Hurricanes
3–5

Hurricane Science

LESSON PLAN 1

Hurricanes and Their Tracks

Children will know better what to expect of an approaching hurricane if they understand what a hurricane is and the weather associated with it.

Key Terms and Concepts

condensation	eye wall	meteorologist
coordinate	hemisphere	precipitation
direction	hurricane	seasons
evaporation	latitude	tracking
eye	longitude	wind speed

Purposes

To help students and their families define hurricanes, understand how they form and identify seasonal weather patterns associated with hurricanes

Objectives

The students will—

- Use *Facts About Hurricanes* to collect and share data on hurricanes and how hurricanes differ from other storms.
- Use a concept map that organizes information about hurricanes to compare and contrast hurricanes to other severe weather in their locale.
- Work together to list questions raised by their original research into hurricanes and conduct research to answer those questions and share new information in a short class presentation. (Linking Across the Curriculum)
- Use maps to illustrate and discuss why hurricanes occur in particular areas and their potential impact.
- Interview family members to record stories about the historical hurricanes found in the students' research. (Home Connection)
- Create a booklet of historical hurricanes from actual weather data and interviews.
- Use hurricane weather terms and concepts to write and illustrate poems in the form known as cinquains. (Linking Across the Curriculum)
- Collect, record and graph weather data to illustrate and analyze weather patterns. (Linking Across the Curriculum)

American Red Cross

Visit the American Red Cross Web site at *www.redcross.org/disaster/masters*

Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks

- Use *Hurricane Tracking Vocabulary* to describe the terms for tracking a weather system.
- Plot latitude and longitude coordinates on the Atlantic with *Hurricane Tracking Map.*
- Continue plotting coordinates with *Fact Sheet for Hurricane Georges*.
- Conduct research on the Internet to compare tracks and statistics of past hurricanes with those of Hurricane Georges. (Linking Across the Curriculum)

Activities

"KWL Chart"

"Where Is the Weather?"

"Hurricane Tracking"

American Red Cross

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Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks

Materials

- *Facts About Hurricanes*, 1 copy per student or group
- Chalkboard and chalk or chart paper and markers

American Red Cross

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"KWL Chart"

SET UP 15 minutes **CONDUCT** 40 minutes

Language Arts: Research; Science: Earth Science and Problem Solving

TEACHING NOTE The purpose of the KWL diagram (what you **K**now, what you **W**ant to know, what you have **L**earned) is to gauge the level of the students' previous knowledge about a particular subject, in this case, hurricanes.

1. Create a KWL chart on the chalkboard or a piece of chart paper.

Example:

Teacher: Today, we will talk about hurricanes. Someone tell me something about hurricanes to put it in our chart.
Student: I know hurricanes make big waves.

List what the students know and also what they want to know. After the lesson, go back to the chart and fill in what was learned.

Know	Want to know	Learned
Hurricanes make big waves.		

Lead the students in a discussion of what they already know about hurricanes.

2. As the students discuss what they know about hurricanes, add information to the chart.

3. Find out what questions the students have about hurricanes. When do they form? How do they form? What hazards do they pose to life and property?

4. Distribute *Facts About Hurricanes*.

5. Group the students into small work teams to discuss and record what makes hurricanes different from other storms.

6. Have the groups share their notes to help you complete a concept map on the board. Begin with hurricanes in a center circle and radiate the information from that center.

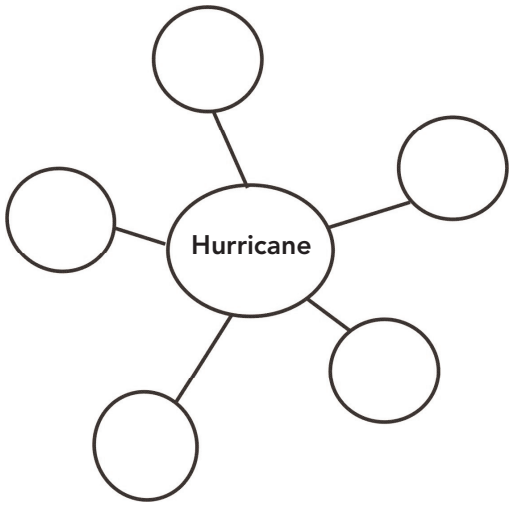
Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks

Wrap-Up

When your students have mapped all the information they learned in the KWL chart, ask them to use the concept map to compare and contrast hurricanes with other severe weather hazards. If your students do not live in a hurricane-prone region, ask them to analyze the severe weather hazards that are typical of their area. Which one is most like hurricanes? How is it similar and how is it different?



Linking Across the Curriculum

Language Arts: Research

Tell students that most researchers find more questions than answers as they delve deeper and deeper into a subject. Ask the following questions:

- Did your reading and class discussion raise more questions about hurricanes?
- What more would you like to know?
- How would you find this information?

Challenge them to choose one or two questions from the discussion and independently research to complete a KWL chart for those questions, using the Internet or other media. When they have completed their research, the students will share what they have learned in a short presentation.

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Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks

Materials

- Map of the United States
- Daily access for each student to weather reports via the newspaper, radio, television or Internet
- *Facts About Hurricanes*, 1 copy per student

American Red Cross

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"Where Is the Weather?"

SET UP 10 minutes **CONDUCT** 30 minutes

Social Studies: Geography; Science: Earth Science; Language Arts: Research and Writing

1. Use a large map of the United States to discuss the weather conditions the students would encounter in different regions of the country.

2. Help the students to use geographic terms (*direction*, *terrain* and *proximity to large bodies of water*) to explain differences in weather patterns.

3. How does weather change with the seasons? How would the students describe seasonal weather in their areas? Is the region affected by hurricanes? When are hurricanes most likely to occur?

4. Distribute copies of *Facts About Hurricanes*. Based on information found on the handout, ask students: Which regions on the mainland of the United States experience hurricanes? (Hurricanes affect the East Coast from Florida to Maine, and the Gulf Coast from Florida to Texas. Wind, rains and flooding from coastal hurricanes can affect states far inland as well.)

5. What do these regions have in common? What are the differences? (The areas border the coast of the Atlantic Ocean or the Gulf of Mexico, which includes the countries of the Caribbean. Where a hurricane makes landfall is dependent on its track, a path that is often difficult to predict. The possibilities of a storm's path may be many: Meteorologists could see a diagonal stomp across the Florida peninsula, or a change in direction to the northeast that skirts the South Coast or perhaps a heading straight inland from the Gulf of Mexico that causes great damage in inland states. Inland areas may not experience the full brunt of the hurricane's highest winds or the effects of the storm surge, but intense rain may fall, causing rivers to swell as the ground becomes saturated, and the potential for falling trees, flash floods and floods is great.)

Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks


Wrap-Up

Have the students research past major hurricanes:

- 1900, Galveston, Texas
- 1935, Florida Keys
- 1938, New England
- 1969, Hurricane Camille
- 1989, Hurricane Hugo
- 1992, Hurricane Andrew
- 1998, Hurricane Georges
- 1999, Hurricane Floyd
- 2005, Hurricane Katrina

Students will refer to maps to answer the following questions about each hurricane:

- Where did it make landfall?
- What was the weather before and after the hurricane struck?
- How great was the impact?
- Which geographic factors affected the impact? Explain.

TEACHING NOTES Some excellent sites for this research are—

- Hurricane History (*http://www.nhc.noaa.gov/HAW2/english/history.shtml*)
- NOAA Coastal Services Center (*http://maps.csc.noaa.gov/hurricanes/index.htm*)
- The National Weather Service: Hurricane History (*http://www.srh.noaa.gov/crp/docs/research/hurrhistory/*)

Students will share the results of their media weather search and compare the data collected. Are specific weather patterns evident for different regions of the country? As a class, compare data across regions most likely to be affected by hurricanes. Can the students discern any common features? If a hurricane were approaching a region, what weather patterns would the students expect?

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Hurricanes 3–5

LESSON PLAN 1

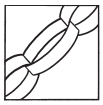
Hurricanes and Their Tracks

Home Connection

Have students share with their families the information that they gathered in the Wrap-Up about historical hurricanes in the United States. Ask them to interview family members and family friends to record personal stories about these hurricanes.

- What was the weather like in the region affected by the hurricane before and after the hurricane hit?
- How did the person experience the hurricane—personally or through news sources?
- What event associated with the hurricane made it particularly memorable?

Collect the stories at school and combine them with the data from the Wrap-Up for a Hurricane History booklet or PowerPoint presentation.



Linking Across the Curriculum

Language Arts: Writing; Fine Arts: Visual Arts

TEACHING NOTE The cinquain construction consists of five lines, each of which has a special purpose. The first line states the title in two syllables. The second line describes the title in four syllables. The third line describes action in six syllables. The fourth line expresses a feeling in eight syllables. The fifth line restates the title in two syllables.

Have the students write cinquains about hurricanes. Here is an example using the term "cyclone":

Cyclone

Ripping, raging

Need to get away from

Scary loud banging blowing storm

Big storm

After writing their verses in the cinquain form, have the class express their weather observations as artwork. They could illustrate their verses or create visual representations of regional weather occurrences, particularly of storms or hurricanes.

Mathematics:

Have the students collect, record and graph weather readings across the country for a specified period of time. Then, have them analyze the data and present it to the class.

American Red Cross

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Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks

"Hurricane Tracking"

SET UP 30 minutes **CONDUCT** 45 minutes

Science: Earth Science; Social Studies: Geography; Language Arts: Reading

TEACHING NOTE If you are teaching this unit in Hawaii, consider procuring maps that track hurricanes of the Pacific from your local chapter of the American Red Cross and assign a local hurricane for your students to track.

Materials

- *Hurricane Tracking Vocabulary*, 1 copy per group
- *Atlantic Hurricane Tracking Map*, 1 copy per group
- *Fact Sheet for Hurricane Georges*, 1 copy per student
- Transparency of *Atlantic Hurricane Tracking Map*

1. Remind the students that meteorologists track the movement of a hurricane using the lines of latitude and longitude, just as we use these lines to find locations on a map.

2. Divide the class into groups of two or three students. Distribute *Hurricane Tracking Vocabulary*. When the students have completed the vocabulary assignment, go over the correct answers and ask them to describe how each term is applied to track a weather system.

Answers to *Hurricane Tracking Vocabulary*

1. Latitude
2. Hemisphere
3. Longitude
4. Meteorologist
5. Hurricane
6. Tracking

3. Distribute *Atlantic Hurricane Tracking Map*.

4. Review the steps for using a coordinate grid.

5. Distribute *Fact Sheet for Hurricane Georges* and have the students plot the path of Hurricane Georges using the coordinates on page 2 of the activity sheet.

Wrap-Up

When the students have completed their tracking maps, have them indicate the following on the transparency of the tracking map:

- Where Hurricane Georges made landfall
- Which areas were most affected

Ask the students—Why is it important to track a hurricane accurately? What information would you need to predict where the hurricane is headed or when it will make landfall?

American Red Cross

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Hurricanes 3–5

LESSON PLAN 1

Hurricanes and Their Tracks


Linking Across the Curriculum

Science: Technology; Social Studies: History

Assign the students to conduct research on the Internet about the paths of active or past hurricanes. Discuss the data gathered and compare the tracks and the statistics with those of Hurricane Georges. Pose the questions—

- Have other hurricanes hit in the same areas?
- Do the hurricanes have common characteristics, for example, time of year, wind speed or storm surge?

TEACHING NOTE Some excellent sites for this research are—

- Hurricane History (*http://www.nhc.noaa.gov/HAW2/english/history.shtml*)
- NOAA Coastal Services Center (*http://maps.csc.noaa.gov/hurricanes/index.htm*)
- The National Weather Service: Hurricane History (*http://www.srh.noaa.gov/crp/docs/research/hurrhistory/*)

American Red Cross

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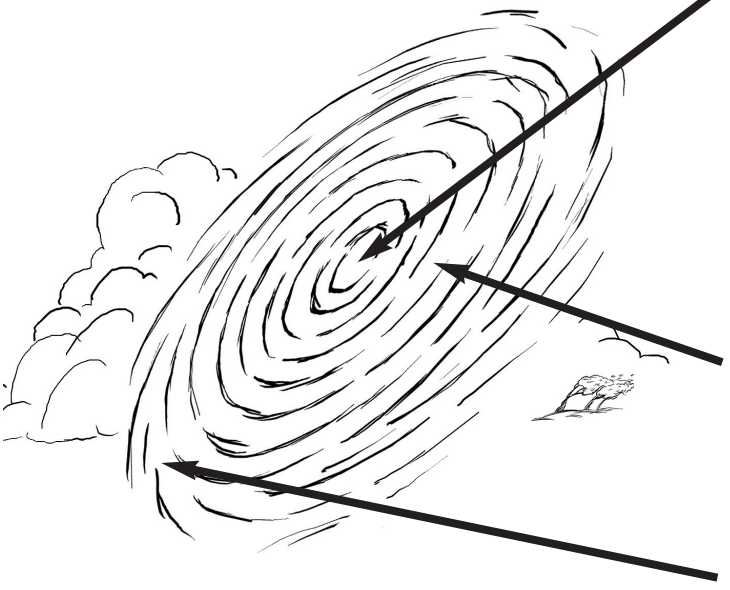
Facts About Hurricanes

Name _____

What are hurricanes?

- Hurricanes are tropical storms with winds greater than 74 miles (119 kilometers) per hour.
- After a tropical storm reaches 39 miles (63 kilometers) per hour, the storm is named.
- In the Northern Hemisphere, hurricane winds blow counterclockwise; in the Southern Hemisphere, they blow clockwise.
- Hurricanes are steered by global winds over the oceans.
- Hurricanes can be beneficial; they are a major source of rain, and they release energy from the atmosphere.



Hurricane Eye
A region that can be as large as 30 miles (48 kilometers) in diameter found at the center of a hurricane, where skies are often clear and winds are light. The storm's lowest pressure readings are found here.

Eye Wall
A "wall" of clouds and intense thunderstorms that surround the eye.

Spiral Rain Bands
Bands of thunderstorms that wrap around the hurricane.

Facts About Hurricanes

When and where do hurricanes form?

- Atlantic hurricane season normally runs from June through November, when the water temperature in these regions is relatively high.
- Hurricanes form in the southern Atlantic Ocean, the Gulf of Mexico, the Caribbean Sea and in the Pacific Ocean.

How do hurricanes form?

- Hurricanes develop over warm tropical waters.
- Hurricanes gather heat and energy through contact with warm ocean waters.
- Condensation of water vapor increases a hurricane's power.
- As warm air near the surface of the water moves toward the eye of the hurricane, it converges, rises and fuels the storm.
- A pronounced rotation develops around the eye of the hurricane.
- This process then builds upon itself, developing a spiral band of swirling clouds that is a hurricane.

Hurricane Tracking Vocabulary

Name _____

Directions: Research to define these words. Use the words to complete the sentences that follow.

hemisphere	**latitude**	**meteorologist**
hurricane	**longitude**	**tracking**

1. The lines that run parallel to the equator are called

   _____ lines.

2. The continents of North America, Europe and Asia are in the

   Northern _____.

3. _____

   lines run from the North Pole to the South Pole.

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Hurricane Tracking Vocabulary

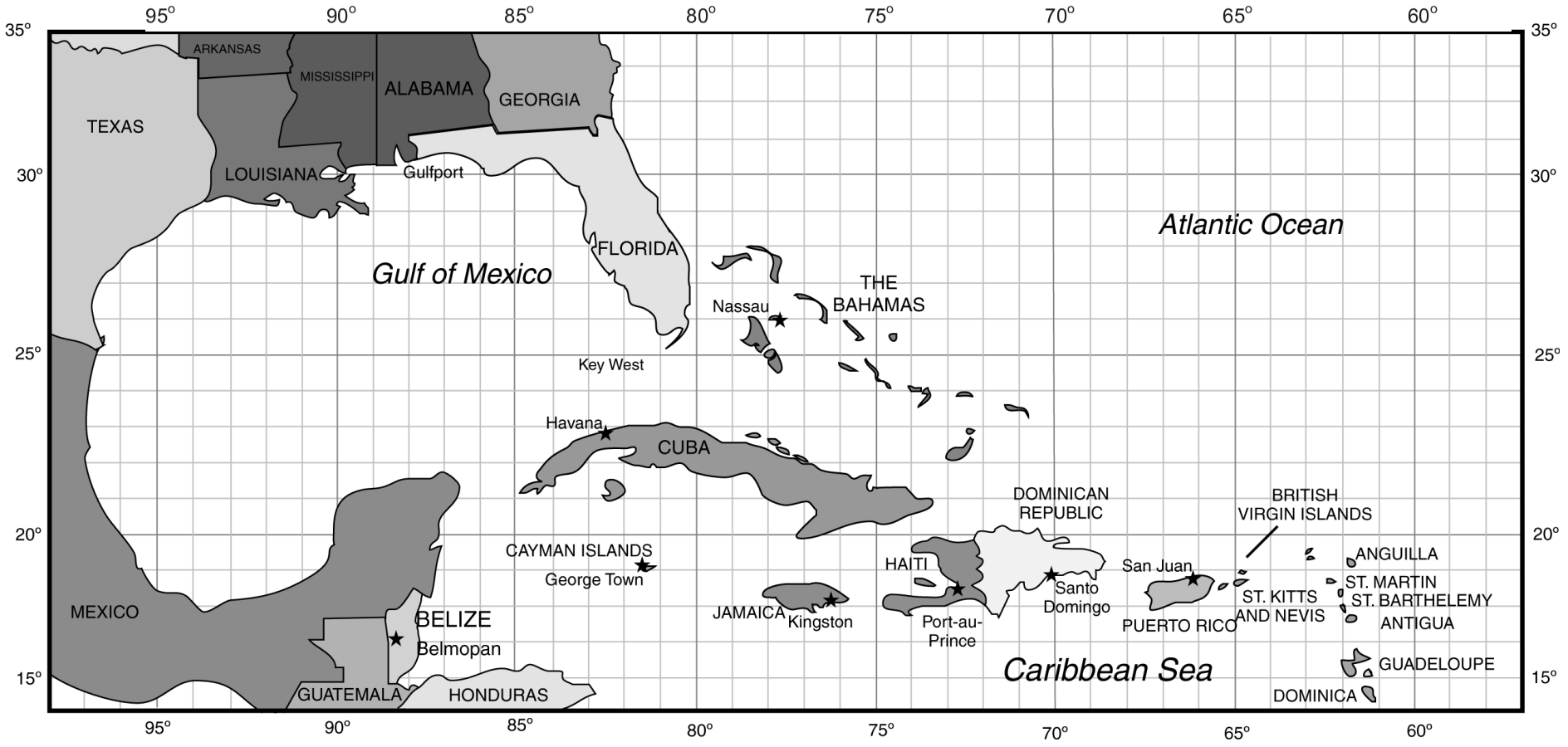
4. A _____ gives us current information on weather.

5. A _____ is a huge storm that packs strong winds and heavy rains. The word comes from the Spanish word *huracán*.

6. _____ is something done by meteorologists to help them make predictions about what direction a hurricane is headed.

Atlantic Hurricane Tracking Map

Name _____



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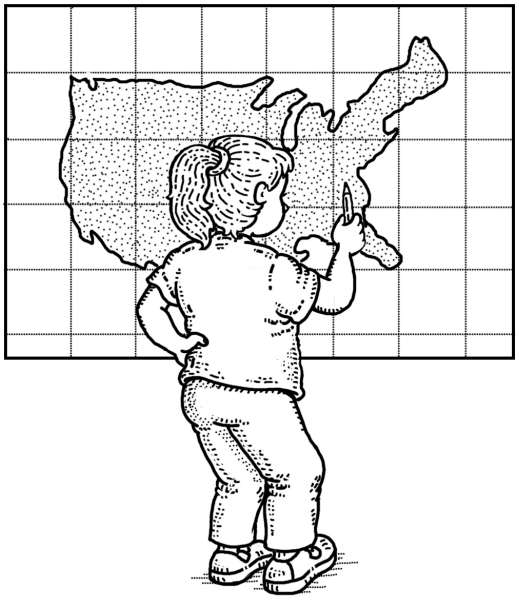
Atlantic Hurricane Tracking Map

Directions: Using what you know about latitude and longitude, plot the following coordinates on the Atlantic Hurricane Tracking Map. Then, connect the plots to make a line graph to show the path of Hurricane Georges.

Coordinates for Hurricane Georges

DATE OF PLOT	LATITUDE	LONGITUDE
9/21/98	17°	62°
9/22/98	18°	67°
9/23/98	19°	72°
9/24/98	21°	77°
9/25/98	23°	80°
9/26/98	26°	85°
9/27/98	28°	88°
9/28/98	31°	89°



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Fact Sheet for Hurricane Georges

Name _____

September 13, 1998
A tropical wave originates off the coast of Africa.

September 14
The wave is upgraded to a tropical depression.

September 15
The tropical depression is increasing in speed.

September 16
The tropical depression is upgraded to a tropical storm moving westward with wind speeds of 39 miles per hour (mph) (63 kilometers per hour [kph]).
It receives its name—Tropical Storm Georges.

September 17
Tropical Storm Georges is upgraded to Hurricane Georges and is predicted to be a major category 4 storm by next week. Satellite imagery shows that an eye is beginning to form. Wind speeds are up to 75 mph (121 kph).

September 18
The wind speed within Hurricane Georges picks up speed; it is now 90 mph (145 kph). Hurricane WATCHES are in effect for some of the islands.

September 19
A hurricane WARNING is in effect for some of the islands. Wind speeds have increased to 125 mph (201 kph).

September 20
A hurricane WATCH is in effect for the Dominican Republic and Puerto Rico. Wind speeds decrease throughout the day, going from 135 mph to 115 mph (217 kph to 185 kph).

American Red Cross

Fact Sheet for Hurricane Georges

September 21
A hurricane WARNING is in effect for the Dominican Republic and Puerto Rico. Wind speeds drop from yesterday's 115 mph (185 kph) to 100 mph (161 kph).

September 22
It is reported that five people were killed in Puerto Rico from Hurricane Georges. Flash floods and mudslides are reported in the Dominican Republic from yesterday's storm. The hurricane WARNING is discontinued on both these islands. A hurricane WATCH is in effect for the Bahamas and southern Florida. By late evening, wind speeds decrease to 95 mph (153 kph) from 105 mph (169 kph) earlier in the day. In the evening, a hurricane WARNING is issued for the Bahamas and parts of Florida.

September 23
Hurricane WARNINGS are still in effect for some of the islands and southern Florida. Wind speeds drop to 65 mph (105 kph).

September 24
Hurricane Georges is headed for Florida—outer bands are now visible on local radar. Hurricane WARNINGS are still in effect for southern Florida. After hitting several of the islands, Hurricane Georges is back over water and is re-intensifying. Wind speeds increase to 75 mph (121 kph).

September 25
Wind speeds increase to 90 mph (145 kph) with a storm surge of 3 to 5 feet (0.9 to 1.5 meters). Hurricane Georges is hitting the Keys and southern Florida hard. A tropical storm WARNING is in effect for the east coast of Florida. A hurricane WATCH is in effect for the Gulf Coast.

September 26
A hurricane WARNING is issued for the north Gulf Coast from Morgan City, Louisiana, to Panama City, Florida. A hurricane WATCH is issued from east of Panama City to St. Marks, Florida. There are dangerous flood threats from the storm surge and rainfall by early morning. Wind speeds continue at 90 mph (145 kph).

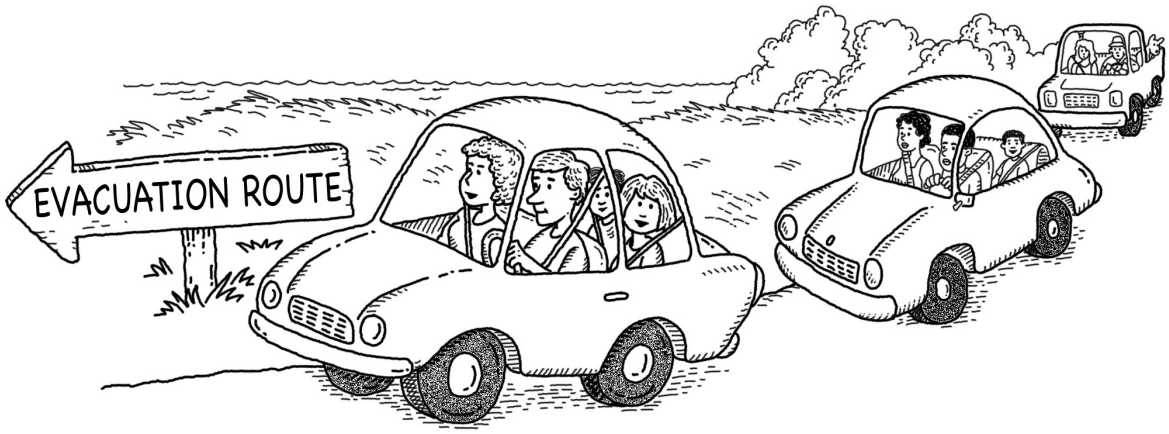
Fact Sheet for Hurricane Georges

September 27
The hurricane WATCH for east of Panama City to St. Marks, Florida, is discontinued. However, these areas are now under a tropical storm WARNING.

September 28
Hurricane Georges makes final landfall at 4:00 a.m. near Biloxi, Mississippi, with wind speeds of 95 mph (153 kph). A hurricane WARNING remains in effect from Morgan City, Louisiana, to Panama City, Florida. The eye of the storm is passing over Ocean Springs, Mississippi—stars can be observed. The storm drops 23 to 25 inches (58 to 64 centimeters) of rain in southern Mississippi and Alabama; more is expected. Hurricane Georges is downgraded to a tropical storm with wind speeds at 65 mph (105 kph).

September 29
Tropical Storm Georges is downgraded to a tropical depression and is over Mobile, Alabama. Wind speeds decrease throughout the day from 50 mph (80 kph) to 30 mph (48 kph).

Fifteen people died as a result of Hurricane Georges in Puerto Rico and the U.S. mainland, and over 200,000 dwellings were damaged or destroyed.



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