girl scouts of the chesapeake bay

H2O Ocean

Resource Book

The Physical Ocean

When the Earth first formed from a swirling, thick cloud of gas and dust more than four billion years ago, there wasn't an ocean on the plant. Instead, the Earth's surface was a rocky war zone. Violent volcanic eruptions showered the atmosphere and landscape with molten rock and with steam and other hot gases.

So when and how did our ocean? That's a question that still puzzles scientists . One of the most widely believed theories claims that the steam and other gases released from these early volcanic eruptions formed a thick layer of clouds around the Earth, eventually causing torrents of rain to fall for hundreds of million of years. According to this theory, the super rainstorm filled the ocean basins by about 3.5 billion years ago.

However, a recent theory states that oceans might not have formed billions of years ago. Louis Frank, a respected space scientists, thinks the oceans have been filling gradually—the results of a four-billion-year-long bombardment of 100-ton icy comets. This bombardment, he says, is still occurring today. As these comments crash into atmosphere, they instantly vaporize, adding moisture to the air that eventually falls as rain or snow. Frank says the amount of moisture—about one ten-thousandth of an inch of water each year—is "indistinguishable from annual rainfall." But if this rate has been constant for the past four billion years or so, it would have produced enough water to have filled up the oceans.

Controversy about the ocean is nothing new. For thousand of years people have debated everything form why the ocean is salty to what causes tides. And although there are still dozens of marine mysteries waiting to be solved, scientists have come a long way in understanding what really makes the ocean "tick."

All About Seawater

If you look at a globe, you'll see that there are four major oceans in the world, together covering about 71 percent of the Earth's surface. From largest to smallest there's the Pacific, the Atlantic, the Indian and the Arctic. But if you take a closer look, you'll see that these oceans are connected, forming one giant world ocean. Although there are some physical difference among ocean areas, the ocean waters of the world mix to form one amazingly uniform pot of salty soup.

Salt in the Sea: If you let a sample of ocean water evaporate, you'll see residue of salt left behind. Most of this residue would be sodium chloride—the same kind of salt that we use on our food. But many other salts, including those of magnesium, calcium and potassium, are also in seawater.

How do these salts get into the ocean? As water flows across the land, it picks up and dissolves salts from soil and rock and eventlly deposits them into the ocean, (Many scientists think most of the Earth's original salts formed as a result of chemical reactions that occurred during volcanic activity billions of years ago.)

But the salt cycle is not a one way path. If it were, the ocean would continue to get saltier every day, which is doesn't/ Instead, salts are constantly "leaving" ocean waters: become in part of the ocean floor, getting carried into the atmosphere on evaporating water droplets and being absorbed by sea organisms. All salts, even those that leave, eventually get recycled back into the ocean—sometimes millions of years later—through geological, biological and chemical processes.

Gold and Gas: Although salts are the major dissolved in oceans water, they aren't the only ones. Seawater also contains traces of gold, silver and all the chemical elements that make up the Earth's crust. When scientist refer to the salinity of the ocean, they are talking about the amount of all dissolved solids in ocean water, including the trace elements and minerals that are not salts.

Gases, such as oxygen and carbon dioxide, are also dissolved in the ocean and can move back and forth between the sea and the air. For example, some oxygen from the air diffuses into surface waters.

Cold, Cold Water: If you live on the Gulf Coast, you might not think ocean water as being frigid. But most ocean water is cold. Only eight percent of all ocean water in the world is warmer than 50°F . And more than half is

colder than 36°F .

The warmest ocean waters are surface waters. That's because most of the energy from the sun that hits the ocean is absorbed in the top few inches. Below the surface, ocean temperature can vary greatly. As a general rule, the lower you go the colder it gets. And in the deepest parts, the water is near or below 32°F .

The Colder the Denser: Water behaved in certain ways depending on its temperature and salinity. Cold water is denser than warm water because the molecules are packed more closely together in a given volume. Salinity also increases density. So water that is cold and salty tends to sink under warmer, less salty water. And this "sinking" is a major triggering force of ocean currents.

Pounds of Pressure: Water is heavy, and the deeper you dive into the ocean water, the more pressure you'll feel. Animals and plants that live deep in the ocean are adapted to the pressure, but people aren't. And that's why they need special pressurized diving suits and capsules to explore ocean depths.

The Motion of the Ocean

Ocean water is always on the move—from the constant tumble of waves along the shore to the quiet ebb of the tide. Here's a closer look at the ocean motions:

Rivers in the Sea

The Gulf Stream, Kuroshio, North Atlantic Drift, Labrador Current and Alaska Drifts are all examples of currents or "rivers of water." that flow through the ocean in certain directions. Ocean currents can be caused by two things: steady winds blowing across the ocean's surface and difference in temperature and salinity of ocean waters.

Steady Winds: Most of the world's wind-generated currents are caused by the prevailing winds—winds that blow continuously in the same general direction. The two most predictable prevailing winds are the tirade winds, which usually blow from east to west toward the equator, and the westerlies, which usually blow form west to East in the middle latitude. One of the strongest wind-generated currents is the West Wind Drift, which travels around the Antarctic continent. (The direction that prevailing winds blow, and thus currents flow, are influenced by the rotation of the Earth.)

Hot and Cold Currents: temperature currents are caused by the differences in temperature between the cold waters of the poles and the warm waters near the equator. Cold-water currents occur as the cold water at the poles sinks and slowly moves toward the equator. Warm-water currents travel out from the equator along the surface, flowing toward the poles to replace the sinking cold water.

Mixing and Warming: currents—especially cold-water currents—circulate ocean water around the world and help mix it vertically, replenishing oxygen supplies in the lower depths and bringing nutrients to the surface. Warm ocean currents bring moderate temperatures to areas that would normally be much colder. For example, the Gulf Stream flows from the Gulf of Mexico, past the East Coast of the US, to northern Europe. Without the Gulf Stream, England and the other European countries would be as cold as Canada.

Wave Action

It's usually impossible to see a current from the ocean's surface. But that's not the case with waves. Waves constantly cause ocean waters to rise and fall as they transfer energy from one part of the ocean to another. What's a Wave?: it's easy to get confused when talking about waves because the word wave is used to describe an actual swell of water, as well as energy that moves through water. Waves can be caused by wind, volcanic activity, or earthquakes, but wind-generated waves are the most common.

Waves differ from currents in that they usually do not move ocean water forward. Instead, they transfer energy from one part of the ocean to another, and as they do this the ocean water moves up and down. A gull sitting on the surface of the water will bob up and down as a wave passed through the water, but it won't move forward.

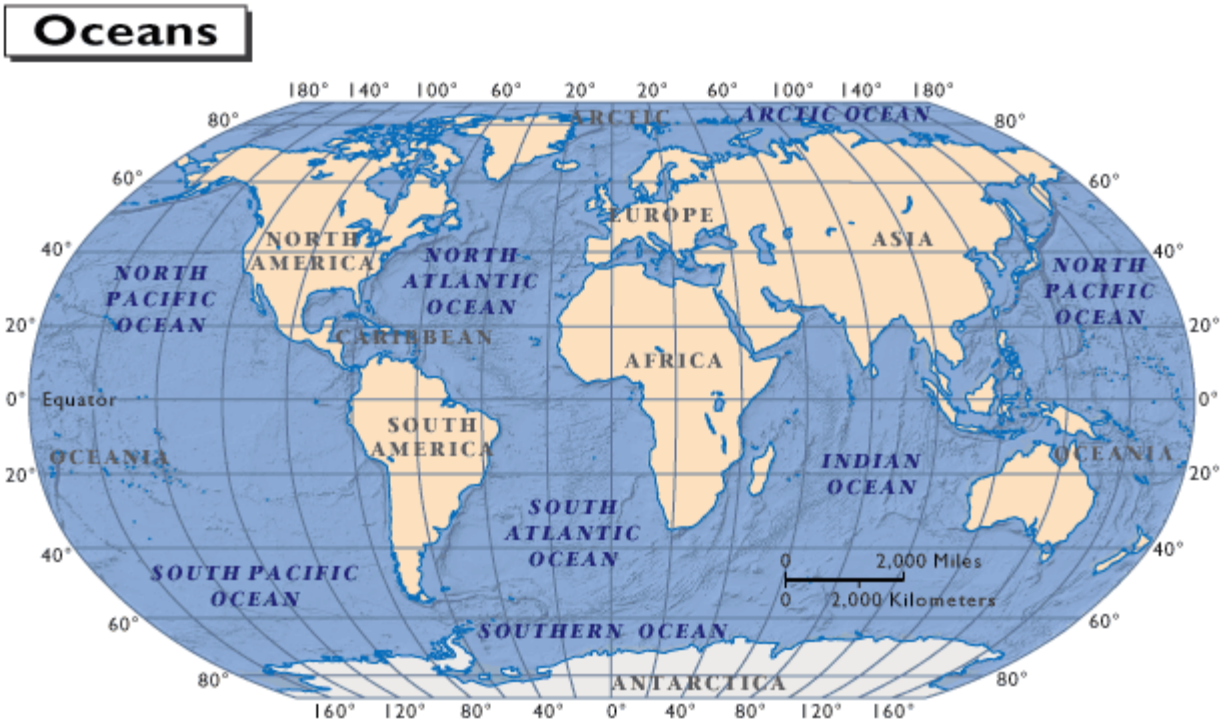
Breakers on the Beach: ocean waves do move water forward when they hit the shore. That's because when a wave reaches land, it starts to drag on the bottom. You can tell when this is happening just by watching an approaching wave. As the bottom of the wave begins to drag on the ocean bottom, the lower part of the wave slows down. But the top keeps going until it topples over, causing the wave to 'break' on the beach. These breakers pitch water, as well as sand and other types of sediment stirred up from the bottom, onto the beach.

Tide Talk

Although the wind plays a big part in most ocean motion, it does not cause tides—the slow, periodic rise and fall of ocean waters. Tides are mainly caused by the gravitational attraction of the moon and sun on the Earth.

Moon Muscle: the gravitational forces of the moon and sun are constantly pulling at the water, air and land on Earth. And because the moon is so much closer to the Earth than the sun is, it exerts a much stronger gravitational pull on the Earth than the sun does. In fact, it pulls more than two times as hard on the Earth than the sun does. This 'moon muscle' is the main reason we experience tides. But the rotation of the Earth and moon also have an affect on them, as does the size, shape and depth of ocean basins. For example, along the Atlantic Ocean, there are usually two high and two low tides a day. But the Mediterranean Sea doesn't have much tide action at all. And some places along the coast of Alaska and the Gulf of Mexico only experience one high tide and one low tide each day.

Highs and Lows: every other week, tides are much higher or much lower than at other times. This is due to the relative positions of the sun, moon and Earth. For example, when the sun, moon and Earth are aligned, the highest high tides, called spring tides, occur. That's because both the sun and moon are pulling ocean water in the same direction. But when the moon and sun are at right angles to each other, their gravitational pulls partially cancel each other, and the lowest high tides, called neap tides, occur.



Oceans All Around Us

Discuss oceans, try some demonstrations, and sing a song.

Objectives

Explain that most ocean water is very cold, that oceans cover most of the Earth and that all the oceans are connected. Name the oceans.

Materials

Construction paper

Toothpicks

Glue

Scissors

Chalkboard or easel paper

Globe

Modeling clay

Tape

Water

Three bowls

Ice cubes

Thermometer

Which covers more of the Earth's surface—land or ocean? In this activity the girls in your troop with find out while learning more about the ocean in general.

Before you get started, make four small flags by gluing small triangular or rectangular pieces of construction paper to four different toothpicks. Number the flags from one to four. Also make an equal number of one-inch brown 'land' and blue 'ocean' squares by cutting apart different-colored sheets of construction paper. (For a globe that's twelve inches in diameter, you should make one hundred of each color.) Then make some smaller 'land' and 'ocean' pieces by cutting a few of the squares in half. The girls will be covering a globe with these squares and half-squares later.

Now begin by asking the girls what they know about the ocean and listing their ideas on a chalkboard or sheet of easel paper. Then discuss oceans in greater detail by doing each of the demonstrations below. (You may want to spread the demonstrations out over a few days.)

Afterward review what the girls have learned by singing the song. Then ask them if there's anything they'd like to change or add to the list they made earlier.

Do Some Demonstrations

One World Ocean

Begin by showing the girls a globe and pointing out your location on it. then point out and name each of the four major oceans. (Pacific, Arctic, Atlantic and Indian.) As you name each ocean, put a small lump of clay somewhere on it and stick one of the numbered flags you made earlier into the clay. You should number the oceans in such a way that the kids can travel from 1 to 4 without passing through the same ocean twice. Once way to do this is to number the oceans as follows: 1– Pacific; 2– Arctic; 3-Atlantic; 4-Indian.

Now ask the girls if they think it's possible to travel completely around the world without touching land. Then challenge one or two girls to trace a path from ocean to ocean by going in order from flags 1 to 4 and then from flag 4 directly to 1. (Make sure they travel only across water.)

Afterward point out that even though different areas of the ocean have different names, They're all connected into one giant ocean.

The Water Planet

Have the girls look at the globe for a few minutes and decide if they think the Earth is covered mostly by ocean or land. Then tell them that they're going to compare the amount of land with the amount of ocean.

First divide the troop into two teams– the 'landlubbers' and the 'sea dogs'. Give each girls on each team some of the colored squares you made earlier and give one girls on each team all of the half-squares. Give all the Landlubbers land squares and all the Sea Dogs ocean squares. Be sure to pass out all of the squares. Explain to the kids that you've passed out an equal number of squares to both teams.

Now have the Landlubbers work in pairs to tape their squares in rows over all the land on the globe. (Tell them to cover lakes and rivers too.) have the girls with half-squares go last to fill in any gaps. Then let the Sea Dogs cover as much of the ocean as they can with their squares, again having the girls with half-squares go last. (Note: Explain to the girls that their squares should touch sides but not over lap. It's OK if there are small gaps between the squares on the globe. And it's OK if their squares are partly on land and partly on ocean as long as each Landlubber square is mostly on land and each Sea Dog square is mostly on ocean. For example, the Landlubbers shouldn't cover small islands in the ocean—they should leave them to the Sea Dogs.)

When all of the girls have finished taping their squares to the globe, have them take another look at it. Ask them how much land they can see and how much ocean. (Almost all of the land should be covered but most of the ocean should be showing.) then ask them again if the earth's surface is covered mostly by ocean or land. (ocean) is there just a little more ocean than land or a lot more? (a lot more)

Cold, Coder, Coldest

Place two bowls in the middle of a small table and label one A and the other B. Fill bowl A with water that's between 65 degrees Fahrenheit and 75 degrees Fahrenheit. Fill bowl B with water that's below 36 degrees Fahrenheit. Place bowl B inside a second, larger bowl that's filled with ice cubes.

Now have the girls gather around the table. Tell them that the two water samples represent water taken from different parts of the ocean. Have them take turns feeling the temperature of each sample by putting their fingers into each of the bowls which sample do the kids think is most like temperatures way down deep in the ocean? (sample B) which do they think is most like temperatures in most of the ocean? (sample B)

Afterward point out that shallow, coastal waters that people go swimming in are warmer that most ocean waters and can be as warm or even warmer than the water in bowl A was. So can surface waters in the open ocean. But most of the water is the ocean is very cold—as cold as or colder than sample B was.

Sing a Song

Sing to the tune of "My Bonnie Lies over the Ocean."

The Earth is all covered with ocean.

The Earth is all covered with sea.

The Earth is all covered with ocean.

More water than land, don't you see?

Chorus:

Water, water, there's water all over the world, the world.

Water, water, there's water all over the world.

So salty and cold is the ocean.

So salty and cold is the sea.

So salty and cold is the ocean.

Too cold and too salty for me.

Repeat Chorus

Atlantic, Pacific, the Arctic,

And then there's the Indian too.

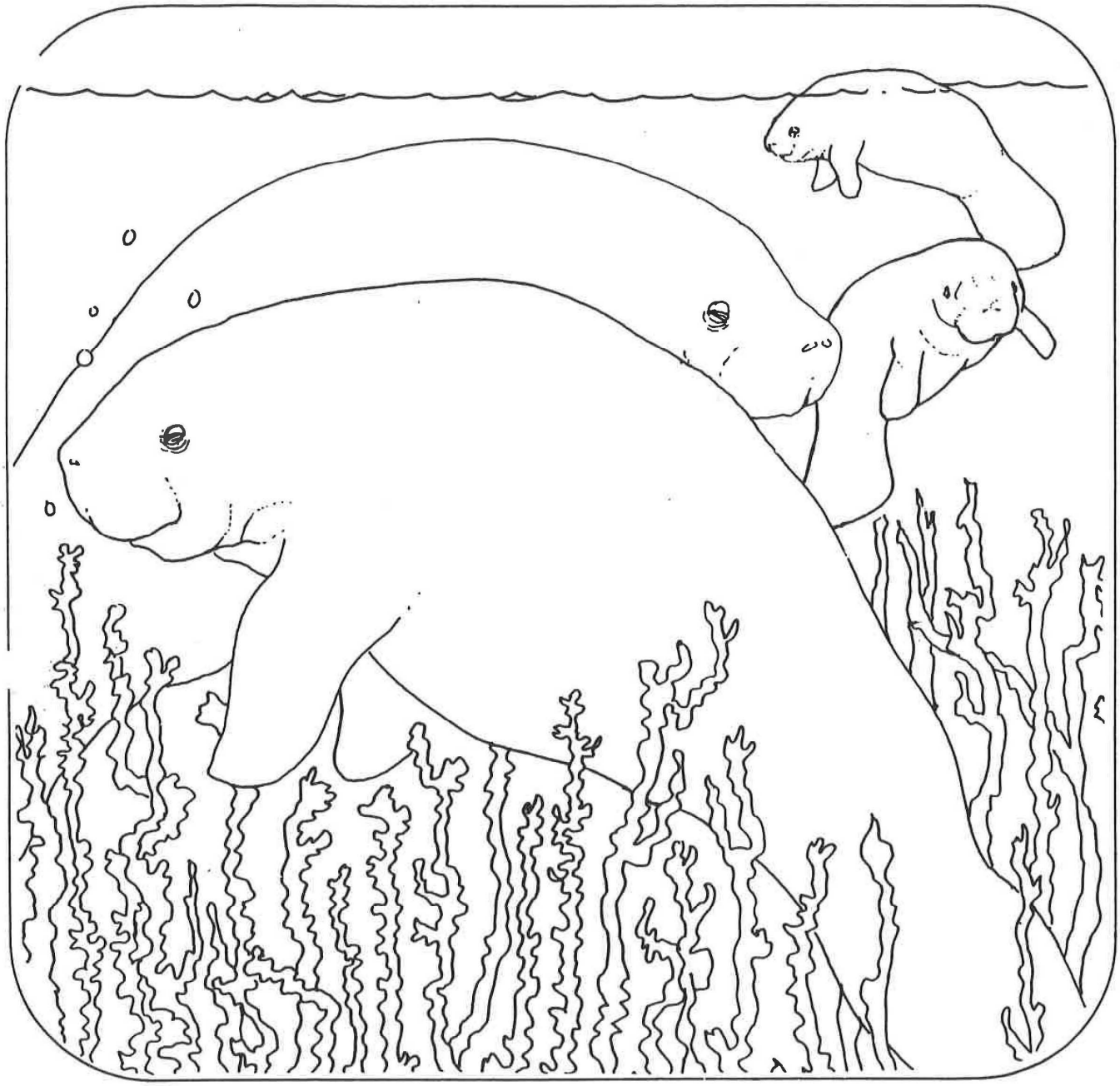
These oceans all cover our planet.

I named all of them, now can you?

Repeat Chorus

Florida Manatee

This gentle animal lives in the coastal waters of Georgia, Florida and Puerto Rico. It is about 10 feet long and can weigh up to 2,000 pounds—as much as a car! Manatees eat only plants. After eating, they may swim to the bottom and rest for a while. Manatees can hold their breath for up to 12 minutes at a time.

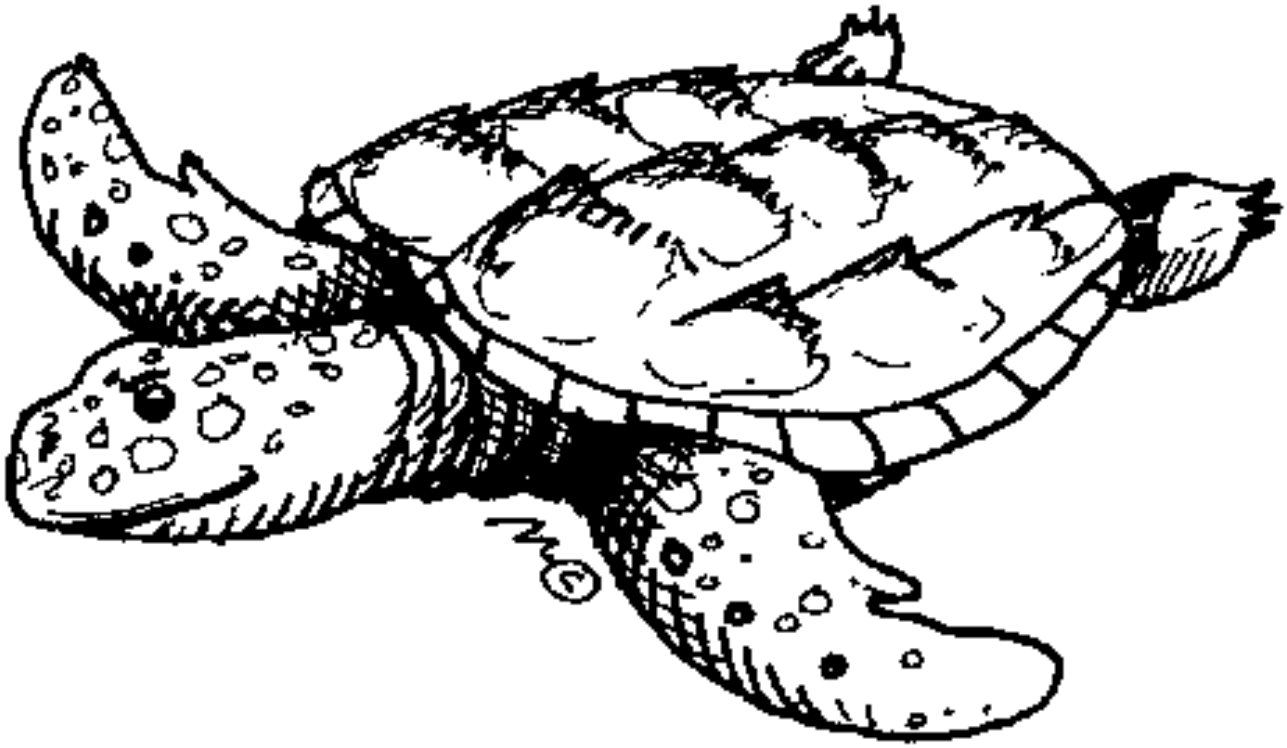


Sea Turtle Questions

Complete the following sentences:

1. The green turtle is named for the color of the _____ under its shell.
2. The leatherback turtle can reach a weight of up to _____ pounds!
3. Loggerhead turtles are primarily carnivorous and eat things such as _____, _____ and _____.
4. _____ and _____ turtles can be found in the Atlantic Ocean.
5. There are _____ living species of sea turtles.
6. Leather backs eat almost exclusively on _____ and can live in water below degrees.
7. _____ are the most endangered of all sea turtles.
8. These turtles are endangered because people kill them for their beautiful shells to make jewelry:

   _____
9. Incubation of turtle eggs takes about _____ days.
10. Only about _____ in _____ baby turtles survives to adulthood because of being eaten by other animals or ingesting trash such as tar balls or plastic.



Answers:
1. fat; 2. 1,300; 3. horseshoe crabs, clams and mussels; 4. olive ridley, hawksbill or loggerheads; 5. seven; 6. jellyfish, forty; 7. kemp's ridley; 8. hawksbills; 9. sixty; 10. one in 1,000

A Scavenger Hunt

Before your trip, modify the scavenger hunt list below to fit the level of your troop. Make enough copies for everyone. When you get to the aquarium, give each person a pencil, a copy of the list and a clipboard. Tell the girls that their goal is to find an animal or plant that fits each clue on the list. They should base their answers on the appearance of the organisms that they see and on any written information at the displays. They can write the name of the plant or animal next to the clue it fits and/or they can sketch it on the back of their paper.

After the trip, go over the results of the scavenger hunt as a troop. And as a follow-up, you may want to have the girls make a mural showing the variety of life they saw at the aquarium.

Scavenger Hunt Clues: as you walk through the aquarium, try to find:

An animal that blends into its surroundings

A species of fish in which the male and female are different colors

An animal that can change colors

A very flat fish

An animal that produces light

An animal that lives in a shell

An animal that's attached to something else

An animal that eats other animals

An animal that looks like a plant

An animal that spends most of its time on the bottom of the ocean

A type of seaweed

An animal that escapes enemies by swimming very quickly

An animal or plant that drifts near the surface

An animal that must go to the surface to breathe air

An animal with tentacles

An animal that spends part of its time in water and part of its time on land

A brightly colored animal

An animal or plant that lives on the shore

An animal that's smaller than an apple

An animal that escapes enemies by hiding in the sand

An animal that escapes enemies by hiding between rocks

A fish that swims in a school

A plant that's attached to the bottom

An animal with more than two eyes

Plastic in the Sea

Discuss plastic pollution and interpret data about plastic dumping in the ocean.

Objectives

List several ways ocean dumping harms wildlife. Describe several ways people can cut back on their use of plastic.

Every year, approximately 14 billion pounds of tires, cardboard boxes, plastic cups, bottles and other trash are dumped into the ocean. Some of the trash sinks, so of it is eaten by ocean creatures and a lot of it—especially plastic—floats. All of the trash can create problems for wildlife and people. But the floating plastic, most of which takes years to break down, can be especially harmful. Your group can find out why plastic dumping is a problem by interpreting data from a beach cleanup and by investigating their own use of plastic.

Part 1: Putting Plastic in Perspective

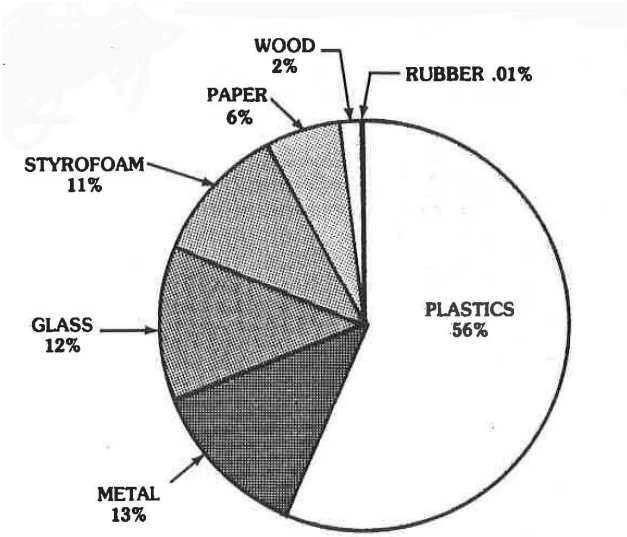
Start by telling the troop they are going to explore some of the problems that occur because of ocean dumping—in particular, the dumping of plastic. To find out what your girls already know about ocean dumping, divide the troop into teams of four or five and give each team the following questions to discuss:

What types of trash have they seen washed up on the beach? What's the most common material? (if they haven't been to a beach, ask them to list things they think might wash up onto beaches.)

How do they think the trash got on the beach?

How do they thin their community disposes of trash?

What are some ways that ocean dumping harms people and wildlife?



After the teams have had a chance to discuss these questions, have each team present their answers to the rest of the girls. Then lead a discussion about wastes and waste-dumping, using the following information:

Trash is disposed of in several different ways. Some trash is burned in incinerators and some is carted away to land-fills. And garbage on ships is often simply dumped into the ocean.

Plastics, metals, chemicals, paper, food and many other types of wastes are dumped into the ocean.

Ocean dumping can harm wildlife in many ways. For example, dumping toxic chemicals into water can poison fish, shellfish and other creatures. And plastic waste can cut, tangle, poison and strangle turtles, seabirds, sea mammals and other marine life. (See page 10 for more about the ways plastic can harm wildlife.)

More than half of the trash that washes up on beaches is plastic. (Many plastics float, and many don't break down for hundreds of years or longer.)

Items Collected in 1986 Texas Coast Cleanup

Material	Number of Items	% of Total
plastics	95,560	56%
rubber	20	0.01%
glass	20,040	12%
Stryofoam	19,280	11%
metal	22,100	13%
paper	10,340	6%
wood	4160	2%

Data courtesy of the Center for Marine Conservation, Washington, DC.

Part 2: Plastic in our Lives

To help get your girls thinking about how prominent plastic is in our daily lives, try these activities:

Plastic Supermarkets: take your troop on a trip to a supermarket to have them 'check out' food packaging. Divide the troop into teams of four or five and assign each team a different aisle to investigate. Tell them to make a list of the types of grocery items they see and how each one is packaged. To show the kids that plastic wrapping is often 'hidden,' you might want to buy one or two items that are packaged in cardboard with plastic liners inside. (Examples include certain types of cereals and frozen pouch dinners.) if it's too difficult to get your group to a supermarket, you can make assignments and have the girls go to the store with their parents or just look at products they have at home.

Plastic Journals: have each girls keep a journal for several days. Ask the girls to keep track of the types of products they use every day, and what types of plastic products they throw away. Also have them note how other people use and dispose of plastic.

Things to Think About: after doing the two previous activities, have the troop break up into their original teams. Then pass out copies of the plastic facts below. Have the girls use the facts on the sheet, as well as the information they gathered in the supermarket search and by keeping journals, to help them brainstorm some ideas about the following:

What are some ways that people can cut down on the amount of plastic they use? What are some alternatives to plastic products?

What are some ways plastic is harmful to wildlife?

Will sponsoring beach cleanups solve the problem of plastic pollution? Why or why not?

If you could pass a law in your community about plastic trash disposal or clean up, what would the law say?

What type of plastic-related research would you like to see conducted?

Branching Out: Clean Up Your Beach

Sponsoring a beach cleanup is a terrific way to introduce your community to the problems of ocean dumping. Many coastal states have regular beach cleanup programs and Adopt-a-beach programs that you can get involved with. In addition, many communities sponsor cleanups of stream, river and lake shorelines.

Plastic in the Sea—Plastic Facts

Young seals often play with plastic six-pack rings and get the bands caught around their necks. These bands can strangle them as they grow.

Over 14 billion pounds of trash is dumped into the ocean every year. A large percentage of this trash is plastic.

Small pellets, beads, cylinders and other types of raw plastic are dumped or spilled into the ocean. Seabirds often mistake this plastic for fish eggs, fish eyes or plankton and sometimes die from eating it.

Some states have banned non-biodegradable plastic six-pack rings.

Some plastics contain PCBs—chemicals that cause some birds to lay thin-shelled eggs that break easily.

Every year millions of pounds of plastic fishing nets, buoys, lines and other gear is lost at sea.

Sea turtles often feed on plastic bags, mistaking them for jellyfish. Many of these turtles eventually starve to death because the plastic clogs their digestive system.

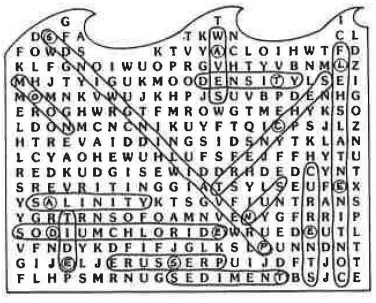
Over 30,000 northern fur seals die each year after becoming entangled in plastic nets and plastic six-pack rings. They die of strangulation, starvation, drowning or exhaustion.

Most plastic is not biodegradable. That means it takes many years for the plastic to break down or disintegrate.

Scientists have developed some biodegradable plastics. However, not enough research has been done to know if these biodegradable plastics break down into safe substances.

Some communities are experimenting with plastic recycling, but it is still very expensive.

In late 1988, an international treaty took effect that restricts plastic ocean dumping by the nations that ratified it—including the US.



Questions and Clues

Research some ocean topics and solve an ocean puzzle.

Objectives

Define tides, currents and waves. Discuss some ocean facts.

Materials

Copies of Copycat Page—Question and Clues Word Search

Chalkboard or easel paper

Reference books

Pencils

By using research to complete a word– puzzle, the girls in your troop will learn about waves, tides, currents and more. Begin by dividing the troop into four or five teams and explain that each team must research the following topics:

Tides, currents and waves and what causes each phenomenon

Features of the ocean bottom

Salinity/composition of seawater

Tell the girls that the information they find about these topics will help them complete a puzzle.

Give the teams plenty of time to do their research and encourage the kids in each team to split up the work. When all the teams are finished, pass out a copy of page 15 to each child. Explain that each person should use The information his or her team collected, along with the words at the bottom of the page. (Team members can work together to complete the clues. Point out that there are more words to choose from than blanks to fill in.)

When everyone has finished, go over the clues using the answers provided below. Also use the background information on pages 1-2 to talk about tides, waves and currents with the girls . Then tell the girls that the word-find contains all of the words and phrases that the girls used earlier to fill in the blanks in the clues. But each of these words and phrases is missing one to two letter. (For example, the word 'currents' in the puzzle is written 'currOnts') the girls should find each word, circle it and write the missing letter in the appropriate space. (For example, they would fill in 'e' in the circled space in 'currents'.) tell them not to look for the words they didn't use in the clues.

When the girls have found all the words and filled in their missing letters, tell them that the puzzle also contains three secret words. Then write the 'mystery facts' listed below onto the chalkboard or a piece of easel paper and explain that each of the three secret words in the puzzle has something to do with one of the mystery facts.

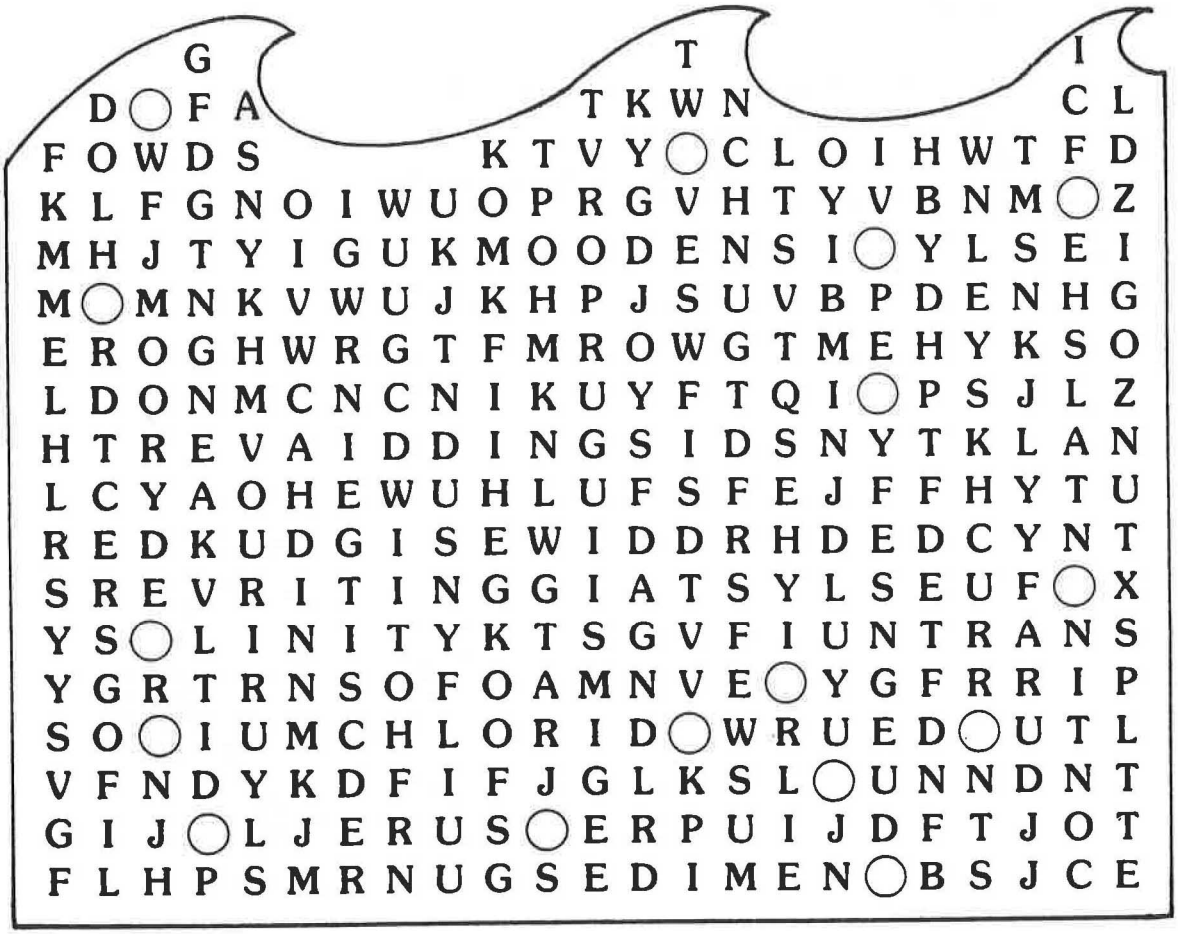
To find the secret words, the girls should read all of the circled letters in order from left to right and top to bottom. They should be able to read the words 'salt', 'ocean' and 'deepest'. Then go over which secret word goes with which mystery fact. Explain that 'salt' goes with 3 1/2 percent, 'ocean' goes with 71 percent, and 'deepest' goes with Mariana Trench. Next tell the kids that, based on the research they did earlier, they should try to come up with a question that has something to do with each secret word. The answer to each question will be one of the mystery facts. For example, 3 1/2 percent is the answer to the question, 'by weight, what percentage of the ocean is made up of salt?' 71 percent is the answer to the question, 'what percentage of the Earth is covered with ocean?' and Mariana Trench is the answer to the question, 'where is the deepest place in the ocean?' (or 'where is the deepest spot on the surface of the Earth?')

Answers: 1—tide; 2—waves; 3—moon; 4—currents; 5—prevailing winds; 6—density; 7—sodium chloride; 8—pressure; 9—salinity; 10—sediment; 11—trenches; 12—continental shelf

Questions and Clues Word Search

1. The slow, periodic rise and fall of water in the ocean is called the _____.
2. _____ transfer energy from one part of the ocean to another. Wind, earthquakes and volcanic eruptions can cause them.
3. Tides are caused by the gravitational attraction between the Earth and the _____ and the Earth and the _____.
4. _____ in the ocean may be caused by wind or by density differences of ocean water. They are sometimes called 'rivers of the ocean.
5. Currents at the surface of the ocean are caused mostly by _____.
6. Deep-ocean currents are caused by differences in the _____ of the water.
7. Most of the salt in the sea is the same as ordinary table salt. This salt is called _____.
8. The tremendous _____ deep in the ocean is created by the weight of water.
9. The total amount of dissolved solids in the water is called _____. Almost all of the dissolved solids in seawater are salts.
10. In some areas, the ocean floor is covered by a thick layer of _____, which is made up of the remains of dead plants and animals, as well as other material.
11. The deepest points on the surface of the Earth are found in _____ in the ocean.
12. The gently sloping edge of a continent is called the _____.

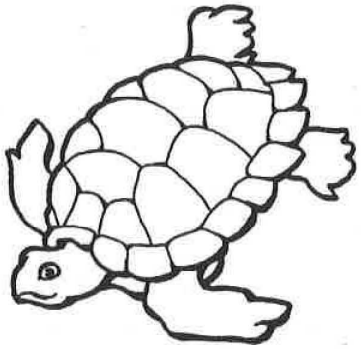
Currents waves continental shelf density trenches continental rise salts salinity sodium chloride prevailing winds oxygen velocity pressure upwellings breakers mid-ocean ridges tides mars moon sun sediment sand



Just for Fun—Turtle Tides

What do you think this turtle is doing? With your crayons or colored pencils, draw in a background to tell a story about this turtle. Is this a female turtle getting ready to nest? Or a turtle looking for food? Is this turtle swimming with other ocean creatures? Or just looking for a place to take a nap?

Leader: make copies of this page for each girl. This is not part of the requirements for the patch.



Turtle Anagrams

An anagram is a puzzle in which you make new words from one original word. To follow are the common names of four different species of turtles that are found in the US waters. See how many new words you can create from these names.

Loggerhead	Kemp's Ridley	Leatherback	Hawksbill
1. _____	1. _____	1. _____	1. _____
2. _____	2. _____	2. _____	2. _____
3. _____	3. _____	3. _____	3. _____
4. _____	4. _____	4. _____	4. _____
5. _____	5. _____	5. _____	5. _____
6. _____	6. _____	6. _____	6. _____
7. _____	7. _____	7. _____	7. _____
8. _____	8. _____	8. _____	8. _____
9. _____	9. _____	9. _____	9. _____
10. _____	10. _____	10. _____	10. _____
11. _____	11. _____	11. _____	11. _____
12. _____	12. _____	12. _____	12. _____
13. _____	13. _____	13. _____	13. _____
14. _____	14. _____	14. _____	14. _____