

LESSON 3 Who's Watching for You?

Lesson at a Glance

After hearing a story and PowerPoint presentation on technologies that the National Oceanic and Atmospheric Administration (NOAA) uses to monitor hurricanes, students choose flashcards about one method of technology that NOAA uses and present this technology to their small group. They compare and contrast methods and complete a record sheet on the six types of technologies. Students complete part of a K-W-L chart to record what they learned in this lesson. (If you decide to jigsaw Lessons 2-5 see Lesson 6 for instructions.)

Lesson Duration

Two 45-minute periods

Essential Question(s)

What technologies are used to locate and keep track of storms and hurricanes?

How does technology assist society in preparing for a hurricane?

Related HCPS III Benchmark(s):

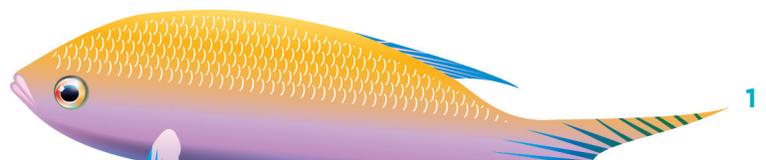
Science SC.3.2.1
Describe ways technologies in fields such as agriculture, information, manufacturing or communication have influenced society.

Key Concepts

- The National Oceanic and Atmospheric Administration (NOAA) is the US government agency that observes and predicts weather.
- NOAA weather technologies monitor hurricanes using floating weather buoys, ships at sea, reconnaissance airplanes, satellites, radiosondes, and Doppler radar.

Instructional Objectives

- I can explain the importance of observing and keeping track of storms that develop at sea that might grow in strength to become hurricanes.
- I can identify two kinds of weather data needed to report on the size and strength of a tropical storm or hurricane.
- I can describe two kinds of weather measurements used to determine the size and strength of a storm.
- I can identify and describe the kinds of information about storms at sea that is collected by floating weather buoys, radar, radiosondes, ships at sea, reconnaissance aircraft specially designed to fly into hurricanes, and satellites.



Assessment Tools

Benchmark Rubric:

Topic	Science, Technology, and Society		
Benchmark SC.3.2.1	Describe ways technologies in fields such as agriculture, information, manufacturing, or communication have influenced society		
Rubric			
Advanced	Proficient	Partially Proficient	Novice
Compare how technologies in various fields have influenced society	Describe ways technologies in fields such as agriculture, information, manufacturing, or communication have influenced society	Identify, with assistance, ways that technologies have influenced society	Recall that technologies have influenced society

Assessment/Evidence Pieces

Lesson
<ul style="list-style-type: none"> Student updates to K-W-L chart

Materials Needed

Teacher	Class	Group	Student
<ul style="list-style-type: none"> Method to present PowerPoint PowerPoint <i>Who's Watching for You?</i> PowerPoint <i>Worldwide Buoys</i> 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Flashcards: <i>How Do We Watch Hurricanes?</i> 	<ul style="list-style-type: none"> Worksheet: <i>Who's Watching for You?</i> KWL sheet from Lesson 1

Instructional Resources

PowerPoint Presentation: *Who's Watching for You?*

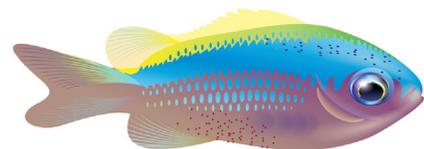
PowerPoint Presentation: *Worldwide Buoys*

Teacher Reading: *Who's Watching for You?*

Student Worksheet: *How Do We Watch Hurricanes?* Flash Cards

Student Worksheet: *How Do We Watch Hurricanes?*

Optional - Student Worksheet: *Unit Self-Assessment* (found at beginning of unit)



Student Vocabulary Words

Doppler radar: a type of weather radar that determines whether atmospheric motion is toward or away from the radar.

hurricane: a severe tropical storm with heavy rains and high winds in excess of 73 mph, enormous waves, and subsequent flooding that can damage buildings and beaches. It is an area of low pressure around which winds blow counterclockwise in the Northern Hemisphere. The term *hurricane* is used for Northern Hemisphere tropical cyclones east of the International Dateline to the Greenwich Meridian. The term *typhoon* is used for Pacific tropical cyclones north of the Equator west of the International Dateline. The term *cyclone* is used for tropical cyclones in the Indian Ocean.

radiosonde: a unit for use in weather balloons that measures various atmospheric parameters and transmits them to a fixed receiver.

tropical storm: a tropical storm in which the sustained wind speed is 39 to 73 mph.

weather buoy: a distinctively shaped and marked floating platform equipped with instruments to measure, record and transmit data on wind speed, wave height and other weather factors.

weather satellite: a device that orbits the Earth, equipped with instruments to measure and transmit data about weather features such as air pressure, humidity, and temperature. Weather satellite observations can cover high parts of the atmosphere that cannot be reached by weather balloons.

Lesson Plan

Lesson Preparation

- Review the Science Background provided in the Unit’s Overview, and the Teacher Reading: *Who’s Watching for You?*
- Preview the PowerPoint presentations *Who’s Watching For You?* and *Worldwide Buoys*, make arrangements to project them.
- Preview and make copies of the Student Worksheet *How Do We Watch Hurricanes?* Flash Cards and *How Do We Watch Hurricanes?* questions.
- Prepare and post a list of the *I Can* statements for this lesson.
- Add to the Word Wall if you’ve created one.

I. PowerPoint Story- “Who’s Watching For You?”

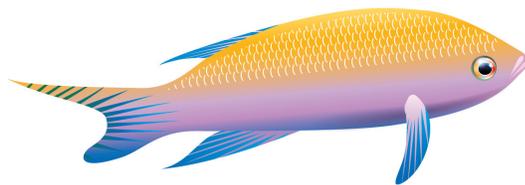
- A. Review with students the key elements of hurricanes: high winds, heavy rains, and damage to property.
- B. Use the PowerPoint slides to tell them about *Who’s Watching for You?*, a story about Christine and her mom watching storms and hurricanes. Have a class discussion after the PowerPoint to review technologies introduced. Create a list of these technologies on the board as you discuss them. When students mention the weather buoy technology piece stop and play PowerPoint *Worldwide Buoys*. Discuss.

II. Activity-How Do We Watch Hurricanes?

- A. Review with students the “I can” statements posted on the wall.
- B. Divide students into groups of six. Each person in the group will be responsible for teaching the others about technologies presented in the powerpoint they just watched.
 - 1) Pass out one pack of *How Do We Watch Hurricanes?* Flash Cards to each group of students. Each student in the group should receive one flash card. Tell students that each person in the group has a different card.
 - 2) Ask students to read their flashcards on their own and think about how they might explain to their group members the information on their card.
 - 3) Distribute a copy of student Worksheet *Who’s Watching for You?* Tell students to record information from each of their team members on this worksheet.
 - 4) Have students share the information on their flashcard to the other members of their group.
 - 5) Have students work as a team to start to answer the questions on the bottom of the worksheet.
- C. Facilitate a discussion with the whole class to review the information about technologies, help answer students’ questions, and use this as an opportunity for all students to complete their worksheet. Suggested guiding questions include: How is this technology similar to (or different from) the others? When are these technologies used? How do you think that using these technologies has changed how we watch the weather? (This is the key question for addressing benchmark SC.3.2.1)

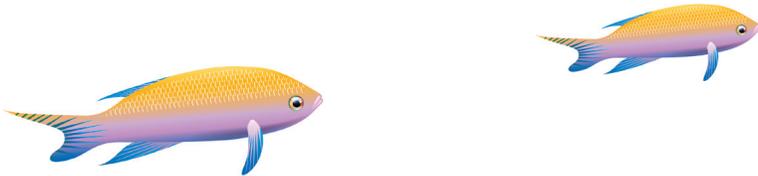
III. Check for Understanding: Extend the K-W-L Chart.

- A. Ask students to add what they learned to the right column of the K-W-L chart.
- B. Discuss with students what they learned about how we watch hurricanes. Encourage students to add to or modify what they wrote in the L column. You may want to have them date what they write so that their progress may be tracked over the course of the unit.
- C. Students may also want to add more questions to their W section. You may also want them to date these additions as well to monitor their progress over the course of the unit.



Extended Activities

1. Have students work in pairs to act out how they might monitor a hurricane with one person as the actual hurricane (or storm that gains strength) and the other person as a scientist monitoring the hurricane using any of the techniques they learned.
2. Students may also want to view additional photos of hurricanes, which can be found in the NOAA Photo Library <http://www.photolib.noaa.gov/nws/hurr1.html>



LESSON 3 Teacher Reading

Who's Watching for You?

What Methods Are Used?

When a hurricane first forms over water, it can be monitored by buoys, ships, and satellites. If and when the hurricane approaches land, a radiosonde can be released and reconnaissance aircraft can be sent into the hurricane. When the hurricane is close to the coast, radar is used. All of these methods provide information for computer models to predict the intensity and movement of the storm.

Details on each method of hurricane monitoring:

Buoys – Buoys are stations in the ocean with equipment to measure different parts of the weather. Buoys can often measure wind speed and direction as well as wave height, atmospheric pressure, air and sea temperature. Buoys transmit this information to weather centers via satellite. (Refer to PowerPoint *Worldwide Buoys*.)

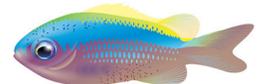
Ships – Many ships at sea participate in voluntary weather monitoring. They observe the weather at their location and send the data via satellite or radio to weather stations that make forecasts.

Weather Satellites – Satellites orbit the earth and take visual and infrared photographs. These photographs can tell scientists the temperature of the earth's surface, type of cloud cover, presence of circulation, and height of moisture in the atmosphere.

Radiosonde – A radiosonde is a measuring device and radio transmitter attached to a balloon. The balloon is released over land and rises in the atmosphere and sends measurements of temperature, humidity and pressure back to a weather center.

Reconnaissance Aircraft – Aircraft can be sent into the hurricane to take measurements directly when the hurricane is close to shore, but still over the ocean. Specially equipped C130 aircraft fly into the center of the hurricane and measure wind, pressure, temperature, and humidity. They can also locate the eye of the hurricane.

Radar - Radio waves are sent out from radar stations on land. When the radio wave hits a raindrop, part of the wave bounces back to the station. Scientists measure how long it takes for the wave to bounce off the raindrops and return to the station. The percent of the wave that bounces back tells scientists how much rain is falling. Of course, if the radio wave does not bounce back, then there is no rain.



LESSON 3

How Do We Watch Hurricanes? Flash Cards

(Cut out flash card on solid line – fold on dotted line)



Buoys

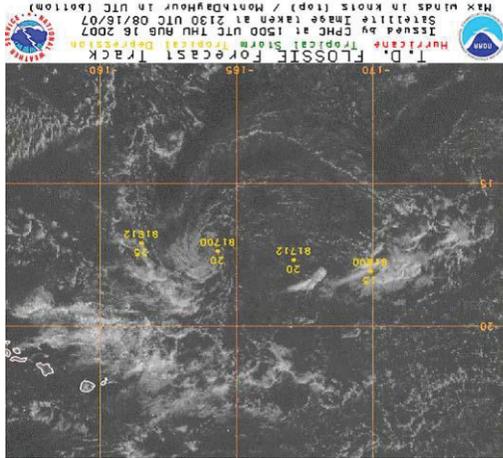
- ▶ Buoys are stations in the ocean with equipment to measure different parts of the weather and sea conditions.
- ▶ Buoys can measure
 1. wind speed and direction
 2. wave height
 3. atmospheric pressure
 4. air and sea temperatures
- ▶ Buoys send this information to weather centers by satellites.



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How Do We Watch Hurricanes? Flash Cards

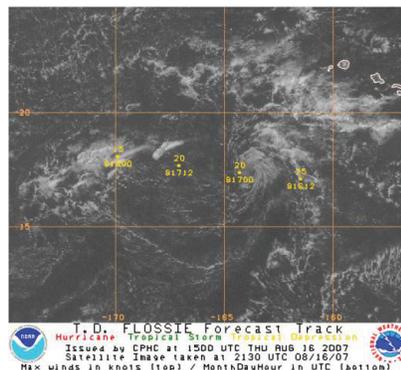
(Cut out flash card on solid line – fold on dotted line)



Weather Satellites

Satellites orbit the earth and take visual and infrared photograph. These photographs can tell scientists

1. The temperature of the earth's surface
2. Type of cloud cover
3. Circulation patterns
4. Height of moisture in the atmosphere



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How Do We Watch Hurricanes? Flash Cards

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Radiosonde

- ▶ Radiosondes are measuring devices and radio transmitters attached to balloons that are released over land.
- ▶ Radiosondes measure:
 1. Air temperature
 2. Humidity
 3. Air pressure



LESSON 3

How Do We Watch Hurricanes? Flash Cards

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Ships

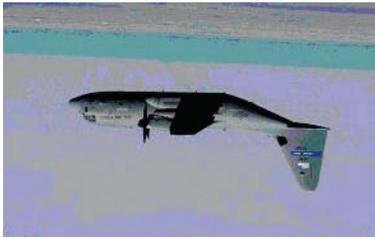
- ▶ Many ships at sea participate in voluntary weather monitoring.
- ▶ They observe the weather at their location and send the data by satellite or radio to weather stations that make weather forecasts.



LESSON 3

How Do We Watch Hurricanes? Flash Cards

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Reconnaissance Aircraft

- ▶ Aircraft can be sent into the hurricane to take measurements directly when the hurricane is close to shore, but still over the ocean.
- ▶ Specially equipped C130 aircraft fly into the center of the hurricane and measure wind, pressure, temperature, and humidity.
- ▶ They can also locate the eye of the hurricane.



LESSON 3

How Do We Watch Hurricanes? Flash Cards

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Radar

- ▶ Radio waves are sent out from radar stations on land. When the radio wave hits a raindrop, part of the wave bounces back to the station.
- ▶ Scientists measure how long it takes for the radio waves to bounce off the raindrops and return to the station.
- ▶ The amount of the wave that bounces back tells scientists how much rain is falling. Of course, if the radio wave does not bounce back, then there is no rain.



LESSON 3

How Do We Watch Hurricanes?

NAME: _____ DATE: _____

How can we watch storms and hurricanes?	What can we measure?
1.	
2.	
3.	
4.	
5.	
6.	

7. How do you think people watched the weather before we had technology to help us?

8. How has the technology changed the way we watch the weather?

9. Has the use of technology to watch the weather helped people? Why or why not?

