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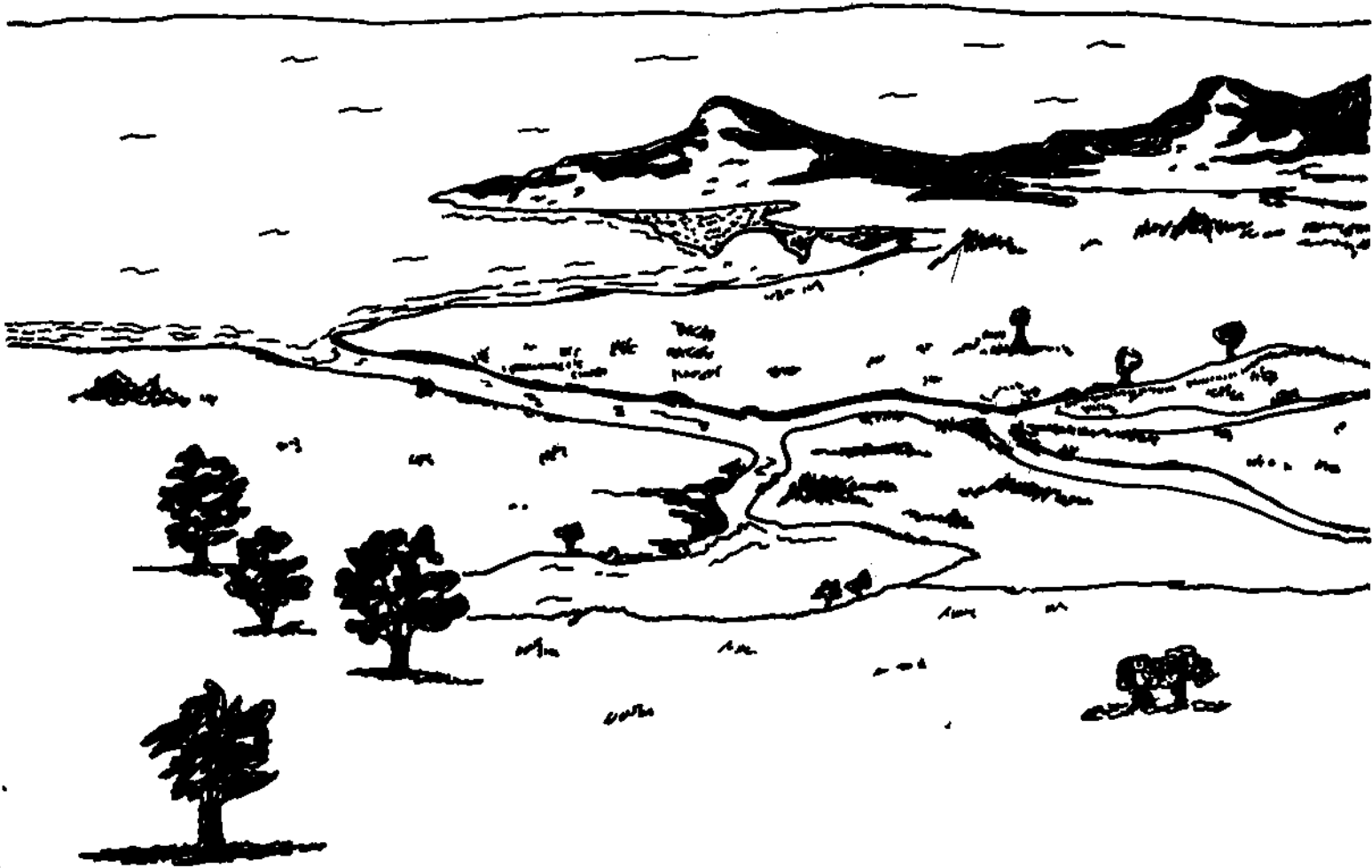
VIRGINIA'S LAND GRANT UNIVERSITIES

4-H MARINE
PROJECT
UNIT TWO

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A STREAM BECOMES AN
OCEAN

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4-H MARINE PROJECT

UNIT TWO

A STREAM BECOMES AN OCEAN

(MEMBER GUIDE)

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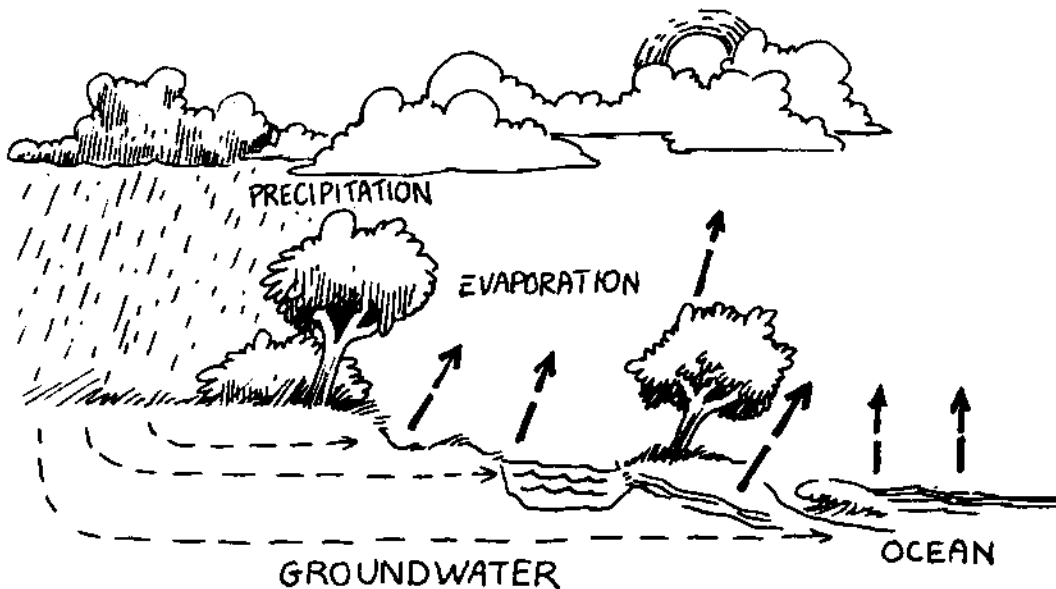
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WATER ON THE MOVE

Water on the earth is always moving - flowing streams, winding rivers, the tides, and ocean currents. Water also moves by evaporating into the air, then reappearing as rain, snow, sleet, hail, dew, or frost. It seeps into the ground; it is used by plants and animals and is also trapped in rocks and minerals. It is even broken down into its basic elements of oxygen and hydrogen by lightning and other energy sources, later to be reformed.

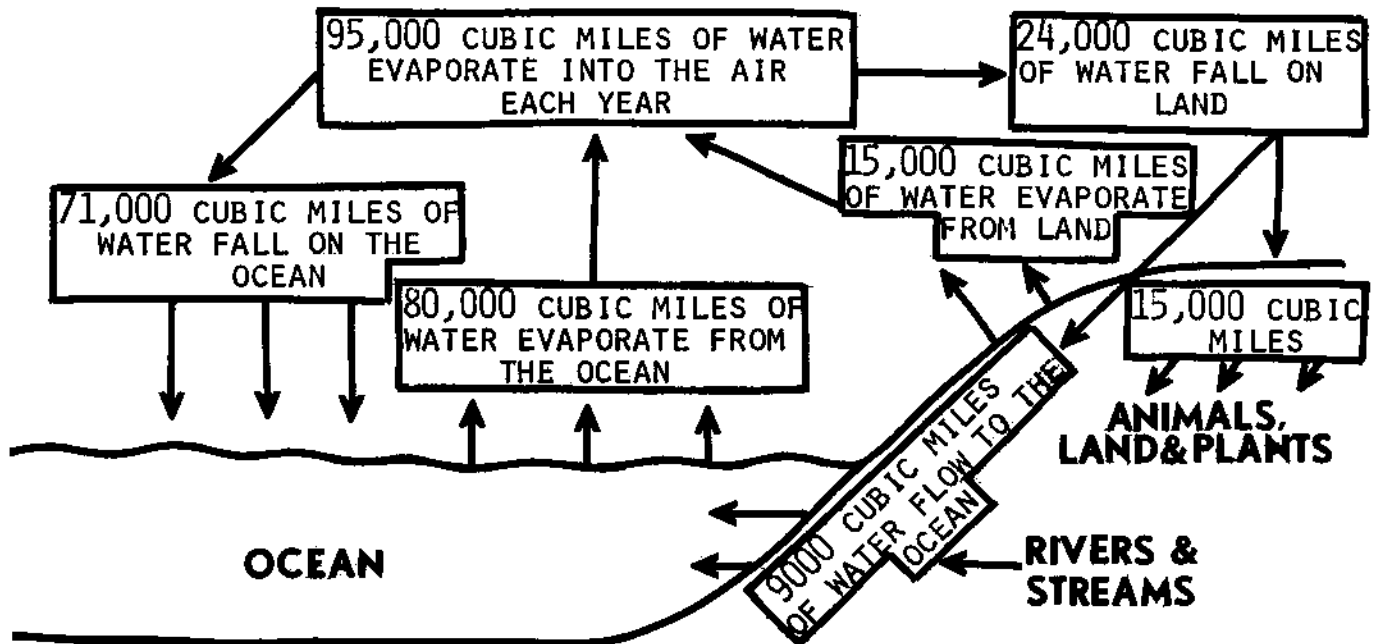
The cycle of moving water is called the **HYDROLOGIC** or **WATER CYCLE**. It is nature's way of renewing the earth's freshwater supply. The sun is the source of energy that keeps the water moving. Water in the air falls as some form of **PRECIPITATION**, then is replaced by **EVAPORATION** of water from land and ocean surfaces. Since the ocean covers nearly three-fourths of the earth's surface, it supplies most of the water involved in the water cycle. Most of the water appearing as precipitation eventually finds its way back to the ocean.



About every twelve days atmospheric water is fully recycled from air to land and oceans and back to the air. There are hundreds of rain storms occurring on the earth at any one time. While one area may be receiving flooding rains, another may be experiencing a devastating drought. In spite of this, the flow of water is a constant process.

(Illustration courtesy of Virginia Water Resources Research Center, VPI&SU.)

During one year about 95,000 cubic miles of water evaporate into the atmosphere. The figure below follows this water as it moves from air, to land, to sea.



HOW MUCH WATER IS ON THE MOVE IN ONE YEAR?

Use the figure above to answer the following questions.

IN ONE YEAR, HOW MANY CUBIC MILES OF WATER:

1. evaporate from the ocean? _____
2. evaporate from the land? _____
3. fall on the ocean? _____
4. fall on the land? _____
5. are taken up by animals, land, and plants? _____
6. flow into the oceans from rivers and streams? _____

How much water evaporates from the earth's surface in one year?

Add the answers to questions 1 and 2. _____

How much water falls to the earth's surface in one year?

Add the answers to questions 3 and 4. _____

COMPARE THE AMOUNTS OF WATER THAT EVAPORATE FROM AND FALL TO THE EARTH IN ONE YEAR.

How much water enters the ocean in one year?

Add the answers to questions 3 and 6. _____

How much water evaporates from the ocean in one year?

Write the answer to question 1. _____

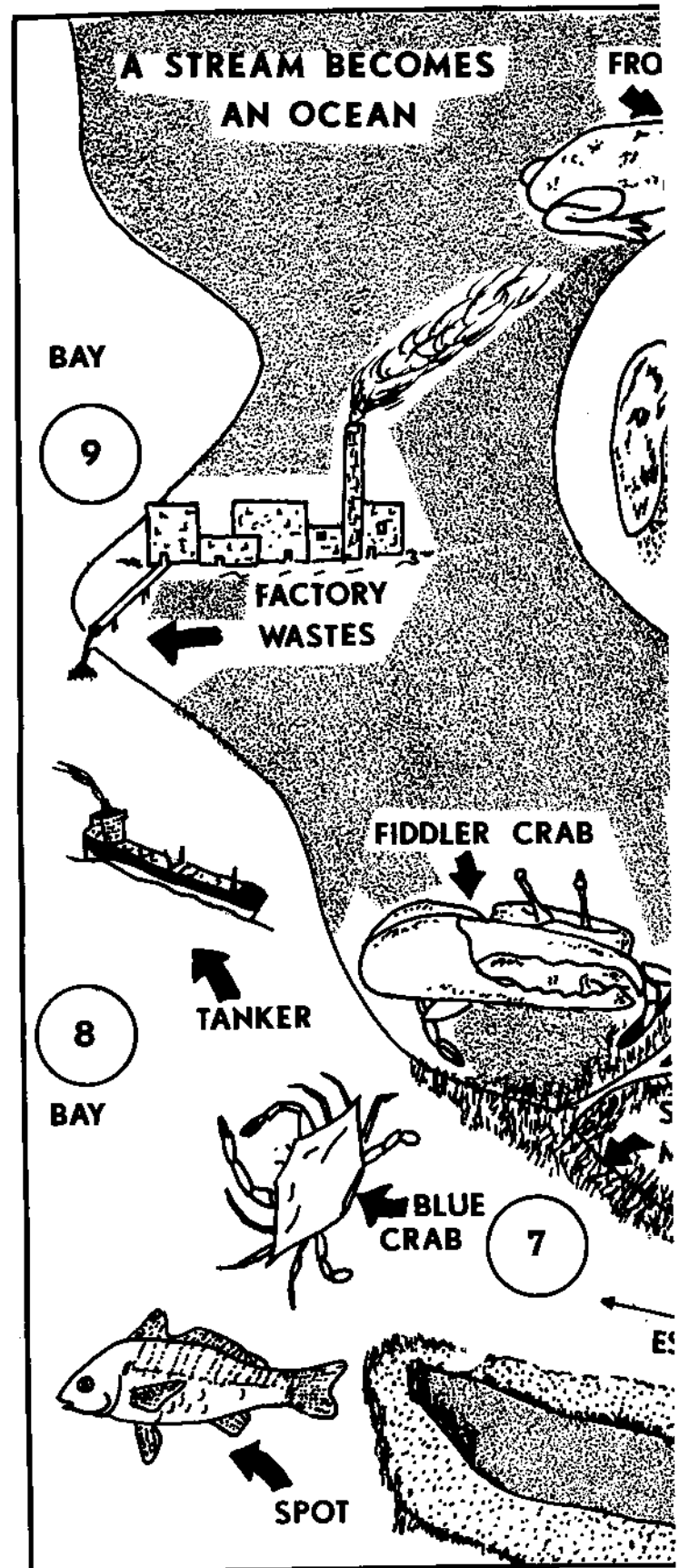
COMPARE THE AMOUNTS OF WATER THAT ENTER AND EVAPORATE FROM THE OCEAN IN ONE YEAR.

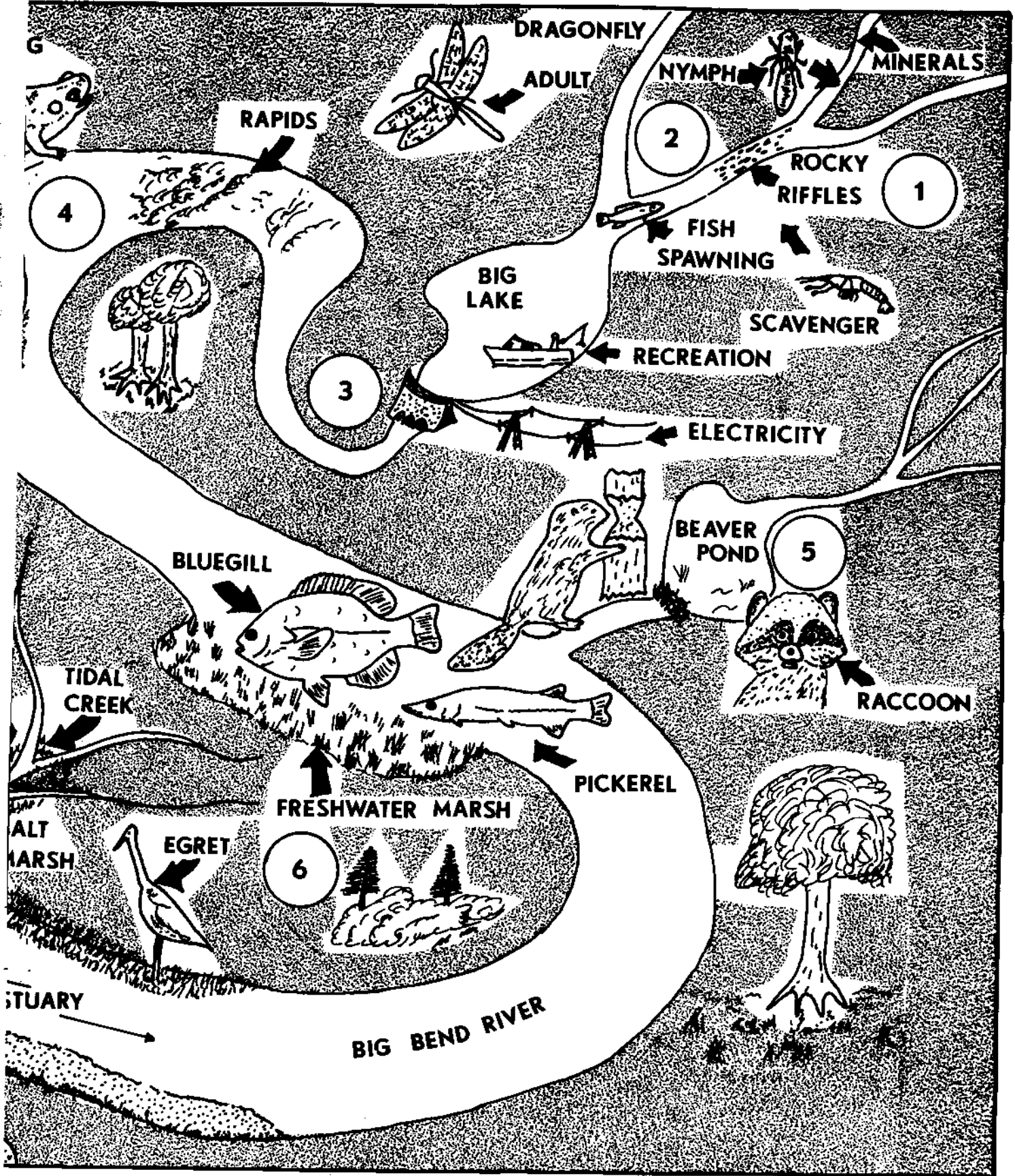
Using the answers to questions 2 and 5, COMPARE THE AMOUNTS OF WATER THAT ENTER AND EVAPORATE FROM THE LAND IN ONE YEAR.

Although water on the earth is always moving, the amount of water in the atmosphere, on the land, and in the ocean is relatively constant. The water cycle is a balanced system. Water removed from the atmosphere through precipitation is replaced by evaporation of water from the land and ocean. The cycle is an unending process and one of many changes. The following story will explain some of the changes of water on the move.

RAIN WATER FLOWS INTO STREAMS, STREAMS FLOW INTO RIVERS AND RIVERS FLOW TO THE SEA. MANY CHANGES OCCUR AS WATER JOURNEYS FROM FAR INLAND TO THE COAST. CAREFULLY FOLLOW THE STORY OF THE EXCITING WORLD OF WATER AS YOU READ "A STREAM BECOMES AN OCEAN,"

THIS MAP FOLLOWS A SMALL MOUNTAIN STREAM AS IT FLOWS TO THE SEA. THE NUMBERS ON THE MAP MATCH THE NUMBERED PARAGRAPHS ON PAGES 6 - 11. REFER TO THE MAP AS YOU READ EACH PARAGRAPH. USING THE MAP AS A GUIDE, FILL IN THE BLANKS IN THE STORY WITH THE WORDS LISTED UNDER EACH PARAGRAPH. THESE WORDS AND OTHERS ARE ALSO USED IN THE ECO-BINGO GAME (PAGE 12), THE CROSS-WORD PUZZLE (PAGE 13), AND THE SEARCH WORD PUZZLE (BACK COVER).



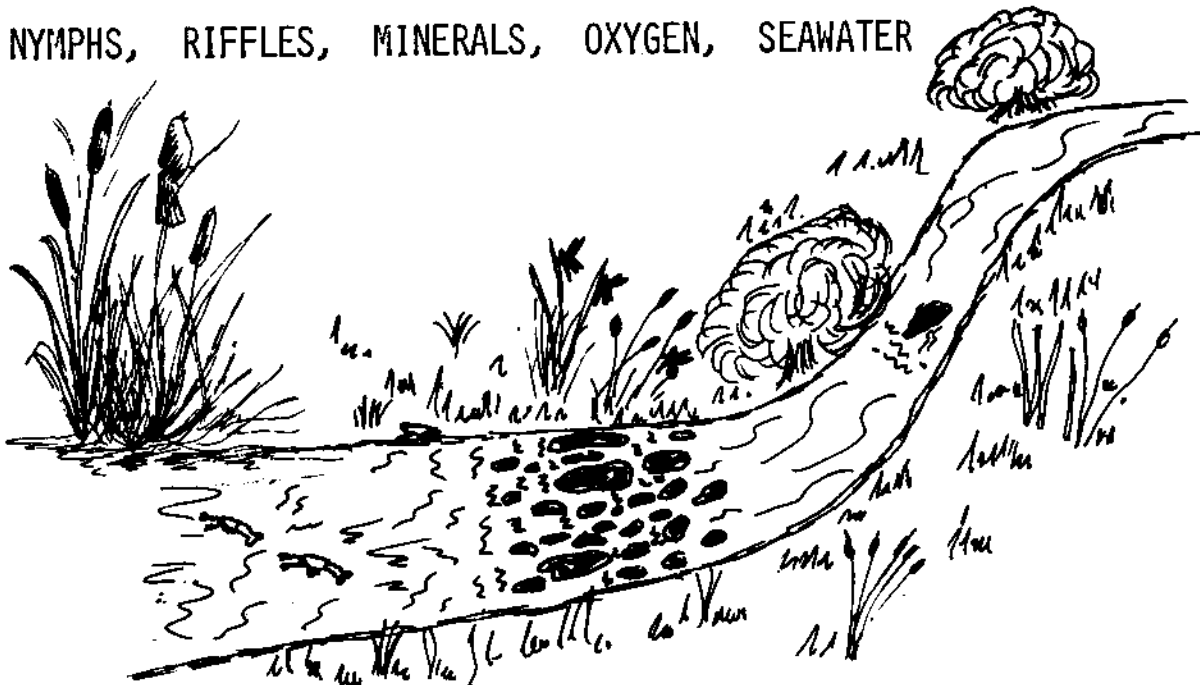


A STREAM BECOMES AN OCEAN

Have you ever watched a flowing stream or river and wondered where the water was going? Water that doesn't evaporate or seep into the ground will eventually reach the ocean. Let's follow the water as it makes the long journey from a mountain stream to the ocean. Match the numbers on the map (pages 4 and 5) with the paragraphs below. Fill in the blanks with the words listed under each paragraph, using the map as a guide. Work in small groups or as a whole class.

- ① Mountain streams are fed by rain, melting snow, and underground springs. As the water flows down the mountain, it tumbles over rocks. This churning action mixes (a) _____ in the air with the water. The cold, oxygen-rich water is a home for trout, minnows, insects, and other animals. The immature forms, or (b) _____, of many insects live on the bottom of these rocky streams where they grow to become adults. The water flows past shallow, rocky areas called (c) _____ and dissolves (d) _____ from the rocks. These minerals will eventually become part of the mineral and salt content of (e) _____.

NYMPHS, RIFFLES, MINERALS, OXYGEN, SEAWATER

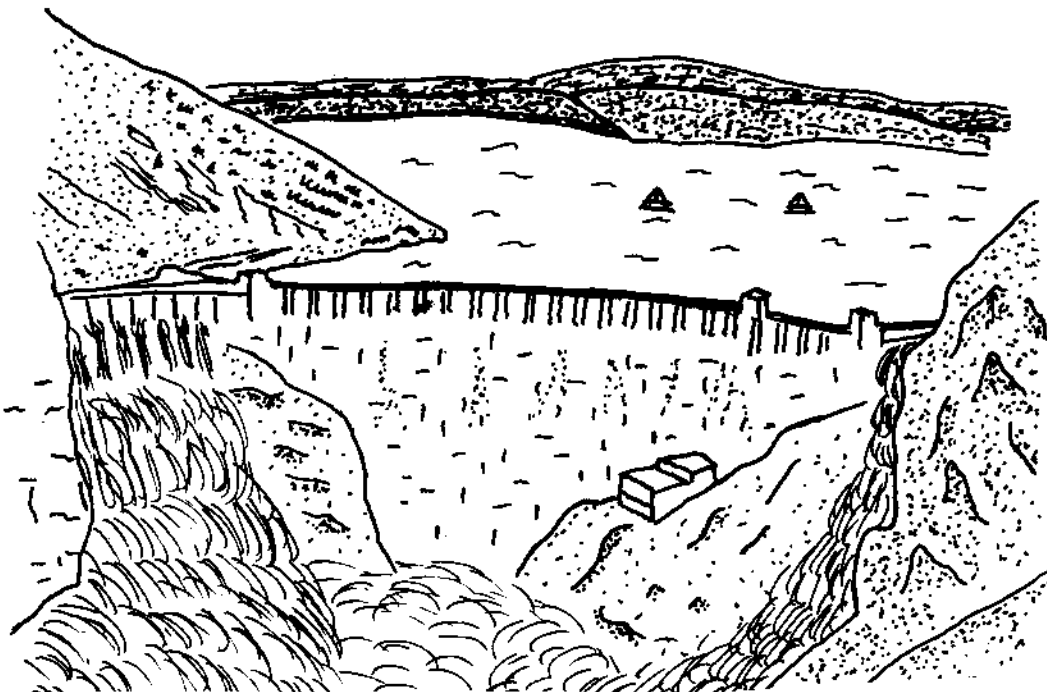


- ② Farther downstream, the water flows slower, is warmer, and has less dissolved oxygen. The types of animal and plants are different from those found in colder, faster water. Changes like these continue along the entire waterway as it approaches the coast. These changes produce different types of (a) _____ such as streams, rivers, marshes, estuaries, and bays. Yet wherever they are found, fish feed and gather to (b) _____ in quiet pools. Crayfish crawl on the bottom and, being (c) _____, feed on decaying matter.

SPAWN, HABITATS, SCAVENGERS

- ③ When smaller streams unite, they form a (a) _____, which may be dammed and the water used to make (b) _____. The resulting lake may also be used for swimming, boating, and other kinds of (c) _____. In addition, the water may be used as a town or city (d) _____. Despite these advantages, poorly designed dams may be harmful to the environment, interfering with natural flooding cycles and water flow, and trapping sediments from farther upstream. Dams may also form impassable barriers for migrating fish such as salmon, shad, and striped bass.

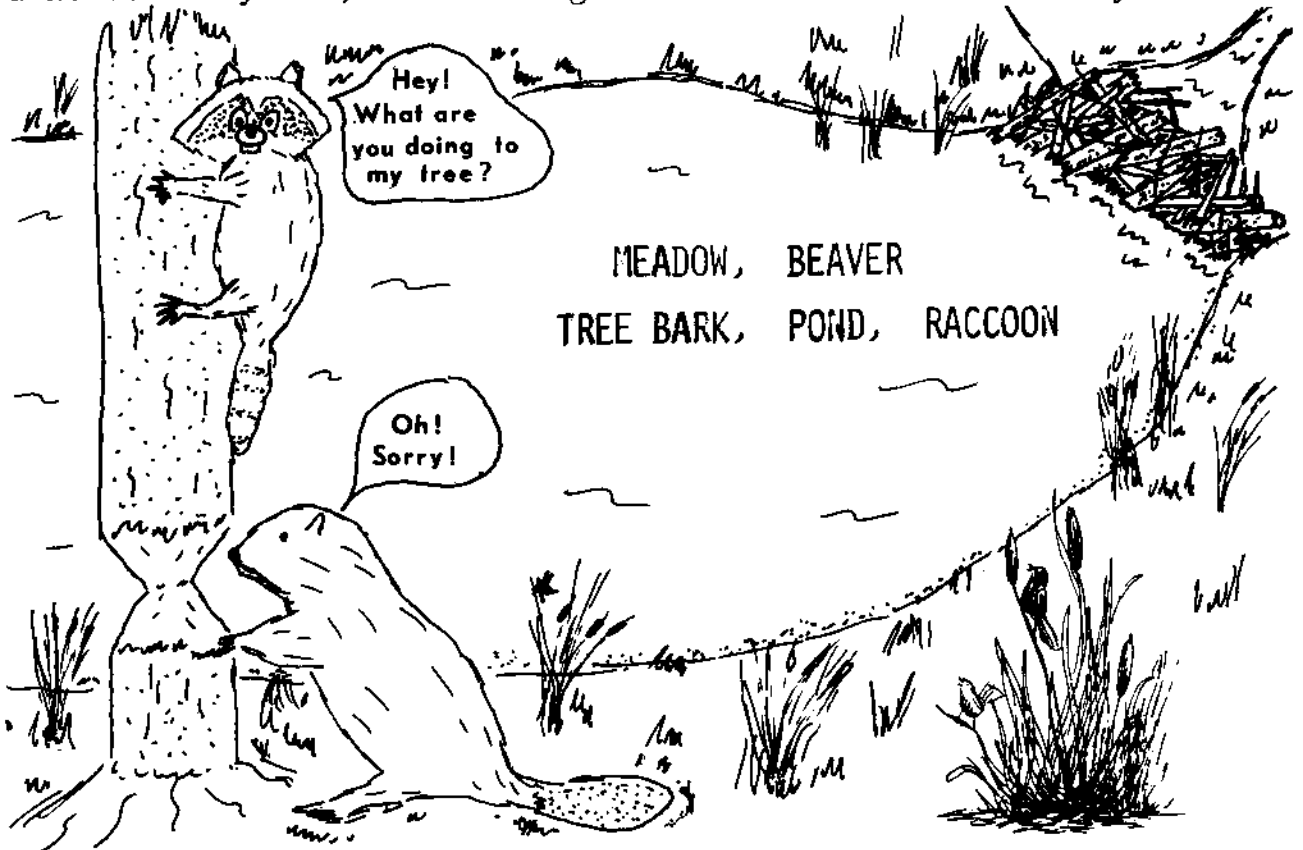
ELECTRICITY, WATER SUPPLY, RIVER, RECREATION



- ④ The river continues on its journey, meandering back and forth, flowing over small water falls, through rocky areas called (a) _____ and around small islands. Frogs, salamanders, snakes, and turtles are abundant. Many types of fish live in the quiet water. Small panfish, such as (b) _____ and redbreast sunfish, and large (c) _____ fish, such as large mouth bass and (d) _____, are favorite gamefish for anglers. Panfish feed mostly on insects, while the (e) _____ of bass and pickerel includes fish and crayfish.

BLUEGILL, PREY, PREDATOR, RAPIDS, PICKEREL

- ⑤ A felled tree or a log and dirt dam is a sure sign of (a) _____ activity. Beaver dams block the flow of water, producing a (b) _____ or marsh. Many animals, such as the (c) _____, share the beaver's habitat. Beavers feed mostly on (d) _____ and water plants. By cutting trees around the water, beavers often create a forest clearing. When their food supply is gone, they move to a different area. As the dam breaks down, the pond or marsh drains and a woodland (e) _____ is formed where trees once stood. After a number of years, the trees grow back and the beavers may return.



- ⑥ Grassy (a) _____ are common along the shores of rivers and streams. The shallow water of the marsh is a very important habitat. It serves as a (b) _____ where many animals nest and as a (c) _____ area where the young animals feed and grow. Marshes are found in both fresh and saltwater.

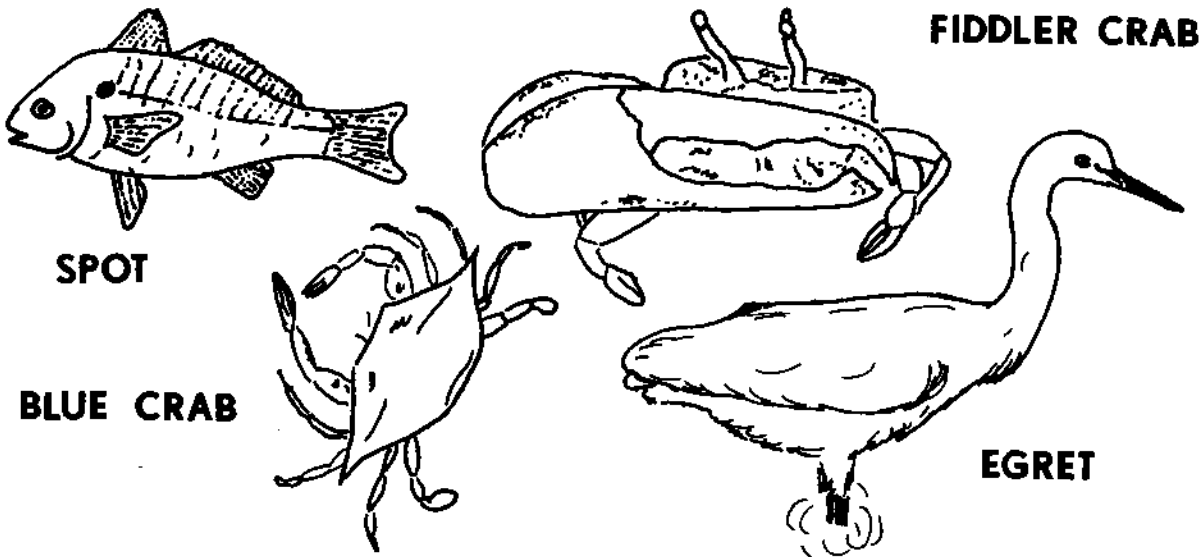
NURSERY, BREEDING GROUND, MARSHES

- ⑦ As the river approaches the coast, the effects of the ocean can be seen. The freshwater of the river mixes with the seawater, producing brackish water. This area of mixing is called an (a) _____. The estuary can be very large and includes lower river areas, salt (b) _____, and (c) _____. The estuary can extend far up into rivers. It is a very important part of the (d) _____, providing food, shelter, and breeding grounds for many types of marine animals.

MARINE ENVIRONMENT, MARSHES, BAYS, ESTUARY

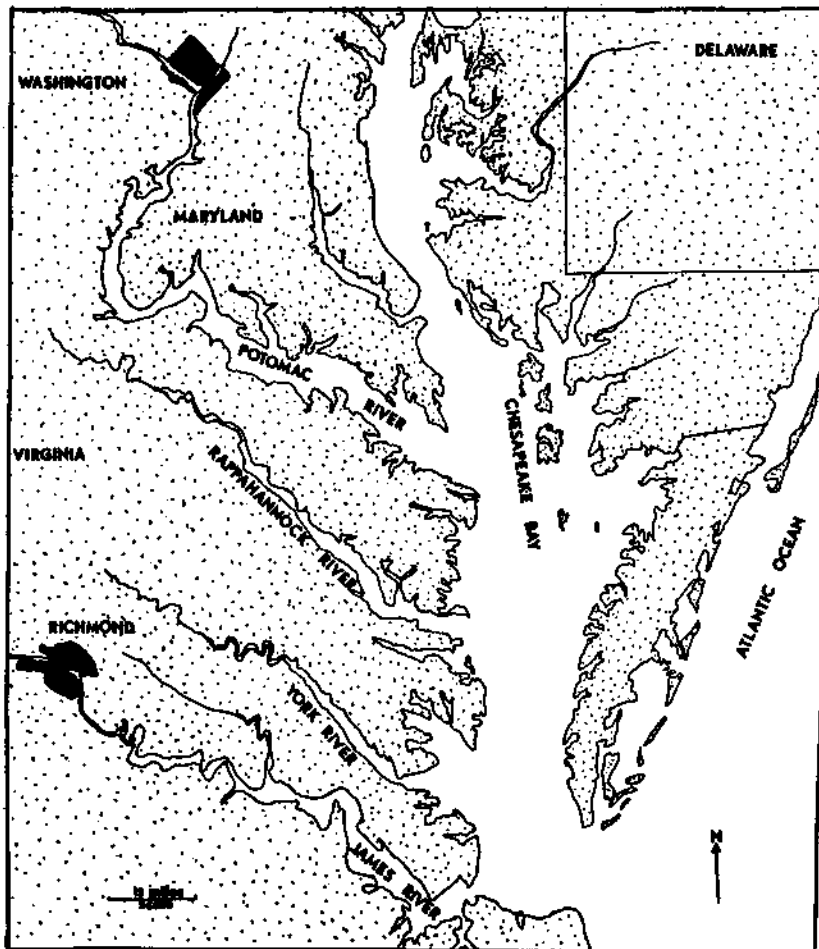
(e) _____ crabs can be found living in burrows on the muddy banks of tidal (f) _____. Blue (g) _____ move into the estuary during the summer to reproduce and feed. Shore birds, such as the American (h) _____, feed and nest along the shore. Many kinds of fish, such as (i) _____, are very abundant in the rich, coastal waters.

SPOT, FIDDLER, CREEKS, CRABS, EGRET



- ⑧ The (a) _____ is the largest estuary in North America. It is an important shipping and fishing center. More than 5000 cargo ships and (b) _____ enter the Bay each year from all over the world, carrying supplies of raw materials and manufactured goods. The (c) _____ industry is an important part of Virginia's economy, providing millions of dollars worth of crabs, oysters, clams, and fish.

TANKERS, SEAFOOD, CHESAPEAKE BAY



THE CHESAPEAKE BAY

- ⑨ Many industries have grown up around the Bay and more and more people are using the Bay. Because of the heavy use, (a) _____ from factories, ship spillage, sewage, and other sources is one of the greatest dangers facing the Bay. Heavy fishing pressure and beach erosion are also important problems. Good management and careful use of the Bay's (b) _____ will help preserve the Bay for future generations.

RESOURCES, POLLUTION

The water of the Chesapeake Bay flows into the (c) _____ and our journey is complete. Water from the ocean's surface (d) _____ into the air; clouds form; rain falls on the land. This process is called the (e) _____ and it replenishes the earth's supply of freshwater. Eventually, rain water flowing into the mountain streams starts its long journey to the sea once again.

WATER CYCLE, ATLANTIC OCEAN, EVAPORATES

Now that you have finished the story, "A Stream Becomes an Ocean," try answering the following questions:

1. LIST THREE DIFFERENT ANIMALS FOUND IN EACH OF THE FOLLOWING HABITATS:
 MOUNTAIN STREAM _____
 RIVER _____
 BAY _____
2. HOW DO BEAVERS AFFECT STREAMS?
3. WHY ARE MARSHES AND ESTUARIES IMPORTANT TO WILDLIFE?
4. WHY IS THE CHESAPEAKE BAY IMPORTANT TO US?
5. HOW IS SEAWATER RECYCLED INTO FRESHWATER?

While completing the previous story, you used certain words. These same words will now be used to play an ECO-BINGO GAME. Use the bingo cards below and follow the instructions of your leader.

CARD #1

OXYGEN	SEAWATER	SPAWNING	RIFFLE	SCAVENGER
NYMPH	RIVER	BEAVER	HABITAT	RECREATION
RAPIDS	PREY	FREE SPACE *****	BLUEGILL	PREDATOR
SALT MARSH	AMERICAN EGRET	TIDAL CREEK	BLUE CRAB	SPOT
ESTUARY	POLLUTION	MARINE ENVIRONMENT	WATER CYCLE	CHESAPEAKE BAY

CARD #2

ESTUARY	OXYGEN	SCAVENGER	CHESAPEAKE BAY	SEAWATER
RIFFLE	WATER CYCLE	POLLUTION	NYMPH	RECREATION
SPOT	SALT MARSH	FREE SPACE *****	SPAWNING	PREDATOR
MARINE ENVIRONMENT	RIVER	BEAVER	HABITAT	BLUE CRAB
TIDAL CREEK	AMERICAN EGRET	PREY	BLUEGILL	RAPIDS

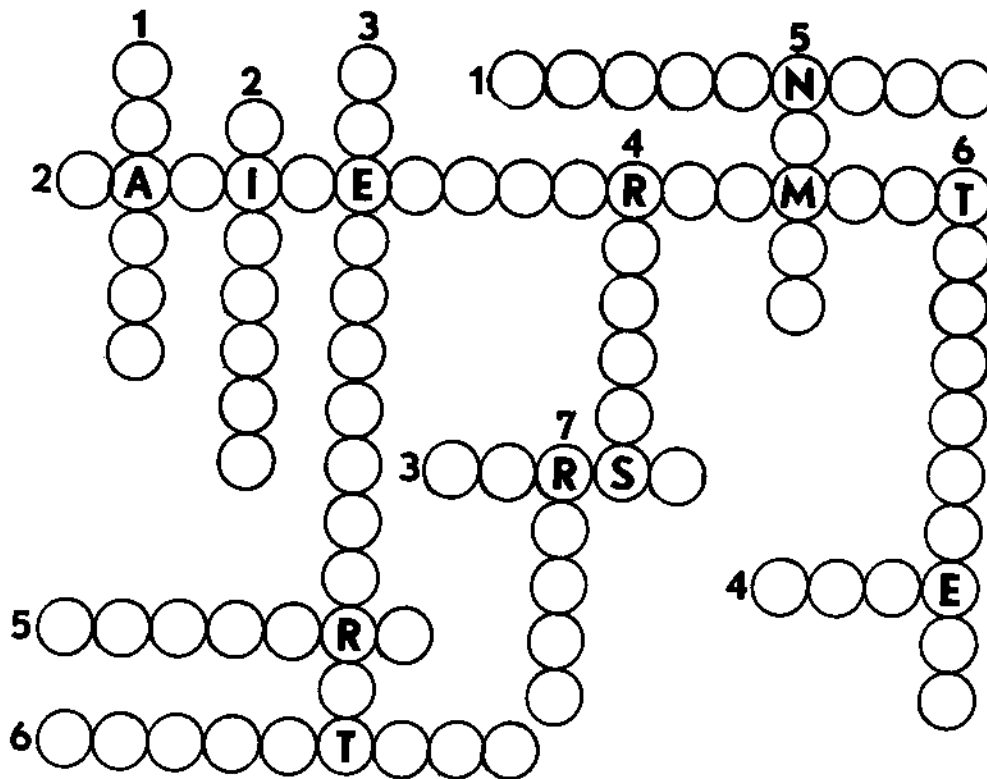
CARD #3

OXYGEN	CHESAPEAKE BAY	SEAWATER	WATER CYCLE	SPAWNING
MARINE ENVIRONMENT	RIFFLE	POLLUTION	SCAVENGER	SPOT
RIVER	TIDAL CREEK	FREE SPACE *****	ESTUARY	RECREATION
AMERICAN EGRET	RAPIDS	SALT MARSH	PREDATOR	BLUEGILL
HABITAT	NYMPH	BLUE CRAB	PREY	BEAVER

CARD #4

POLLUTION	OXYGEN	ESTUARY	SEA WATER	SPAWNING
MARINE ENVIRONMENT	RIFFLE	WATER CYCLE	SCAVENGER	CHESAPEAKE BAY
SALT MARSH	SPOT	FREE SPACE *****	BEAVER	HABITAT
BLUEGILL	BLUE CRAB	TIDAL CREEK	AMERICAN EGRET	PREY
RIVER	NYMPH	RECREATION	RAPIDS	PREDATOR

Use what you have learned from this project to complete the crossword puzzle below.



ACROSS

- | | |
|-------------------------------------|------------------------------------|
| 1. feeds on dead or decaying matter | 1. builds dams and changes streams |
| 2. the oceans, seas, and bays | 2. shallow, rocky areas of streams |
| 3. a breeding ground and nursery | 3. large, wading shore bird |
| 4. the _____ crab | 4. small, rocky waterfalls |
| 5. where a river meets the sea | 5. immature insect stage |
| 6. a danger to the Chesapeake Bay | 6. a creek affected by tides |
| | 7. larger than a stream |

If you are interested in finding out more about the ecology of streams, rivers, and the ocean, you can find these books in your school or local library.

The Life of the Marsh by W. A. Niering, 1967, McGraw-Hill, New York,

The Sea by Leonard Engel, 1963, Time Incorporated, New York,

The Silent World by Jacques-Ives Cousteau, 1953, Harper and Brothers, New York.

FIND AND CIRCLE THE WORDS LISTED BELOW IN THE WORD PUZZLE.

SALT	S P E L E C T R I C I T Y R P I T R E S	RIVER
EGRET	L C V R O B E A V E R K O E H H P R E W A	MARSH
ATLANTIC	A N A I B A R C I Y U T R S S I Y C L M	NURSERY
BEAVER	R O P V C R G R K T A O P E I C I F D R	ESTUARY
SEAFOOD	E O O E E K E E V W T N L S F T L P E E	RACCOON
PREY	N C R K V N S E R A G F W L N K I K N C	PREDATOR
SPOT	I C A B C R G K D I F S D A A O N U P R	ELECTRICITY
SPAWN	M A T L U B C E O I N K L Y P A P T A E	CRAB
RAPIDS	O R E N H C K F R L N T P O T S V P K A	PANFISH
BARK	C H E S A P E A K E A G L H A B I T A T	POLLUTION
BREEDING GROUND	D F K Y T T O P S F G L G L I D P Y T I	CREEK
TANKER	O A U L B U M N I Y U S F R S P I T Y O	MARINE
RESOURCE	M A R I N E A O U T P A L R O X Y G E N	WATER
EVAPORATE	E C R U O S E R I I L L I G E U L B C X	POND
BLUEGILL	I U Y T G H K O Y R D T C D S E N P L S	MINERALS
OXYGEN	S D T Y N H N Y S E A F O O D P H D L M	RECREATION
RIFFLES		HABITAT
CHESAPEAKE		SCAVENGER

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