NATURAL DISASTERS

EARTH SCIENCE READINGS

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PUBLISHER
PORTLAND, MAINE

CONTENTS

TO THE TEACHER

Almost every day, a natural disaster makes headlines somewhere in the world. The 1990's have had their share of tragedies caused by natural disasters.

- Hurricane Andrew hit Florida in August 1992, causing the greatest property damage of any natural disaster ever to hit the United States.
- The eruption of Mount Pinatubo in June 1991 in the Philippines was the largest volcanic eruption of the twentieth century.
- A cyclone followed by a storm surge roared up the Bay of Bengal toward Bangladesh in April 1991, killing at least 150,000 people in that flood-prone country.
- The Yangtze (Chang) River in central China flooded in 1995. Between May and July, 1200 people died in the extensive flooding.
- In Russia, an earthquake measuring 7.5 on the Richter scale occurred in May 1995. It flattened the town of Neftegorsk, killing thousands of people.
- An earthquake in northern Iran in June 1990 killed 36,000 people.

Other natural disasters appear less dramatic but are often even more deadly. In the African Sahel, millions have died from disease and starvation as a severe drought has lingered for years. Chronic droughts plague other areas of the world, including India, Australia, and the American West.

The number of deaths and the amount of property damage from natural disasters is on the rise around the world. The less-developed countries suffer 90 percent of the deaths from natural disasters, because of their huge populations and poor standards of living. Developed nations usually suffer fewer deaths but have enormous losses of property. Today, countries around the world are much more interdependent than they used to be. So, a disaster in one affects not just that country but others as well.

With all the scientific advances of the past century, we still have little ability to predict or control natural disasters. In fact, scientists have only a sketchy understanding of the causes of most natural disasters.

We may never fully understand the causes of all natural disasters. But we can improve our chances of surviving a natural disaster by being aware of those likely to occur where we live and by being prepared ahead of time for them.

Thus, the purpose of *Natural Disasters* is to explain what scientists believe to be the causes of a variety of natural disasters and to suggest steps you and your students can take to be better prepared in the event of a natural disaster.

How to Use This Book

Natural Disasters is a reproducible teacher book containing both student sections and teacher sections. Each teacher section includes vocabulary, an answer key, and information pertaining to the student section that follows it.

The student sections contain short reading selections followed by a Review page containing comprehension questions. Each Review includes factual recall questions as well as comprehension and application questions. You may wish to instruct students to write their answers to comprehension and application questions on the back of the sheet or on a separate piece of paper.

Three sections following each unit contain further information, suggested student activities, and a list of vocabulary words with definitions.

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You can present all the units in *Natural Disasters,* or you can use only selected units, as time permits.

Teacher's Guide for pp. 66–68

This teacher material covers the following reading selections:

How Are Hurricanes Formed?
How Do Hurricanes Kill?

Vocabulary (See page 75 for definitions.)

baguio
condense
cyclone
evaporate
eye of hurricane
low-pressure area
satellite
storm surge
typhoon
willy willy

Answer Key (Review 2, p. 68)

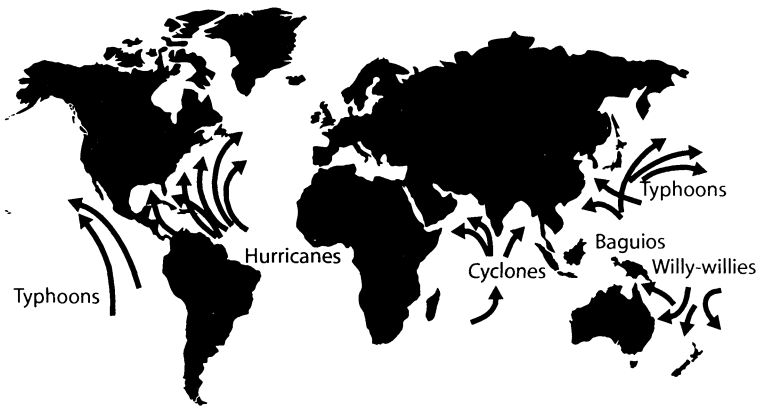
1. baguio (Philippines); cyclone (Indian Ocean); typhoon (China Seas); willy willy (Australia)
2. off the west coast of Africa; in the Caribbean Sea; in the Gulf of Mexico
3. Water evaporates from the warm ocean. The warm air rises. Cool air rushes into the resulting low-pressure area, whirling upward. As the rising air cools, water vapor condenses, forming clouds around the eye.
4. 74 mph or greater
5. so that large amounts of water evaporate into the air
6. wind; floods; storm surge
7. storm surge
8. The eye is calm. The sun may be shining.
9. They are coming from the opposite direction and often destroy objects weakened by the first winds.
10. It is huge amounts of water that have been sucked up by the hurricane and carried along with it. It may be 30 feet high when it reaches the land.

Answers for the following will vary.

11. People can protect themselves to a degree from high winds by seeking appropriate shelter. There is no protection from a 30-foot-high wall of water due to the enormous force it exerts as it batters into everything in its path.
12. Many people do not tie down their mobile homes correctly. Even a mobile home that is correctly anchored is much more vulnerable to being blown over or crushed than a permanent structure.

Additional Information on Paths of Hurricanes

This map shows paths usually taken by hurricanes. Using a large world map, show students where hurricanes are most likely to hit.



How Are Hurricanes Formed?

The word hurricane comes from the Spanish word *huracán*, meaning evil spirit. The word huracán comes from the name of the Mayan storm god *Hunraken*. Ancient tribes believed that the gods sent hurricanes to show great displeasure with the people. Around the world, there are other names for a hurricane. In the Philippines it is known as a *baguio*. In the Indian Ocean, it is a *cyclone*. In the China Seas it is a *typhoon*. And in Australia, it is a *willy willy*. Whatever the name, the storms are the same.

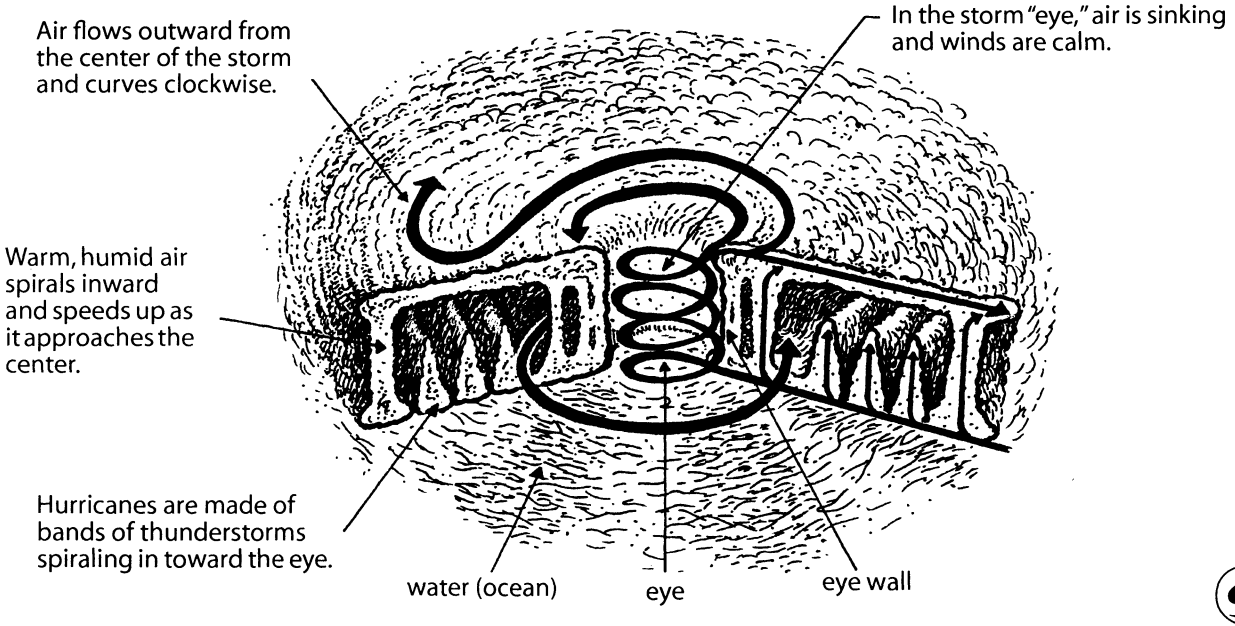
Hurricanes that hit North America are usually born in the warm waters off the west coast of Africa. They may also start in the Caribbean Sea or the Gulf of Mexico.

In the late summer and fall, the ocean is very warm. The air over the ocean is full of moisture. These are the conditions hurricanes must have to form. The main hurricane season runs from July to October.

The sun shining on the ocean causes much water to evaporate into the air. A current of warm, moist air rises. This makes a low-pressure center on the surface below. Cooler air rushes into this low-pressure area and whirls upward. This makes a whirlpool of air that spirals in and upward in the center. As the warm, moist air rises, it cools. As it cools, the huge amounts of water vapor condense and form gigantic clouds all around the calm central eye.

Sometimes, these clouds break up. Then a thunderstorm results. But other times, the storm continues to grow. It moves over the ocean picking up more water vapor. Its winds increase.

Many tropical storms die at sea. This happens when the storm travels over cooler water or a land mass. But other storms continue to build strength. When the winds reach 74 mph, the storm has become a hurricane. Still it can grow. Its winds can reach up to 200 mph.



How Do Hurricanes Kill?

Hurricanes carry three forces of destruction: wind, flood, and storm surge.

Wind

Satellite photographs of hurricanes show masses of clouds spinning around a quiet eye in the center. In the eye, the winds are calm. The sun may even shine. But in the walls around the eye, the winds whirl at speeds of up to 200 miles per hour. As the eye passes over an area, the storm appears to be over. But the worst is yet to come. Soon the hurricane strikes again. The winds on the second side come from the opposite direction. Objects damaged by the first winds are often destroyed by the second winds.

At 200 mph, hurricane winds have awesome power. No person can walk in such a wind. Few buildings can withstand these winds. Mobile homes are the first to go. Toppled trees crush people and buildings. Everyday objects such as bicycles or tools become weapons of destruction as they fly through the air at great speed.

Flood

Hurricanes carry huge amounts of water in their swirling clouds. As they move inland, possibly far from the sea, they begin to dump their water. The water in streams rises. Great flooding may occur. Hurricane Camille held its rains until it had traveled all the way from the Gulf Coast of Mississippi to Virginia. There it dumped 2 feet of rain in just 8 hours; 155 people died from the flash flooding that resulted.

Storm Surge

The eye of a hurricane may be 25 to 50 miles across. Inside the eye is a huge low-pressure area. This area serves as a straw. It sucks up vast amounts of water from the ocean. This water is carried along by the hurricane as it reaches land. This is called the storm surge.

As the storm approaches land, billions of tons of water begin to pile up under the eye. When it hits the land, the storm surge may be 30 feet high. It engulfs everything in its path. It may continue its roll of destruction 20 or more miles inland. Most deaths in hurricanes are caused by storm surges. The only protection is to get away from it.

Wind, flood, and storm surge. Combined, these make hurricanes a deadly force of nature.

Name _____

Date _____

HURRICANES
REVIEW 2

Get the Facts

1. What are some other names for hurricanes?

2. Where do most hurricanes that hit North America start?

3. Describe how hurricanes form.

4. How fast must winds be for a storm to be called a hurricane?

5. Why must the ocean water be warm for a hurricane to form?

6. Name the three forces of destruction brought by a hurricane.

7. Which of these three forces causes the most deaths in a hurricane?

8. Why does the eye of the hurricane fool many people into thinking the storm is over?

9. Why are the winds on the second side of the hurricane so destructive?

10. What is a storm surge?

What Do You Think?

11. Why do you think most hurricane deaths are caused by drowning rather than by high winds?

12. Why are mobile homes so dangerous in storms?

Teacher's Guide for pp. 134–136

This teacher material covers the following reading selections:

What Is a Drought?
What Causes Drought?

Vocabulary (See page 144 for definitions.)

desert
desertification
drought
monsoon
semiarid land

Answer Key (Review 2, p. 136)

1. It can last for years and leads to massive deaths from starvation and disease.
2. Rainfall is far below normal over a length of time.
3. It must be far less than is normal for that area.
4. Deserts normally get very little rain.
5. During the good years, people can make a living there. When drought arrives, it brings much hardship.
6. the pressure of population
7. semiarid lands turning into deserts
8. (any three) overworking the soil; stripping land of trees and grasses; overgrazing; wasting water

Answers for the following will vary.

9. These people are very poor and would lose everything if they moved. They tend to stay in the area where they were born.
10. They could plan ahead by stockpiling food, digging wells, and building dams. They should conduct studies of the ecology of their country and implement farming methods which will conserve water and soil. They could aid people in building terraces, replanting forests, etc.

Additional Information on Weather, Geography, and Drought

- There is always the same amount of water on earth. But it moves from place to place in the water cycle. The heat of the sun causes water to evaporate from oceans and other bodies of water. This water forms clouds. Rain or snow falls from the clouds. It lands on the soil or in the oceans. The cycle repeats.
- The sun is the major influence on the earth's weather. It causes seasons, precipitation, and winds. Thus, changes in the sun's energy cycles bring changes in our weather, including droughts.
- Scientists can study the history of droughts by looking at tree rings. Thick rings mean good weather. Thin rings mean drought.
- Deserts and drought-prone areas are more likely to occur on the side of a mountain away from the sea. Clouds tend to drop their rain on the seaward side of the mountains before they pass over the mountains.
- Areas closer to the sea tend to get more rain. As clouds are carried inland for miles and miles, they gradually lose moisture. That is why many desert and arid regions occur at about 30 degrees latitude (see map on page 134).
- Drought is a problem in many developing countries. Many of these countries are located in areas where rainfall is not reliable. The lands bordering the Sahara Desert in Africa (for example, Ethiopia) suffer extreme droughts. China and India are two other countries that have lost millions of lives to droughts.

What Is a Drought?

Drought is not a sudden, spectacular natural disaster like a volcanic eruption or an earthquake. Drought creeps up slowly. It often goes unnoticed until water supplies dry up and crops fail. In fact, drought is the worst of all disasters because once it sets in, it can last for years. Prolonged drought often leads to mass starvation and death from disease. Throughout history, more people have died because of droughts and their effects than from any other kind of natural disaster.

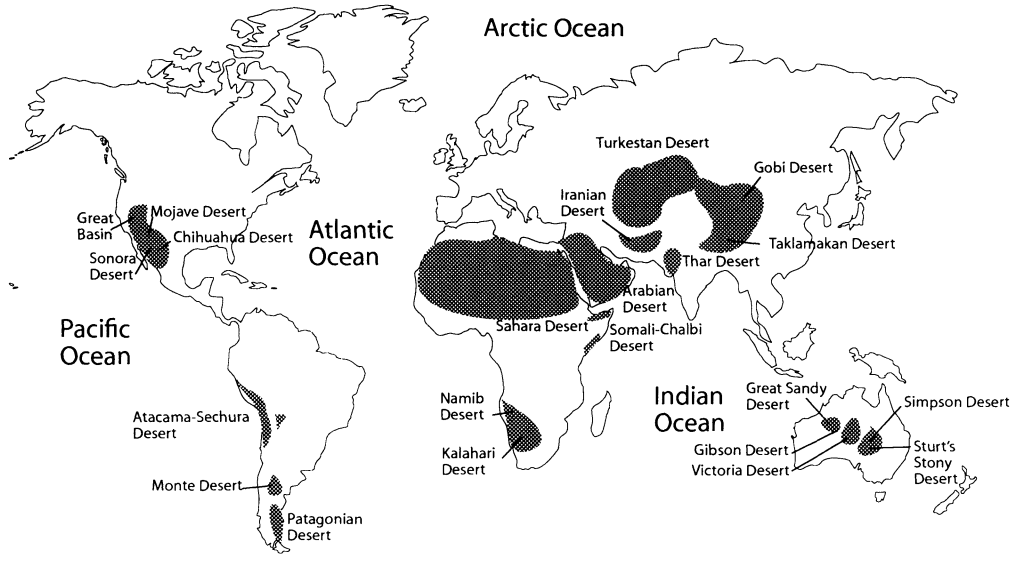
Drought does not mean that an area gets no rain. It means that rainfall is far below normal over a great length of time. And the result is not enough water to support the life in that area.

The term drought means different things in different climates. If a desert normally gets less than 10 inches of rain per year, 10 inches is not a drought there. But in a rain forest that usually gets 100 inches of rain in a year, 20 inches would be a drought since plants there need more water to grow. Thus, droughts can happen anywhere.

When most people think of drought, they mistakenly think of deserts. Deserts are vast sandy areas with little or even no rainfall in a year. True deserts, which make up about one third of the world's land, have remained deserts for thousands of years. Few people live on a desert. So it is meaningless to speak of droughts in a desert.

Semiarid lands, which often border deserts, are actually the lands at greatest risk from droughts. These marginal areas get enough rain to allow some crops or livestock to be raised. In years of good rainfall, people can live fairly well on these lands. Populations grow, and more and more people move onto semiarid lands. But the drought years always come. And they bring great hardship to those living there.

Across the world, more semiarid lands appear to be turning into deserts. This process is called *desertification*. Some of this spreading of deserts may be due to changes in the climate of our earth. But people play a big part in this process. They overwork the soil. They strip land of trees and grasses. They allow livestock to overgraze. And they waste water.



Earth's Deserts

What Causes Droughts?

Scientists don't yet understand all the causes of every drought. There are several different theories.

Many scientists believe that droughts are related to sunspots. When there is low sunspot activity, the weather is cooler than average. The oceans are not warmed as much as usual. With cooler oceans, less water evaporates into the air. With less moisture in the air, less rain falls on the land.

Other scientists say volcanic eruptions cause droughts. Huge amounts of ash in the air block sunlight and cause the oceans to cool. Some scientists believe that pollution has the same effect.

A third group of scientists point to the earth's magnetic field. Changes in this field alter wind and water currents. This causes rain to fall in different patterns.

Seasonal droughts are caused by the failure of the monsoons. In India and south Asia, the monsoon season falls between June and September. During this time, moisture-laden winds usually blow over the country from the Indian Ocean. Usually, the start of the season is very predictable. But when strong west winds blow over the Indian Ocean, the rains end up falling in the ocean. Farmers depend on the rainy season. When the rains do not come, their crops do not grow.

Droughts seem to occur in somewhat regular cycles. On the Great Plains, they arrive about every 24 years. In Africa, they appear at about the same interval. In China's Yellow River basin, they alternate with floods. Both kill a tremendous number of people. In the past century, 100 million people have died from droughts or floods in that area of China.

Meanwhile, the demand for water continues to rise. An ever-increasing population requires more water to live. Farming methods fail to make the best use of available water. Overplanting, overgrazing, and the cutting of too many trees sap the soil from what was once good farmland.

Name _____

Date _____

DROUGHT
REVIEW 2

Get the Facts

1. Why can drought be thought of as the worst of all natural disasters?

2. What does drought mean?

3. Why would 10 inches of rain in one year be considered a drought in one area but not in another?

4. Why is it meaningless to speak of drought in a desert?

5. Why are semiarid lands at greatest risk from droughts?

6. Why do so many people move into semiarid lands if there is risk from drought there?

7. What is *desertification*?

8. Name three ways people are causing desertification to occur.

What Do You Think?

9. Over the years, millions of people have died from droughts in India, Ethiopia, and the Yellow River Valley of China. Why do you think people don't just move out of these drought-prone areas?

10. In certain areas of the world, drought is expected every few years. How do you think the government of a drought-prone area could prepare its people for future droughts?