

Lessons 13–15

Climate Zones

Prepare

In Lessons 13 through 15, students build on what they have learned about their local climate to find out whether the climate is the same everywhere. In Lesson 13, students work in small groups to analyze and interpret patterns in weather data to describe the climate in four other locations. In Lesson 14, students compare the climate of these four locations and their local climate as they investigate climate zones. Students use these comparisons as evidence to explain that climate varies in different regions of the world. In Lesson 15, students use what they have learned about climate in a Conceptual Checkpoint as they analyze the climate of Galveston, Texas, and make predictions about weather conditions expected during a particular season.

Student Learning

Knowledge Statement

Different regions of the world have different climate zones that are determined by patterns in average monthly temperature and annual precipitation.

Concept 2: Climate

Focus Question

How do people know what weather to expect?

Phenomenon Question

Is the climate the same everywhere?

Objectives

- Lesson 13: Analyze and interpret patterns in weather data to describe the climate of various locations.
- Lesson 14: Compare climate data to explain that climate varies in different regions of the world.
- Lesson 15: Analyze the climate of Galveston, Texas, and explain how climate data can be used to make predictions about weather conditions.

Texas Essential Knowledge and Skills Addressed

- 3.2C **Construct maps**, graphic organizers, simple tables, **charts**, and bar graphs using tools and current technology **to organize, examine, and evaluate** measured **data**. (Addressed)
- 3.2D **Analyze and interpret patterns in data to construct reasonable explanations based on evidence** from investigations. (Addressed)
- 3.3A **Analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning**, and experimental and observational testing. (Addressed)
- 3.3B **Represent the natural world using models** such as volcanoes or the Sun, Earth, and Moon system and identify their limitations, including size, properties, and materials. (Addressed)
- 3.8A **Observe, measure, record**, and compare day-to-day **weather** changes **in different locations at the same time that** include air temperature, wind direction, and precipitation. (Addressed)

English Language Proficiency Standards Addressed

- 2E Use visual, contextual, and linguistic support to enhance and confirm understanding of increasingly complex and elaborated spoken language.
- 3E Share information in cooperative learning interactions.



Materials

		Lesson 13	Lesson 14	Lesson 15
Student	Science Logbook (Lesson 13 Activity Guide)	●		
	Climate data for US cities (1 set of graphs for 1 city per student pair)	●		
	Science Logbook (Lesson 14 Activity Guide)		●	
	Science Logbook (Lesson 15 Activity Guide)			●
Teacher	North America Climate Zone Map (Lesson 14 Resource A)	●	●	
	Map of the United States	●		
	Class climate chart from Lesson 12	●	●	
	Climate Zone Descriptions (Lesson 14 Resource B)		●	●
	World Climate Zone Map (Lesson 14 Resource C)		●	
	Anchor chart, anchor model, driving question board			●
	Conceptual Checkpoint Graphs (Lesson 15 Resource A)			●
	Conceptual Checkpoint Questions (Lesson 15 Resource B)			●
Preparation	Print copies of climate graphs for four US cities (see Lesson 13 Resources A, B, C, D, or E); each student pair will need graphs for one city.	●		

Lesson 13

Objective: Analyze and interpret patterns in weather data to describe the climate of various locations. 🌍



Teacher Note

Before this lesson, use the North America climate zone map (Lesson 14 Resource A) to determine the climate of the location students have been studying as they gather information on their local climate. During this activity, do not include the city that has the same climate as that location so that by the end of Concept 2, students will have observed locations in all five climate zones. For reference, the cities in this activity are in the following climate zones:

- West Palm Beach, FL: tropical
- Las Vegas, NV: dry/desert
- Buffalo, NY: cold
- Birmingham, AL: temperate
- Nome, AK: polar/tundra

For the samples shown in these lessons, Buffalo, NY, has been omitted since the sample local city (Boston, MA) is also in the cold climate zone.

Launch 5 minutes

Display a map of the United States and place a pin or other marker on the map to indicate students' location. Ask students to name other locations in the United States they would like to visit. As students name other locations, point them out on the map. Encourage students to think about whether the seasonal weather patterns they described in previous lessons would be the same for those locations. Ask questions such as these: If you visited Florida in the winter, would it be as cold as where we live? How do you know?



Agenda

Launch (5 minutes)

Learn (35 minutes)

- Analyze Climate Data (25 minutes)
- Develop Class Climate Chart (10 minutes)

Land (5 minutes)



Content Area Connection: Mathematics

As students begin to compare climates in different cities by using their previous understanding of temperature and precipitation, they should look for patterns and use reasoning to generalize how climate varies in different regions of the world. To support students in making these generalizations, consider using questions such as these:

- How do you know whether something is a pattern?
- How does this relate to _____?
- How would you prove that _____?
- What predictions can this pattern support?
- Is this always true, sometimes true, or never true?

Explain to students that it may be helpful to see what typical weather conditions are like in other locations to see whether the climate is the same everywhere.

Next, place a pin or other marker on the map to indicate the four cities from the list below that are in climate zones different from the climate zone of students' location:

- West Palm Beach, FL
- Las Vegas, NV
- Buffalo, NY
- Birmingham, AL
- Nome, AK

Ask students to observe where the cities are located on the map, and introduce the Phenomenon Question **Is the climate the same everywhere?** Explain that students will work as a class to examine weather data from these four cities to help answer this question.

Learn 35 minutes

Analyze Climate Data 25 minutes

Divide students into pairs and explain that each pair will describe the climate of one of the four cities marked on the map. Distribute temperature and precipitation graphs for one city (Lesson 13 Resources A–E) to each student pair and ask students to record their city on the top row of the chart in their Science Logbooks (Lesson 13 Activity Guide). 

Each student pair should analyze the average monthly temperature and total precipitation for their assigned city by using the same procedure they used in Lesson 11. As students work, they should record the following in their Science Logbooks (Lesson 13 Activity Guide):

- The lowest average monthly temperature and highest average monthly temperature for each season

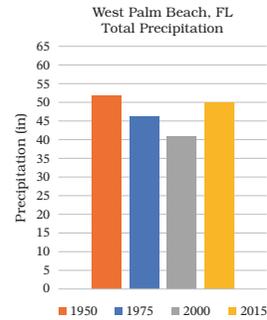
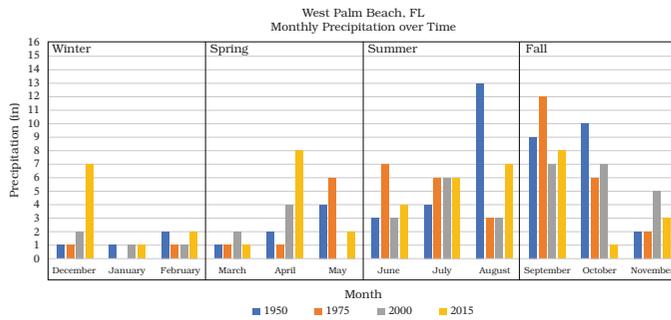
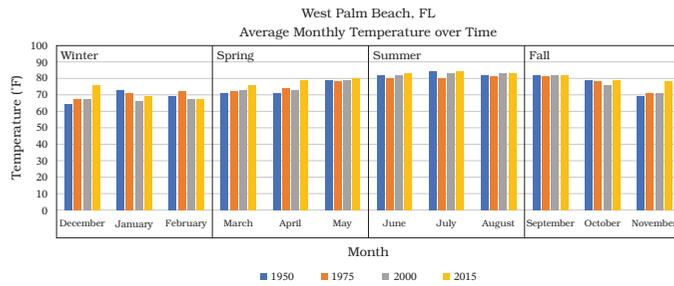


Teacher Note

More than one student pair will examine data for each city. Distribute each city's data as evenly as possible among the class so that about the same number of student pairs are working with data for each city (3E).

- Any seasonal patterns in temperature (e.g., whether the average temperature changed throughout the season or whether it stayed mostly stable)
- The lowest yearly total precipitation and the highest yearly total precipitation
- Any seasonal patterns of precipitation

Sample climate data graphs and student response for West Palm Beach, FL:



City: West Palm Beach, Florida		
Season	Lowest and Highest Average Monthly Temperature	Seasonal Pattern
Winter	Lowest: 64°F Highest: 76°F	The temperature was mostly stable each month.
Spring	Lowest: 71°F Highest: 80°F	The temperature got a little warmer each month.
Summer	Lowest: 80°F Highest: 84°F	The temperature was mostly stable each month.
Fall	Lowest: 69°F Highest: 82°F	The temperature got a little cooler each month.
Lowest and Highest Total Yearly Precipitation		Seasonal Pattern
Lowest: 41 inches Highest: 52 inches		Winter had the least precipitation. Summer and fall had the most precipitation.



Check for Understanding

As student pairs work together to describe the climate of their assigned city, listen for students to read data accurately and to correctly describe any seasonal patterns in average monthly temperature and amount of precipitation.

Evidence

Look for evidence that all students

- identify the highest and lowest average monthly temperature for each season,
- describe any seasonal patterns in average monthly temperature across each season,
- identify the highest and lowest total yearly precipitation, and
- describe any seasonal patterns of precipitation.

Next Steps

If students need support with identifying patterns, then ask questions such as these: What month in spring had the highest temperature? Do the bars go up or down throughout the season? Do any seasons have more precipitation than others?

Develop Class Climate Chart 10 minutes

Bring the class back together and tell students they will use what they have learned about each city's climate to build onto the class climate chart they started in Lesson 12. Invite student pairs to share with the class what they learned about each city's climate. As students share, ask other pairs who examined the same city to use nonverbal signals to show whether they agree or disagree. As students agree, add each city's lowest and highest average monthly temperatures for each season and lowest and highest total yearly precipitation to the class climate chart. As in Lesson 12, also add the lowest and highest average monthly temperature across all seasons for all years to the bottom of the temperature data for each city.

Sample class climate chart started in Lesson 12:

	Boston, MA	West Palm Beach, FL	Nome, AK	Birmingham, AL	Las Vegas, NV
Lowest and Highest Average Monthly Temperature over Time	<i>Winter:</i> 19°F–45°F <i>Spring:</i> 33°F–62°F <i>Summer:</i> 65°F–76°F <i>Fall:</i> 44°F–69°F <i>All seasons:</i> 19°F–76°F	<i>Winter:</i> 64°F–76°F <i>Spring:</i> 71°F–80°F <i>Summer:</i> 80°F–84°F <i>Fall:</i> 69°F–82°F <i>All seasons:</i> 64°F–84°F	<i>Winter:</i> 0°F–24°F <i>Spring:</i> 7°F–41°F <i>Summer:</i> 41°F–55°F <i>Fall:</i> 8°F–44°F <i>All seasons:</i> 0°F–55°F	<i>Winter:</i> 38°F–59°F <i>Spring:</i> 52°F–74°F <i>Summer:</i> 76°F–83°F <i>Fall:</i> 47°F–75°F <i>All seasons:</i> 38°F–83°F	<i>Winter:</i> 41°F–60°F <i>Spring:</i> 54°F–81°F <i>Summer:</i> 81°F–93°F <i>Fall:</i> 50°F–87°F <i>All seasons:</i> 41°F–93°F
Lowest and Highest Total Yearly Precipitation	32–48 inches	41–52 inches	15–26 inches	51–60 inches	2–4 inches

Land

5 minutes

Ask students to share any similarities they notice about the locations based on the class climate chart.

► **What similarities do you notice about these locations' climates? Are there any similarities in their seasonal patterns?**

- *In every location, summer is the hottest season.*
- *Winter is always the coldest season.*
- *In each location, fall and spring have similar temperatures to one another.*

Use student responses to agree that in each location, summer is the warmest season and winter is the coldest season. Point out that while spring and fall have similar temperatures, the temperatures increase each month in the spring and decrease each month in the fall.  As needed, ask student pairs to confirm these patterns for the city they investigated by looking at the seasonal patterns they described in their Science Logbooks (Lesson 13 Activity Guide).

► **What differences do you notice about these locations' climates?**

- *Nome, Alaska, is a lot colder than West Palm Beach, Florida, all year long.*
- *Las Vegas, Nevada, doesn't get much precipitation compared to the other locations.*

Use student responses to agree that the locations differ in average monthly temperature and total yearly precipitation. Tell students they will further explore these differences in the next lesson.

Optional Homework

Students think about what it would be like to live in one of the four cities explored in this lesson. Ask students to choose one of the cities and record how the average monthly temperature and total precipitation in that city may affect the daily lives of the people who live there.



Differentiation

Some students may benefit from additional support in noticing similarities across climate zones. As needed, draw students' attention back to the graphs for each city and ask questions such as these (3E):

- Which season is the warmest in _____? What about in the other locations?
- What do you notice about the way the temperature changes throughout the fall in each location? What about during the spring?