Teacher's Guide **Grade 6**

Water Matters!

Saving Your Water through Science

Southwest Florida
Water Management District

WATERMATTERS.ORG • 1-800-423-1476

Introduction

Welcome to the "*Water Matters!*" curriculum developed by the Southwest Florida Water Management District (SWFWMD). The SWFWMD manages the water resources for west-central Florida as directed by state law. It was established in 1961 as a flood protection agency. Since then, its responsibilities have grown to include managing the water supply, protecting water quality and preserving natural systems that serve important water-related functions.

As a teacher, you have a very important role in preparing students to take on the responsibility of being stewards of the land and our water resources. By educating your students about the protection of Florida's water, you teach them to be responsible citizens actively involved in maintaining a clean and healthy environment.

This Teacher's Guide accompanies the sixth-grade module of the "*Water Matters!*" curriculum which is correlated to the Next Generation Sunshine State Standards. The Student Publication contains vocabulary words (*italicized* and **bolded**) with vocabulary activities and review questions after each section. The Teacher's Guide includes answers to student questions and additional content, activities and websites to explore.

We encourage teachers to use this guide electronically as there are hyperlinks available for easy access to other resources. In preparation for using the "*Water Matters!*" curriculum with your students, it will be helpful to read the entire Student Publication and Teacher's Guide and test or bookmark the hyperlinks in the Teacher's Guide. While using the curriculum —

- Read and discuss the material presented in the Student Publication with your students.
- Direct students to complete the vocabulary activities and questions at the end of each section of the Student Publication and then discuss the results with students.
- Implement the extension activities you select from the Teacher's Guide.

Please note:
Suggested extension activities with an asterisk after the name (only in Section One) reference **Project WET** activities. Project WET, which stands for Water Education for Teachers, is a series of hands-on, investigative and easy-to-use activities for teaching students about water resources. To receive a Project WET guide, teachers must attend a six-hour training. If you don't have a Project WET guide, check with your colleagues or order a free sample of the guide by emailing *WaterEducation@WaterMatters.org*. To learn more about Project WET, visit *ProjectWET.org*.

A variety of other publications and electronic resources are available from the SWFWMD. Visit *WaterMatters.org/Education* to learn more. For questions or comments, email *WaterEducation@WaterMatters.org*.

Section One:
The Hydrologic Cycle

Key Ideas:

- The hydrologic cycle is a never-ending process that recycles the Earth's water over and over again with no beginning and no end.
- Although 75 percent of the Earth's surface is covered in water, only one percent is fresh water available for human use.
- Water is a limited resource, so we must all conserve and protect our water resources.

Standards

SC.6.E.7.2
Investigate and apply how the cycling of water between the atmosphere and hydrosphere has an effect on weather patterns and climate.

SC.6.E.7.4
Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.

SC.6.N.3.4
Identify the role of models in the context of the sixth grade science benchmarks.

Objectives

- The student will explain the process by which water on Earth is recycled in a never-ending process called the hydrologic cycle.
- The student will justify why we must all conserve and protect our water resources.

Vocabulary

Hydrologic cycle	Condensation	Water vapor
Evaporation	Precipitation	Humidity
Transpiration	Percolation	

Bellringer

Ask students to list five examples of how they have used water today. Share responses.

Engage

The Life Box*
Project WET Curriculum and Activity Guide 2009 version, page 76 or 2.0 version, page 69.

In this activity, students will discover four essential factors needed to sustain life. After completing **The Life Box***, discuss these questions with the class:

- How is it possible that all life depends on these four factors?
- Why is it important for us to protect our natural resources?

Then divide students into groups and give each group a piece of copy paper. Tell each group to construct a diagram of what happens to rain when it reaches Earth's surface. Ask each group to present their diagram to the class.

Explore

Students should read Section One of the *"Water Matters!"* Student Publication and complete the vocabulary review and questions.

Here are additional options for you to select from to further student knowledge about the water cycle:

Water Cycle Podcast
Show this video to your class. It's under five minutes and is easily found at *WaterMatters.org/Podcasts*.

Water Cycle in a Bag
In this hands-on activity, students capture the water cycle in a plastic bag after they plant a seed or tiny plant in the bag. View the instructions at *WaterMatters.org/Activities*.

Florida Waters Manual
Visit *WaterMatters.org/Publications* or click here for a direct link to the *Florida Waters* Manual. As a class or individually, read all about the water cycle in pages 34–39 of Chapter 2.

The Blue Planet*
Project WET Curriculum and Activity Guide 2.0 version, page 125 or the 2.0 Sampler, page 9.

Students will estimate the percentage of Earth's surface that is covered by water. To check their estimates, students will toss an inflatable globe and take a probability sample.

The Incredible Journey*
Project WET Curriculum and Activity Guide 2009 version, page 161; 2.0 version, page 155; or the 2.0 Sampler, page 19. Also available in a "flipped lesson" on *ProjectWET.org* website under Resources.

With the roll of a cube, students simulate the movement of water within the water cycle.

Origami Earth
After making an Origami Balloon, students will compare the amount of water visible on the balloon to the estimates found during the Blue Planet activity. Origami balloon template provided by the National Oceanic and Atmospheric Administration (NOAA) at NGDC.NOAA.Gov/Mgg/Image/OrigamiEarth.pdf.

Where is Earth's Water?
Give each student a large paper plate and ask them to fold it into eight segments. Then direct students to Section One or have them research online to find the percentage of fresh, salt and glacial water available on Earth. Students will color and label the plate to represent the correct percentages. You could even ask students to be more specific about where Earth's water is found by referring to the chart at *Water.USGS.Gov/Edu/WaterCycle.*

Explain

By completing the questions after Section One, students will explain what they read and comprehended.

After completing the **Incredible Journey**, ask students to write a paragraph describing the journey of a raindrop that includes the following terms: Condensation, Evaporation, Percolation, Precipitation, Transpiration and Solar Energy.

Visit the Environmental Protection Agency's (EPA) Water Trivia Facts and complete an Error Analysis Journal Writing assignment. Ask students what assumptions they have made about water that isn't supported by the facts? *Water.EPA.Gov/Learn/Kids/DrinkingWater/Water_Trivia_Facts.cfm*

Elaborate

Graphing Results

After completing the **Incredible Journey**, compile the data from student tally sheets and construct a graph of the results.

Make a Water Cycle Bracelet

Have students construct a water cycle bracelet after ordering the supplies from SWFWMD by emailing *WaterEducation@WaterMatters.org*. View the instructions at *WaterMatters.org/Activities*.

Reviewing Diagrams

Ask students to revisit the diagrams created during the **The Life Box** activity in the Engage section. Students can compare the diagrams to what they learned in Section One and make revisions to their diagrams if needed.

Evaluate

Plus/Minus/Intriguing

Ask students to review the vocabulary and questions at the end of Section One and evaluate them using this Plus/Minus/Intriguing method:

(+) One new concept learned
(-) One concept you still don't understand
(I) One thought that still makes you wonder

Analyzing Perspectives

As a journal writing assignment, ask students to write a paragraph from the perspective of a water fountain. What "secrets" would the water fountain tell about the water passing through it? Where has the water been before reaching the water fountain?

Data Collection

Have students complete the *Daily Water Use at Home* survey found at *WaterMatters.org/Activities*. It allows students to collect data regarding their own water usage. After students have completed the survey, ask students to think about where their water comes from and how much water they use on a daily basis. Ask students to write about why they think it is important to conserve water.

Additional Resources

Order FREE hydrologic cycle posters at *WaterMatters.org/Publications*.

Section Two: Weather and Climate

Key Ideas

- A region's weather depends on its air temperature, air pressure, humidity, precipitation, wind speed and direction, and other factors.
- Climate is an average pattern of weather for a particular region over a long period of time.
- The difference between weather and climate is a measurement of time.
- Weather can change in minutes, but climate changes very slowly.

Standards

SC.6.E.7.6
Differentiate between weather and climate.

Objectives

- The student will compare and contrast weather to climate.
- The student will identify the factors that impact weather.
- The student will identify the tools used by meteorologists and the functions of the tools.
- Students will engage in a hands-on activity about weather mapping to develop an awareness of the importance of weather forecasting.

Vocabulary

Weather	Hydrographs	Rain gauge	Climatologist
Front	Weather vanes	Climate	Global warming
Troposphere	Anemometer	Humid subtropical	Climate change
Meteorologist	Barometer	Tropical savanna	

Bellringer

Ask students to think about what their favorite type of weather is and why they like it? Share responses.

Engage

Take the class outside and ask students to:

- Write a sentence describing today's weather.
- Write a sentence describing Florida's climate.

Class T-chart
On chart paper, create a class t-chart labeled weather and climate. Record student responses for each heading.

Explore

Students should read Section Two and complete the vocabulary review and questions.

Here are additional options to select from to further student knowledge about weather and climate:

Group T-charts
Divide students into groups and ask each group to draw a t-chart. Students should label one column "Weather" and the second column "Climate." Ask the groups to write what they know about these terms in the corresponding columns. The t-charts will provide a visual representation for students to compare and contrast what they learned about weather and climate. Hang up each group's t-chart and discuss the similarities and differences among them.

Florida Waters Manual
Visit *WaterMatters.org/Publications* or click here for a direct link to the *Florida Waters* Manual. As a class or individually, read about weather and climate in pages 40–42 of Chapter 2.

Compare Rainfall Distribution
Using rainfall distribution maps found at *WaterMatters.org/Weather*, discuss the differences in rainfall throughout the SWFWMD's 16-county region. Ask students why they think some areas receive more or less rain than normal rainfall amounts.

Discuss Measurements
Ask the class what measurements might be used to describe weather and climate.

Explain

By completing the questions after Section Two, students will explain what they read and comprehended.

Learn more about weather in SWFWMD's *WaterWeb Extreme Weather and Mapping* publication available at *WaterMatters.org/Publications*.

Explore careers in meteorology at *NSSL.NOAA.Gov/People/Jobs/Careers.php*. Or contact a meteorologist from a local news station to be a guest speaker.

Elaborate

Weather Maps
In this activity, students will study a weather map then collect information about today's weather conditions and draw the conditions on a map of Florida. A map is available in the Appendix. Students should develop a legend and add labels that may be helpful to map viewers.

After students complete their maps, ask students the following questions:

- How do your legends and symbols differ from those used by meteorologists?
- How do your symbols differ from those of other classmates? How are they similar?
- How might these weather patterns be different in a few hours? How about the following day?

Evaluate

Use the information found in Section Two to answer the following questions:

- Explain the difference between weather and climate. Compare and contrast the roles of meteorologists and climatologists.
- Discuss different factors that contribute to weather in Florida.
- Name four tools used to predict the weather and describe the function of each.

Additional Resources

Check out the Engineering a Barometer activity at *WaterMatters.org/Activities*. Also available in the Appendix.

Check out NOAA's *Climate.Gov/Teaching* for many educational resources about climate.

Help students make their own weather vane with Steve Spangler's Do-It-Yourself Weather Vane found at *SteveSpanglerScience.com/Lab/Experiments/Weather-Vane*.

Section Three: Extreme Weather

Key Ideas

- Droughts have a serious impact on water resources.
- Hurricanes, tornadoes and thunderstorms can have positive and negative impacts on the environment.
- Floridians should be prepared for the negative impacts of Florida's extreme weather.

Standards

SC.6.E.7.7
Investigate how natural disasters have affected human life in Florida.

SC.6.E.7.8
Describe ways human beings protect themselves from hazardous weather and sun exposure.

Objectives

- The student will explain how different types of extreme Florida weather impact the environment.
- The student will be able to track hurricane paths.
- The student will know how to develop emergency preparedness kits for their home.
- The student will develop strategies to solve real-world problems.

Vocabulary

Drought	Hurricane hunter	Lightning
Hurricane	Tornado	
Storm surge	Thunderstorm	

Bellringer

Ask students to write a paragraph describing weather that frightens them. Share and tally student responses.

Engage

Discuss consequences of extreme weather.

Hurricane Kit

Ask students to make a list of supplies for a hurricane preparedness kit. Tell students to think about needs for before, during and after a storm. Compare student responses to the hurricane checklists provided by Bay News 9 at *BayNews9.Com/Content/News/BayNews9/Weather/Hurricane-Center/Checklist*.

Foldable

Ask students to make a foldable with four squares labeled Drought, Hurricane, Tornado and Thunderstorm. In each square, students should write what they know about the label.

Explore

Students should read Section Three and complete the vocabulary review and questions.

Florida Waters Manual

Visit *WaterMatters.org/Publications* or click here for a direct link to the *Florida Waters* Manual. As a class or individually, read about types of weather in pages 41–45 of Chapter 4.

Check out *WeatherWizKids.com* for a variety of weather content, activities, experiments, vocabulary and more.

Learn all about thunderstorms, tornadoes and lightning in this thorough guide from NOAA available at *nws.noaa.gov/os/severeweather/resources/ttl6-10.pdf*.

Explain

By completing the questions after Section Three, students will explain what they read and comprehended.

Read about lightning and hurricanes from SWFWMD's Kids Corner at *WaterMatters.org/Kids*.

Learn more about extreme weather in SWFWMD's *WaterWeb Extreme Weather and Mapping* publication available at *WaterMatters.org/Publications*.

Elaborate

Tracking a Hurricane – Latitude and Longitude

Maps are often used to provide tracking information about tropical storms and hurricanes. The Atlantic hurricane season (June 1 – November 30) typically experiences 10 tropical storms and six hurricanes. In this activity, students will use clues to determine the path of a tropical storm that develops into a hurricane. If possible, have students use the outline of Florida provided in the Appendix as a model for creating their own maps. If you don't have time for students to create their own maps, then use the one provided and begin with Step 3 of the activity. This activity can be a lot of fun for your students and will help them improve their map-reading skills. When they finish the activity, have students compare their maps with those of others. Storm tracking paths should dissipate in the Atlantic Ocean, southeast of Cape Hatteras.

Materials:

Outline of Florida provided in the Appendix, graph paper, highlighter, pencil

Student Directions:

1. Using the outline of Florida provided, use graph paper to construct a similar map.
2. Label all parts of the map including latitudes and longitudes. Add a compass to indicate north, south, east and west.
3. Read the clues provided to describe the current location of the storm. Locate each position on your map and label it with the correct letter.
4. Connect the dots by using a highlighter to shade the path of the storm. Then compare your map with the maps of others to find out if your tracking ended in the same place.

Storm Path Clues:

e. A tropical storm forms north of Puerto Rico at 20°N and 67°W.

f. The storm moves directly west five degrees.

g. The storm increases speed and moves seven degrees west and two degrees north.

h. The 100 mph winds cause the storm to become a Category 2 hurricane as it moves north to 79°W and 25°N.

i. The hurricane's 120 mph winds increase its status to a Category 3 as it threatens the coastal area near 26°N and 80°W.

j. Instead of moving inland, however, the hurricane weakens, turns and moves in a northeast direction away from the coast, passing over 75°W and 29°N.

k. After weakening to a tropical depression, it gets absorbed by a cold front at 70°W and 34°N.

Evaluate

Storm Busters

During this activity, students will work together to investigate hurricanes and invent a way to diffuse or redirect a hurricane before it causes severe damage. Activity found at *etc.usf.edu/plans/lessons/lp/lp0160.htm*.

Additional Resources

Pick up free hurricane tracking maps, preparedness brochures and information on flood zones and emergency shelters from local grocery or home supply stores, news stations or government offices.

Contact your county's Emergency Management Department for further information or to request a guest speaker.

During this activity, demonstrate Colorful Convection Currents — *SteveSpanglerScience.com/Lab/Experiments/Colorful-Convection-Currents*.

How does a tornado form? Learn how while making a Tornado in a Bottle — *SteveSpanglerScience.com/Lab/Experiments/Tornado-in-a-Bottle1*.

Learn more about layers of the atmosphere at *Ducksters.com/Science/Atmosphere*.

Student Publication Answer Key

Section One: The Hydrologic Cycle

1. Can a cloudy day affect transpiration? Why or why not?

   Yes, there is likely to be less transpiration on a cloudy day because there is less sunlight. Sunlight increases the amount of transpiration as plants transpire to cool off.

2. What can affect the rate of evaporation?

   Temperature or the warmth of the sun

3. Your breath contains water vapor. Why can you sometimes see your breath when it is cold outside?

   Water vapor from our breath mixes with dry air in the cold and becomes humidity.

4. How are oceans connected to other surface waters on Earth?

   Oceans are connected to all surface waters through the water cycle, more specifically through evaporation and precipitation.

Section Two: Weather and Climate

1. Pretend your school has decided to set up its own weather station. Which equipment and supplies would be needed to monitor weather conditions in your area? Explain your reasons for your choices.

   Student answers will vary but should include:
   - a thermometer (measures air temperature)
   - a barometer (measures air pressure)
   - a rain gauge (measures amount of fallen rain)
   - a wind vane (determines wind direction)
   - an anemometer (measures wind speed)
   - student's eyes (best way to help detect current weather in an area)

2. What is the difference between weather and climate?

   Weather includes natural events that happen in the atmosphere on a daily basis. Weather can change quickly. Climate is the average pattern of weather in a particular area over extended periods of time (years, decades, centuries).

3. Explain the importance of understanding the weather and the climate as you plan for a family vacation.

   Student answers will vary but should include the differences in weather and climate, and being prepared for the climate you are visiting and the weather, which can change quickly.

4. How does the hydrologic cycle affect weather and climate?

   The hydrologic cycle puts moisture in the atmosphere (water vapor). This water vapor is responsible for the formation of many weather systems. The water vapor is returned to Earth as precipitation, also part of the hydrologic cycle, which affects the weather. Climate might be affected by changes in the hydrologic cycle such as faster melting of glacial ice, increases in the risk of fire, or coastal and wetland loss from sea-level rise.

5. What are the two types of climates in Florida and how are they different? What type of climate does west-central Florida have?

   The north and central parts of Florida have a humid subtropical climate, which is cooler than the tropical savanna climate in south Florida. A humid subtropical climate also differs from a tropical savanna climate in that it does not have distinct wet and dry seasons. West-central Florida has a humid subtropical climate.

Section Three: Extreme Weather

1. What are three examples of ways droughts can cause problems for Florida's residents?

   Student answers will vary but might include: lack of fresh water, reduce water use, limit on recreational activities such as boating and fishing; lack of plants and crops; thirst; disease or wildfires.

2. Hurricanes are formed by warm tropical waters. What part does the sun play in the formation of hurricanes?

   The sun heats the ocean and land creating an updraft, which continues to spin and strengthen as more air is drawn in. The sun also has heated the air being drawn in. This column of air can potentially develop into a hurricane.

3. Do you hear thunder before you see lightning, or do you see lightning before you hear the thunder? Explain your answer.

   You will see lightning before you will hear thunder because lightning causes thunder. In addition, light travels through air faster than sound.

4. Have you ever heard the saying, "The calm before the storm?" What do you think this saying means? Answers may include:
   - Peaceful calm before a sudden outburst
   - Calm in the eye of a hurricane followed by the "backside" of the hurricane

Answers to Extension Activities

Student answers will vary.

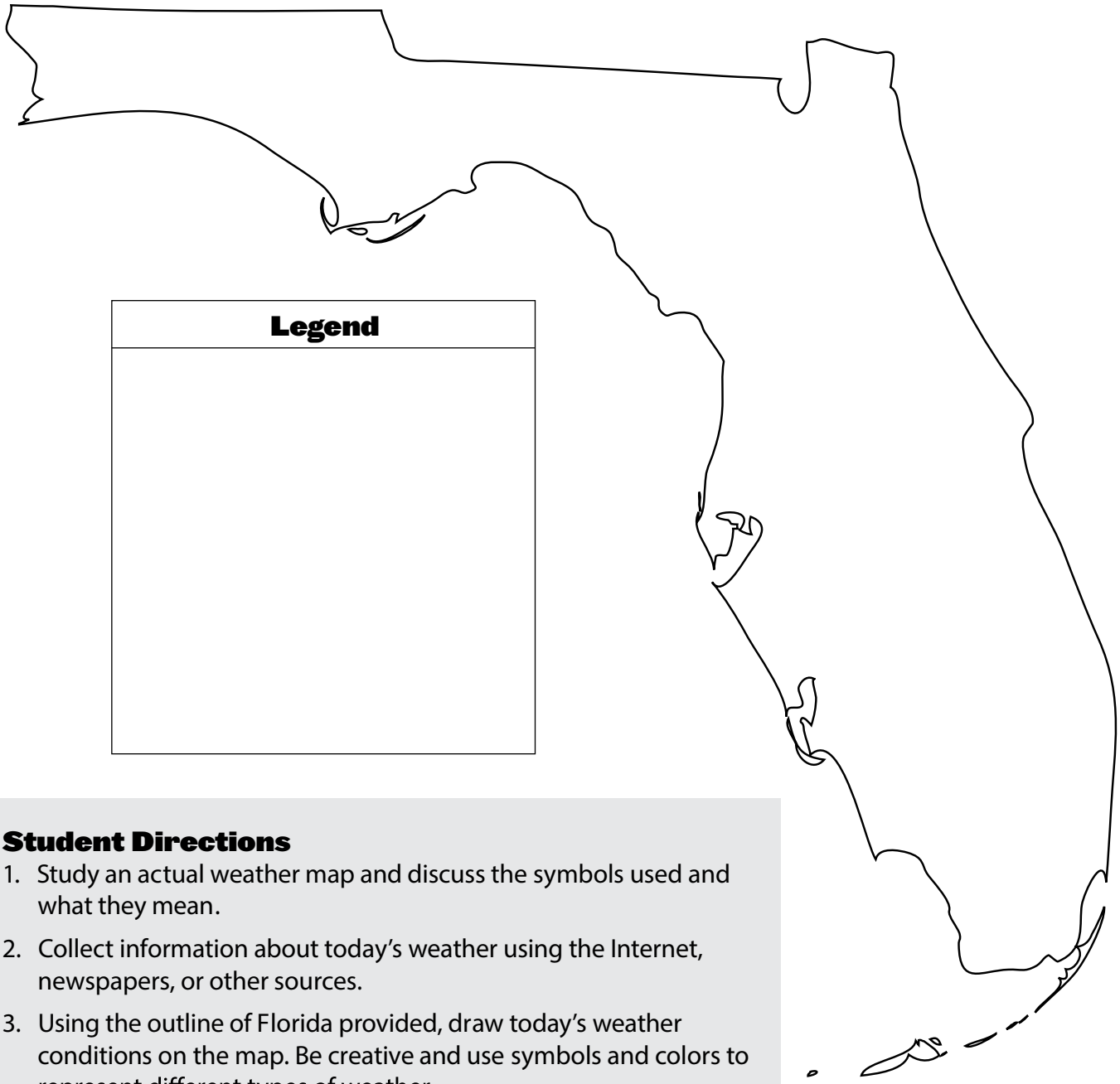
Engineering a Barometer

1. Measure the diameter of the top of the glass.
2. Cut a piece of the balloon big enough so its diameter, when stretched, will be at least one inch larger than the top of the glass.
3. Stretch the balloon over the top of the glass and seal it with a rubber band and tape.
4. Cut one end of the straw to make a pointer. Tape the other end to the center of the balloon in a horizontal position.
5. On the right end of the index card, make nine short lines to be used as a scale and number them 1–9.
6. Position the index card behind the glass so the straw is lined up with the number 5. Then tape the card to the glass.
7. Make a chart to record daily changes in air pressure. On your chart, title the columns as follows: date, weather conditions, barometric reading (1–9), and weather observations.
8. Record your observations over several days. Also make note of the weather conditions each day. Using information from your chart, describe how changes in air pressure influence weather conditions.

Steps 1–4 Pictured

Weather Maps

Title:_____Forecast Date: _____



Legend

Student Directions

1. Study an actual weather map and discuss the symbols used and what they mean.
2. Collect information about today's weather using the Internet, newspapers, or other sources.
3. Using the outline of Florida provided, draw today's weather conditions on the map. Be creative and use symbols and colors to represent different types of weather.
4. Develop a legend to help others interpret the symbols and colors on your map.
5. Title the map and include the date of the forecast.
6. Add any other information that would be useful to the reader.