIVITY - page 10

Activity: For additional information see Dredging fact sheet attached  
Dredging is:

Helpful to man by clearing boat channels and marinas of sand which blocks boats (1), and sand from a dredging operation can be placed on a beach to help control erosion (2).

Helpful to nature: dredge spoil islands may provide a new habitat for nesting birds (3).

Harmful to nature because it can cause increased sediments in the water, blocking light and smothering fish and shellfish.

SUGGESTED READING LIST 3-4 GRADE

STUDENT READING LIST

HURRICANES:

- Bixby, William. Hurricanes. David McKay Co. Inc. New York, NY, 1979.
- Brindze, Ruth. Hurricanes; Monster Storms From the Sea. Atheneum Publishing Co. New York, NY, 1973.
- Buchr, Walter. Storm Warning. William Morrow and Co. New York, NY, 1972.
- Hitte, Kathryn. Hurricanes, Tornadoes and Blizzards. Random House, Inc. New York, NY, 1960.

SHORELINE PROCESSES:

- Roach, Marilynne K. Dune Fox. Little Brown Co. Boston, 1977.

SALT MARSHES :

- Perkins, Polly. Marsh Muddles. The Wetlands Institute. Stone Harbor. NJ, 1980.

TEACHER READING LIST

HURRICANES:

- Douglas, Marjory. Hurricane. Rinehart & Company Inc., New York. 1958.
- Battan, Louis, J. Weather. Prentice-Hall, Inc. New Jersey. 1974.
- Laun, H. Charles. The Natural History Guide. Alsace Books. Alton, Illinois. 1970.

SHORELINE PROCESSES:

- Kaufman, Wallace and Orrin Pilkey. The Beaches are Moving. Doubleday Press. New York, 1979.
- Shepard, F.P. and H.R. Wanless. Our Changing Coastlines. McGraw-Hill, New York, 1971.
- Gares, Paul. Coastal Dunes: Their Function, Delineation, and Management. Rutgers, The State University, New Brunswick, N.J. 1979.

DREDGING:

- Nordstrom, Karl. Dredging- Water Ways, Intercoastal, New Jersey. New Jersey Marine Science Center, Rutgers, The State University, New Brunswick, N.J. 1974.

### SALT MARSHES:

- Ursin, M.J. Life In and Around the Salt Marshes. Crowell Publishing Co. New York, 1972.
- Teal, John. Life and Death of the Salt Marsh. Little, Brown Co. Boston. 1969.
- Amos, William, H. The Estuary. Defenders of Wildlife, Washington, D.C.
- Beard, Wendy. A Salt Marsh Through the Seasons. The Wetlands Institute. Stone Harbor, N.J. 1976.
- Carlson, Cathey and John Fowler. The Salt Marsh of Southern New Jersey. Stockton State College, Pomona, N.J. 1980.
- Snow, John. Secrets of a Salt Marsh. Guy Gannett. Portland, Maine. 1980.

### SEASHORES:

- Sterling, Dorothy. The Outer Lands, W.W.Norton, New York, 1978.
- Swenson, Allen A. Secrets of the Seashore. Guy Gannett, Portland, Maine. 1979.
- White, Lawrence B. Life in the Shifting Dunes. Museum of Science, Boston. 1976.
- Zim, Herbert S. Seashores. Golden Press. New York. 1955.

This project was sponsored by the New Jersey Sea Grant Program under a grant from the Office of Sea Grant, National Oceanic and Atmospheric Administration (NOAA), US Department of Commerce.  
*Grant Nos. NA79AA-D-00063 and NA81AA-D-00065, NJSG Proj. E/P-1*

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