UNIT ★

1

The Geography of Texas

Why It Matters

As you study Unit 1, *you will learn about the geography of Texas. Geographers are interested in the places where events occur. They ask, "Where?" Historians are interested in events as they occur in time. Among the questions they ask is, "When?" Both geographers and historians want to know "Why?" It is, perhaps, the most important question of all. For you to understand why events in Texas history occurred, you will need to understand both where events occurred and when they occurred.*
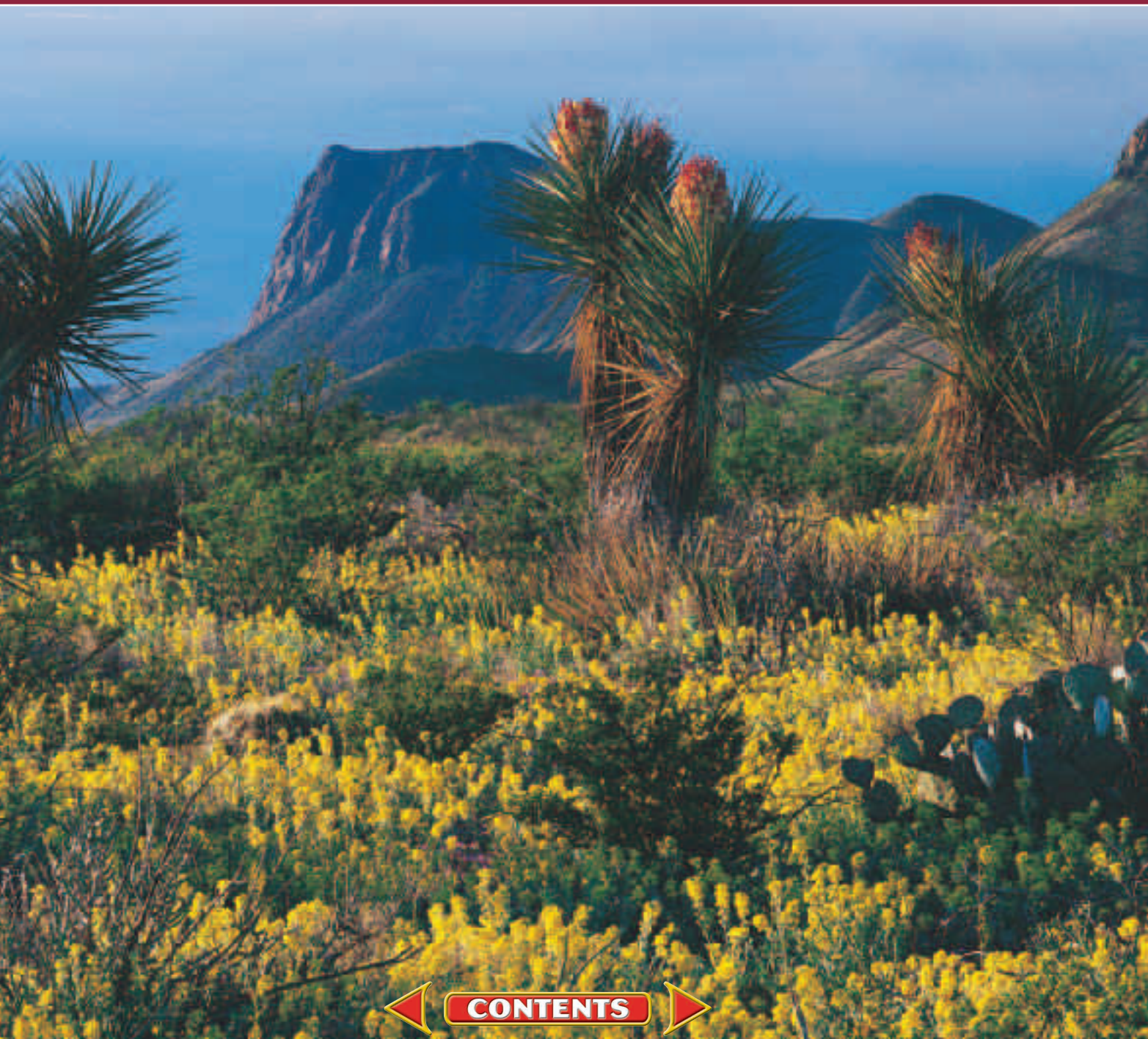
Primary Sources Library

Wildflowers and yucca plants thrive at the foot of Nugent Mountain in Big Bend National Park.

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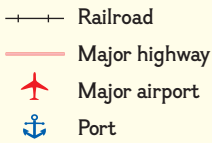*"Texas is, in many respects, the most eligible part of North America."*

—Mary Austin Holley (1784–1846)

Population by county

▮	Over 1 million
▮	500,000 - 1 million
▮	150,000 - 499,999
▮	100,000 - 149,999
▮	Less than 100,000

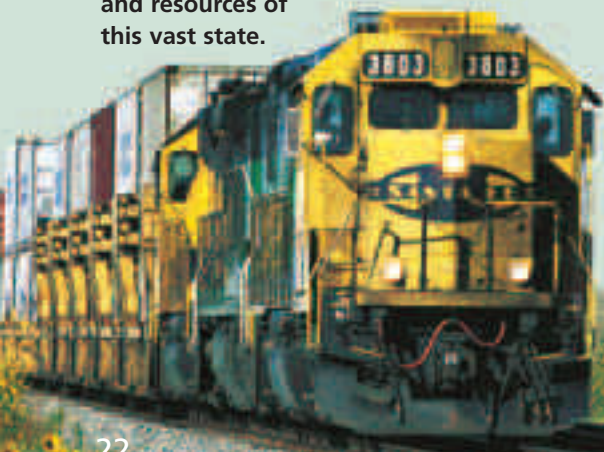### Transportation

- ┼┼┼ Railroad
- ── Major highway
- ✈ Major airport
- ⚓ Port

Population growth has occurred among all ethnic groups. Runners competing in Austin reflect the rich diversity of Texans.

Amarillo

Canadian R.

ARK.

Lubbock

Wichita Falls

Red R.

Brazos R.

Sherman

Fort Worth   Dallas

Longview

LA.

El Paso

Abilene

Tyler

Midland

Odessa

Colorado R.

Sabine R.

Pecos

San Angelo

Waco

Lufkin

Pecos R.

Austin

Trinity R.

Beaumont

Port Arthur

Rio Grande

San Antonio

Houston

Houston Ship Channel

Del Rio

Galveston

Nueces R.

Victoria

MEXICO

Corpus Christi

Railroads, highways, and airlines link the people and resources of this vast state.

Laredo

Gulf of Mexico

Edinburg

McAllen

Brownsville

N W E S

| 0 mi. | | 150 |
| 0 km | | 200 |

Albers Equal-Area projection
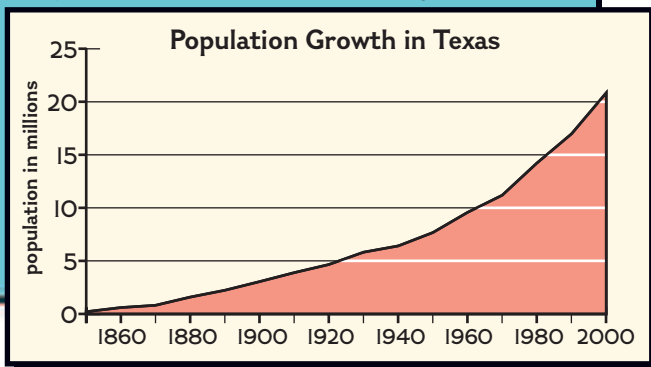
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POPULATION PATTERNS

Modern skyscrapers dot the night skyline of Dallas. Dallas is the second largest city in Texas. Combined with Fort Worth and other neighboring communities, it forms the state's largest metropolitan area.

MISSISSIPPI

A drilling ship probes for oil off the Texas coast. The oil industry has stimulated population growth.

The rapidly growing population of Texas is expected to double in the next 50 years.

Population Growth in Texas

population in millions

25
20
15
10
5
0

1860 1880 1900 1920 1940 1960 1980 2000

Today eight out of ten Texans live in urban areas. The largest, most crowded cities developed in the eastern part of Texas. People originally settled there because they found moist, fertile lowlands where they could grow crops. Later, the discovery of oil, natural gas, and other resources attracted workers to the region. Slightly more than half of all Texans live in the metropolitan areas of Houston, Dallas–Fort Worth, and San Antonio.

More than four million people representing many different cultures have settled in and around Houston. Originally a cotton-shipping port, the city expanded rapidly after railroads were built and oil was discovered nearby. Today Houston is one of the busiest ports in the country and a leading petrochemical center.

Dallas and Fort Worth, located in the heart of a rich agricultural region, have expanded toward each other. Like Houston, Dallas started out as a cotton market and grew dramatically when oil was found. Fort Worth, originally a military outpost, mushroomed into a large cattle-shipping center after railroads were constructed. Today Dallas–Fort Worth has evolved into a single large metropolitan area with a wide variety of industries, including oil refining, aircraft and electronic equipment manufacturing, and food processing.

Good transportation is key to population growth. Many railroads and highways in south central Texas meet in San Antonio. It has been a commercial center since its early days of selling supplies to cowboys as they started north to sell cattle. The population of San Antonio jumped dramatically when the military established bases and training facilities there during World War II.

Vast transportation and communication networks link Texas's major metropolitan areas to the people and resources of smaller towns and cities throughout the state and the rest of the world.

LEARNING from GEOGRAPHY

1. Where do most of the people in Texas live today?

2. How do you think railroads and highways have affected settlement patterns in the state? How have settlements affected railroads and highways?

1

Land of Contrasts

Why It Matters

Texas is a diverse state in many different ways, including its landscapes and climate. Knowing about the basic geographical features of Texas provides a good context for learning about the history of Texas.

The Impact Today

Understanding geography helps us to understand events that shape our lives today. Although people modify their environment through technology, all societies are dependent upon a natural resource base. The location of those resources influences where Texans live and how they make a living.
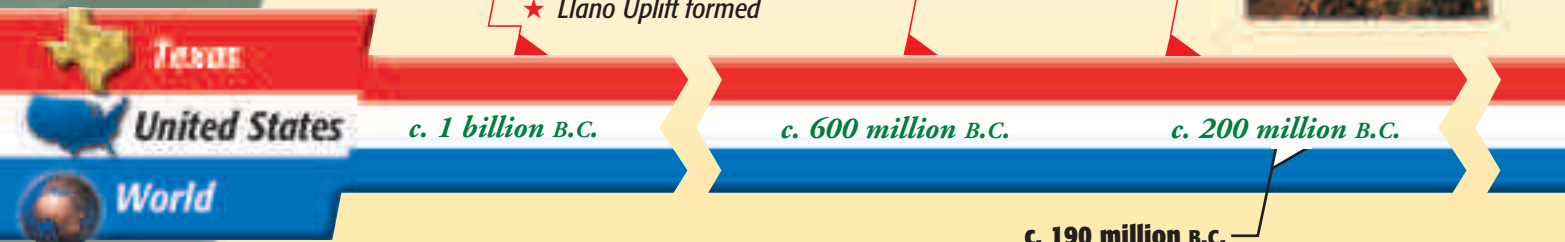
c. 600 million B.C.
★ *Broad, shallow seas covered much of Texas*

c. 300 million B.C.
★ *Ouachita Mountains uplifted across Texas; seas receded*

c. 1 billion B.C.
★ *Llano Uplift formed*

Texas

United States   *c. 1 billion B.C.*   *c. 600 million B.C.*   *c. 200 million B.C.*

World

c. 190 million B.C.
• *Dinosaurs and flowering plants covered North America*

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Guadalupe Mountains National Park contains some of the most dramatic landscape in Texas.

Summarizing Information Study Foldable
Make this foldable to help you summarize what you learn about the geography of Texas by focusing on six key words and phrases.
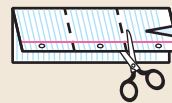
Step 1 Fold a sheet of paper in half from side to side.

Fold it so the left edge lays about $\frac{1}{2}$ inch from the right edge.

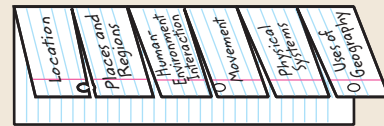**Step 2** Turn the paper and fold it into thirds.

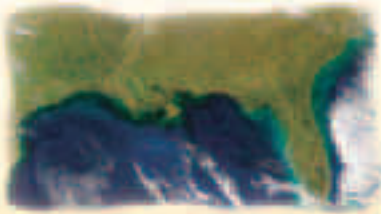**Step 3** Unfold and cut the top layer only along both folds.

This will make three tabs.

Step 4 Now cut each of the three tabs in half and label as shown.

Location • Places and Regions • Human Environment Interaction • Movement • Physical Systems • Uses of Geography

Reading and Writing As you read the chapter, write definitions and examples under the appropriate tabs of your foldable to learn why Texas is called a "Land of Contrasts."

c. 140 million B.C.
★ Seas covered Texas again

c. 65 million B.C.

c. 2 million B.C.

c. 65 million B.C.
• Rocky Mountains began to form

c. 2 million B.C.
• Ice Age began

TEXAS HISTORY
Online

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Understanding Texas Geography

Guide to Reading

Main Idea
Geographers look at a variety of topics as they learn about a place.

Key Terms
geography, environment, location, absolute location, relative location, place, region, human-environment interaction, movement, cultural diffusion, diameter

Reading Strategy
Organizing Information Complete a chart like the one shown here by explaining the importance of the elements below.

Geographical Elements	Importance
Places/Regions	
Human-Environment Interaction	
Movement	

Read to Learn
• what questions geographers ask.
• about absolute and relative location.
• why people need to understand the geography of their area.

Section Theme
Geography and History Geography explains why people live where they do and why certain events occurred where they did.

Preview of Events

♦ *c. 600 million B.C.*
Broad, shallow seas cover much of Texas

♦ *c. 300 million B.C.*
Ouachita Trough forms

A Texas Story

The first Texas Almanac

The *Texas Almanac* was published for the first time in 1857 in Galveston. It was a reference book that provided information about the climate, government, and law. It was also intended as a guide to help people moving to Texas. The *Texas Almanac* is still published every two years. Instead of merely telling about Texas, it has become part of Texas culture.

Six Geographical Questions

Do you live in a large city, in a small town, or on a farm or ranch? What language or languages do you speak? Is the food you eat grown nearby or brought in from elsewhere? These questions have to do with **geography.** Almost every detail of your life is affected by geography. The foods you eat, the things you do for fun, the type of house you live in, and the

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clothes you wear are all influenced by where you live. If you live in Amarillo, for example, you need warmer winter clothes than if you live in Brownsville.

Geography deals with the present by helping to explain why people live the way they do. Geography also helps explain the past—why certain events occurred. Whether you are studying Texas or the world, the past or the present, a knowledge of geography is essential.

When you study places and events in Texas, ask yourself these six questions: (1) Where is the place? (2) What is the place like? (3) How is the place similar to and different from other places? (4) How do the people who live there interact with their surroundings, or **environment?** (5) How are those people in that place linked with other people and places? (6) How does geography relate to the past, present, and future of that place? These questions reflect the six essential elements of the national standards in geography: location, places and regions, human-environment interaction, human systems, physical systems, and uses of geography.

✓**Reading Check** **Evaluating** How is a knowledge of geography useful to people?

Location

Location answers the question "Where is it?" For example, where is Houston? Houston is located near the eastern border of Texas, a state in the United States of America.

There are two types of location: absolute and relative. **Absolute location** refers to the exact position of a place on the earth's surface. It is identified by latitude and longitude 📖 *(see the Geography Handbook, pages 1–17).* Absolute location can be considered as a place's "global address." Look at the map on page 28 and identify the absolute location for the southernmost point in Texas.

Relative location is the position of a place in relation to other places. Austin is located 182 miles *south* of Dallas and 78 miles *north* of San Antonio. A place may be described with many relative locations. When describing relative location, you may use terms like *south of, located next to, between,* and *in the same region.*

The relative location of Texas has been one of the most important factors in the state's development. On the southeast coast, the warm waters of the **Gulf of Mexico** wash Texas beaches. Today, the Gulf of Mexico provides jobs to thousands of Texans who work in the fishing, oil, tourist, and shipping industries.

Texas's relative location places it along the border of Mexico. This long border has deeply affected Texas history and in the future may be the single most important factor in the state's economic and social development. According to U.S. Census figures, the Mexican American population of Texas stood at over 32 percent in 2000 and is expected to continue growing.

Texas's location in the south central part of the United States makes it attractive to many kinds of businesses. Its relatively moderate climate and central location make it an ideal place for airline and product distribution operations serving the entire United States.

✓**Reading Check** **Examining** How does the relative location of Texas affect the state's economy?
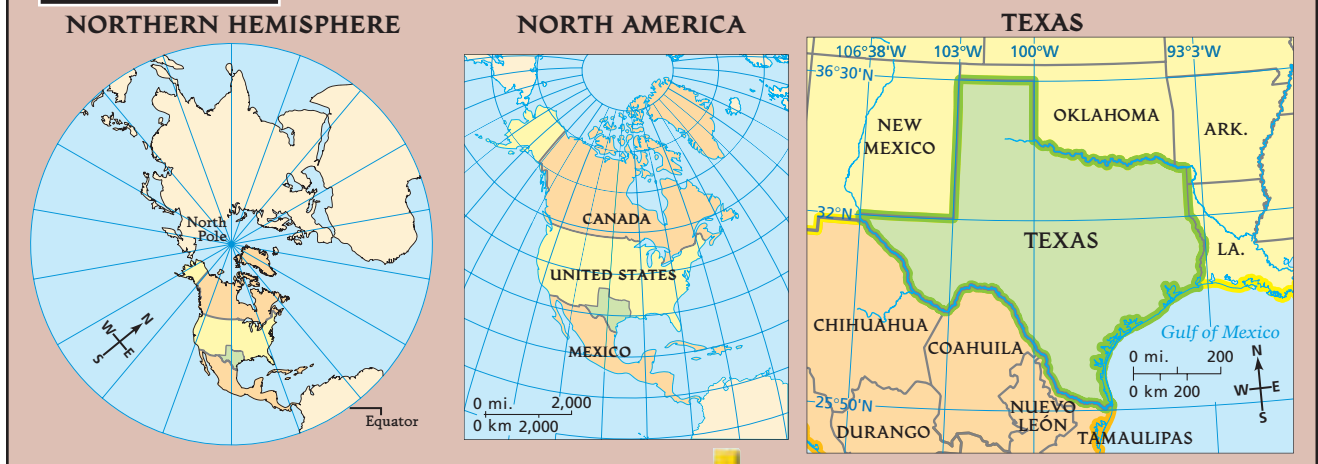
🍅 *Exploring* **Geography**

Route 66 is a famous highway that once connected Los Angeles to Chicago. Today, only parts of it still exist. What is Adrian's location relative to Los Angeles and Chicago?

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NATIONAL GEOGRAPHIC — Absolute and Relative Locations of Texas

NORTHERN HEMISPHERE

North Pole

Equator

NORTH AMERICA

CANADA

UNITED STATES

MEXICO

0 mi. 2,000
0 km 2,000

TEXAS

106°38'W   103°W   100°W   93°3'W
36°30'N

NEW MEXICO   OKLAHOMA   ARK.

32°N

TEXAS   LA.

CHIHUAHUA   COAHUILA   Gulf of Mexico

25°50'N   NUEVO LEÓN

DURANGO   TAMAULIPAS

0 mi. 200
0 km 200

Places and Regions

Geographers also look at places and regions. **Place** refers to those features and characteristics that give an area its own identity or personality. Places have physical characteristics—such as landforms, climate, plants, and animals—and human characteristics—such as language, religion, architecture, music, politics, and way of life.

To make sense of all the complex things in the world, geographers often group places or areas into regions. **Regions** are areas that are united by one or more common characteristics. When many places share similar characteristics, they form a region. In addition to physical and human characteristics, regions may be defined by their business needs. For example, Mexico trades heavily with United States border towns along the Rio Grande to form an economic region.

Human-Environment Interaction

The study of geography includes looking at **human-environment interaction,** or the relationships linking people to their surrounding environment. Throughout history, people have cut forests and dammed rivers to build farms and cities. Some of these activities have led to air and water pollution. The physical environment affects human activities as well. The type of soil and amount of water in a place determines if crops can be grown. Earthquakes and floods also affect human life.

Human Systems

Geographers also examine human systems, or the way people go about shaping the world. They look at how boundary lines are determined and analyze why people settle in certain places and not in others. An important theme in geography is the continual **movement** of people, ideas, and goods. People bring ideas and culture from one place to another. Sometimes those ideas are widely accepted in the new location, changing the culture. This process is called **cultural diffusion.** Other aspects of movement and human systems include trade and urbanization (the growth of cities).

Physical Systems

Why do some places have mountains and other places have flat deserts? When studying places and regions, geographers analyze how physical systems—such as volcanoes, glaciers, and hurricanes—interact and shape the earth's surface. They also look at ecosystems, or communities of plants and animals that are dependent upon one another and their particular surroundings for survival.

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The Uses of Geography

Understanding geography and knowing how to use the tools and technology available to study it help prepare you for life in our technological society. Individuals, businesses, and governments depend upon geography and maps of all kinds on a daily basis. Computer software, such as the **Geographic Information System** (GIS), allows us to make informed decisions about using our physical and human environment. If, for example, a company wanted to log in a forest where a rare species of birds nested, they could enter nesting and logging data into the computer. GIS would be used to determine what areas had to be protected and which could be cut.

Sizing Up Texas

Texas is the second largest state in the United States. Only Alaska is bigger. Of the other states, only California and Montana are even half as large as Texas. The state stretches 801 miles (1,289 km) from the northwest corner of the Panhandle to the extreme southern tip near Brownsville. It is 773 miles (1,244 km) from the easternmost bulge of the Sabine (suh•BEEN) River in Newton County to the westernmost point near El Paso.

The total surface area of Texas is 267,277 square miles (692,247 sq. km). This includes both land and water. If you wanted to hike around the boundaries of Texas, you would have to walk 3,822 miles (6,150 km). That is almost two and one-half times the distance from Dallas to New York City! Texas is as large as the states of New York, Pennsylvania, Ohio, Illinois, Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, New Jersey, and Maine combined. Even then, Texas still has land to spare. Texas makes up about 7 percent of the total area of the United

TWO VIEWPOINTS

Rural Past or Urban Future?

Although this high-speed rail system plan was defeated, conflict continues between urban and rural interests. Read the two views below and then answer the questions.

A City Point-of-View Supports High-Speed Rail System

There are countless numbers of good ideas that have fallen by the wayside because skeptics thought they would never work. The Texas High-Speed Rail project, the first bullet train system for North America, should not become one of them. The Texas project would connect the state's biggest cities, provide thousands of jobs and put Texas on the map in a dramatic way.

—Editorial, *Dallas Morning News*

Small Town Opposition

We realized that this is not good for Westphalia. Many residents are concerned because the rail's route run[s] about 2,000 feet from a 100-year-old Catholic church that is the town's focal point. Many residents fear that the train tracks will cut off access from one section [of their property] to another. They also fear that noise from the train will hurt cattle.

During peak hours, a train will pass every 15 minutes and generate about 107 decibels at 25 feet.

—*Dallas Morning News*

Learning From History

1. Why are many rural residents opposed to the rail system?

2. What are some of the special needs of big city populations?

People of Texas

Roy Bedichek 1878-1959

Roy Bedichek was a naturalist who was inspired by the vast Texas landscape. Early in his career, he taught English in high schools in Houston and San Angelo. Later, after working at University of Texas, Bedichek traveled around the state visiting schools, often writing about his travels. At times, he would camp out. This experience got him interested in wildlife, especially birds. In 1946, he retreated to Friday Mountain Ranch in Austin, where he wrote *Adventures With a Texas Naturalist.* His next two books, *Karánkaway Country* and *Educational Competition,* were recognized as books of the year in Texas. Bedichek had a gift for describing the world around him.

States. The state is larger than many nations, including Ecuador, France, Italy, Spain, Germany, Poland, Kenya, Japan, and Vietnam.

Sometimes the vast distances between cities pose problems for Texans. The following examples will help you understand how big Texas is. El Paso is closer to the Pacific Ocean than it is to Houston. A circle 500 miles (805 km) in **diameter**—with El Paso as its center—would include the capitals of three Mexican and two American states, but not Austin. Amarillo is closer to the capitals of New Mexico, Colorado, and Oklahoma than it is to that of Texas. Residents of the village of Lajitas (lah•HEE•tahs), in the Big Bend area, live nearly 100 miles (161 km) from the nearest high school. Some students must spend 4 hours each day on a school bus. Understandably, people in these far-flung parts of Texas sometimes have closer business and social ties with the people of other states than they do with fellow Texans.

✓**Reading Check** **Explaining** How do long distances pose problems for some Texans?

SECTION 1 ASSESSMENT

Checking for Understanding
1. **Using Key Terms** Write a short paragraph explaining how location, place, and region are related.
2. **Reviewing Facts** How do you describe a place's relative location?

Reviewing Themes
3. **Geography and History** How does the physical environment affect human activities?

Organizing to Learn
4. **Categorizing** Create a web like the one shown here and list the physical and human characteristics of your hometown or neighborhood.

Your Home Town

Human Characteristics

Physical Characteristics

Critical Thinking
5. **Identifying** Are there examples of cultural diffusion in your community? What are they?

TAKS PRACTICE

Supporting Generalizations
Explain whether you think there is more movement of people, ideas, and goods today than in the past. Support your answer with examples.

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Natural Resources

Guide to Reading

Main Idea

Texas contains a number of different landforms and an abundance of natural resources.

Key Terms

plain, barrier island, escarpment, fault, plateau, aquifer, savanna, grassland

Reading Strategy

Classifying Information Complete a chart like the one shown here.

Major Rivers	Major Minerals

Read to Learn

• about major landforms and water resources.
• about natural vegetation.
• about Texas's mineral resources.

Section Theme

Economic Factors The land's resources affect economic activities in an area.

Preview of Events

♦*c. 240 million B.C.*   ♦*c. 65 million B.C.*

Gulf of Mexico begins to develop

Earthquakes create Balcones Escarpment

Piney Woods of Texas

A
Texas Story

"The northern counties of the state embrace what is usually called the wheat region of Texas . . . Eastern Texas is the great timbered region of the state . . . The counties between the Colorado and San Antonio Rivers possess the advantage of being better adapted to stock-raising and wool growing . . . the region extending from San Antonio to the Rio Grande is capable of supporting stock sufficient to supply the whole United States . . . "

—*The Texas Almanac and Emigrant's Guide to Texas,* 1869

Viewing Texas

Imagine flying over the widest part of Texas in a straight line from the south to the north and then from the east to the west. During these two flights, the face of Texas would change dramatically.

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Texas Physical Map

The Davis Mts. were named for Jefferson Davis who, as Secretary of War, ordered the building of Ft. Davis.

To the Spanish, the hills of the *Balcones Escarpment* looked like balconies from the plains.

The difference between plains and plateaus is the elevation. Plains are low and plateaus are high.

High Plains · Palo Duro Canyon · Caprock Escarpment · Llano Estacado · Permian Basin · Guadalupe Mts. · Davis Mts. · Chisos Mts. · Stockton Plateau · Edwards Plateau · Balcones Escarpment · Pecos R. · Rio Grande · Nueces R. · Guadalupe R. · Colorado R. · Brazos R. · Trinity R. · Red R. · Angelina R. · Sabine R. · Coastal Plains · Laguna Madre · Padre Island · Gulf of Mexico · MEXICO · TEXAS · OKLAHOMA · NEW · ARIZ. · TENN. · ALA. · MISS.

0 mi. 200
0 km 200
Albers Equal-Area projection

TAKS PRACTICE

A physical map shows the natural features of an area, such as mountains and rivers. **Analyzing** *What are the major physical landforms shown on the map?*

The southernmost point in Texas lies on a mostly level **plain.** Plains may be gently rolling and even have low hills. The southern tip of Texas is very near sea level where Texas meets the Gulf of Mexico. Running along the coast a few miles offshore is Padre Island. This long thin strip of land covered with sand dunes is a **barrier island** protecting the mainland shore from ocean waves. Between Padre Island and the mainland is Laguna Madre, a large sheltered bay. Laguna Madre is a rich fishing area.

Moving northward from the Brownsville area, you will see that the land slowly rises, as it begins to gently roll. This part of Texas is covered with a tough and prickly mixture of mesquite trees, cacti, blackbrush, and other plants that thrive in a dry, hot climate. Large areas of South Texas are also covered with grasses. In spring, great masses of bluebonnets, Indian blankets, Indian paintbrushes, and other wildflowers carpet the land.

Cutting across Texas in a great curving arc is an **escarpment,** or long cliff. The **Balcones** (bal•KOH•neez) **Escarpment,** formed millions of years ago by a giant earthquake, follows a weak part of the earth's crust called a **fault.** In the distant past, the land sank east and south of the fault. North and west of it, the land rose many feet, forming the escarpment.

The Balcones Escarpment marks the beginning of a region of Texas known as the **"Hill Country."** This part of Texas is a **plateau,** or tableland, covered with small trees and brush. Hills on the rim of the plateau were formed by streams cutting and smoothing over the plateau's limestone edges. There are more streams and rivers in this part of Texas than in any other. This region is also known for the massive wildflower displays that blanket its slopes in spring.

The land gradually gets flatter and higher as you travel northwest. One abrupt change disrupts this plains region. The **Caprock**

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Escarpment slashes south to north from Big Spring to Pampa. Palo Duro and Tule Canyons, great gashes in the Caprock, hold some of the most beautiful scenery in Texas.

A trip starting at the easternmost point in the state would also begin on a plain. Again, the level of the land gently rises as you travel westward. After crossing the Balcones Escarpment and the hilly central region, you finally reach the plains to the west.

West Texas has landforms that do not appear in other parts of the state. Most noticeable are the mountains. Texas has 91 mountains more than one mile high, and all of them are in West Texas. The highest point in the state, **Guadalupe Peak,** rises 8,749 feet (2,667 m) above sea level and is part of the Guadalupe Mountains National Park in Culberson County.

✔ **Reading Check** **Contrasting** What noticeable difference in land level occurs as you travel westward?

Texas's Water Resources

Hardly anywhere is water more precious than in the hot, arid, and rapidly growing region of the Southwest United States. Texas faces many of the concerns shared by people in this region.

Increasing demands for water are straining the ecosystems of communities along rivers and near dams. There are few new water sources available to the many businesses and homes that have been built here in the past decades.

The Gulf of Mexico is a major water resource of Texas. Both commercial and sports fishing boats ply its waters. Also important are the many bays found along the Texas coast. These bays serve as nurseries for fish, shrimp, oysters, crabs, and birds. They are also important fishing areas. Emptying into the bays, however, are rivers often polluted by wastes and chemicals from cities, factories, and fields. Because of this pollution, seafood from some Texas bays is sometimes declared unsafe to eat.

Rivers of Texas

Texas's river systems vary widely from region to region. Because it receives little rainfall, South Texas has few rivers. The **Rio Grande** forms most of Texas's southern boundary. Between 15 and 30 million years ago, forces within the earth caused the crust to drop, forming a rift, or gash, more than 5 miles deep in places. The basins of the rift filled with the runoff of rain and snow to form inland seas. Earthquakes caused the seas to

NATIONAL GEOGRAPHIC **Rivers of Texas**

CALIF.

ARIZONA

NEW MEXICO

OKLA.

ARK.

TENN.

MISS.

ALA.

LA.

TEXAS

MEXICO

104°W
100°W
96°W
36°N
32°N
28°N

Canadian R.
Red R.
Wichita R.
Sulphur R.
Sabine R.
Trinity R.
Pecos R.
Concho R.
San Saba R.
Colorado R.
Little R.
Brazos R.
Neches R.
Jacinto R.
San Jacinto R.
Llano R.
Guadalupe R.
San Antonio R.
Frio R.
Medina R.
Nueces R.
Rio Grande

TAKS PRACTICE

Rivers hold only a small part of the earth's fresh water but, along with other sources, rivers provide water for cities and for farmland. **Identifying Physical Characteristics** *What river forms a northern border of Texas?*

Mountains and Basins
Great Plains
North Central Plains
Coastal Plains

0 mi. 200
0 km 200
Albers Equal-Area projection

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Texas rivers are sometimes called "wrong-way" rivers because they carry water from the dry part of the state, where it is needed, to the southeastern part, which normally has plenty of water. Texas is like a giant tabletop that has been tipped from northwest to southeast. Because the land is higher in the northwest, almost all the rivers in Texas run to the southeast. To keep precious water from running unchecked into the Gulf of Mexico and to control floods, many rivers in Texas have been dammed, forming lakes.

Texas Lakes Have Many Uses

Texas has about 200 major lakes. All but one were formed when rivers were dammed. Only **Caddo Lake** in East Texas began as a natural lake. Even this lake, however, now holds waters backed up by a dam. Surprisingly, Texas ranks third behind Alaska and Minnesota in the surface area of its inland waters.

Originally built for flood control and water conservation, Texas lakes have taken on more roles. Most lake water is still used for irrigation, but surface waters (drawn primarily from lakes) provided about 60 percent of the needs of cities and towns in 1997 and most of the water used in manufacturing. For many years, lakes have supplied about 40 percent of Texas's water needs.

✓ **Reading Check** **Identifying** What are the two major rivers in the Texas Panhandle?

Exploring Geography

Caddo Lake ★

Named for the Caddo Indians, Caddo Lake is noted for its giant cypress trees. A dam was built in 1971, and the lake was designated an international wetlands region in 1993. What is the purpose of creating dams along rivers and lakes in Texas?

overflow, and the Rio Grande was formed. In hopscotch fashion, the river connected basin after basin, finally reaching the ocean about a half-million years ago. The beds of the ancient seas now form the fertile valleys through which some parts of the river runs.

The Rio Grande actually carries little water compared to other rivers of its length. The nearly 2,000-mile-long (3,218 km) river is one of the longest in the United States and the 24th longest river in the world. Rising in the San Juan Mountains of southern Colorado, it ends at the Gulf of Mexico. Most of the river's water is from sources in Mexico.

Two major rivers are found in the Texas Panhandle. The Red River flows eastward and acts as part of the boundary between Texas and Oklahoma. The Canadian River cuts across the Panhandle from west to east as it runs north of Amarillo.

The eastern part of the state is notable for its many rivers. Starting at the Sabine River, a person traveling west crosses the Neches, Trinity, San Jacinto, Brazos, Colorado, and Pecos Rivers.

Aquifers Used for Irrigation

North of the Frio River is the Balcones Escarpment, an area famous for its many springs. Springs occur where **aquifers,** or underground water reservoirs, meet the surface. Large springs are found at San Antonio, New Braunfels, San Marcos, and Austin. These springs depend on the **Edwards Aquifer,** which gets its water from rain that falls on the Hill Country to the north and west. In dry years, the water level in the Edwards Aquifer drops so much that some springs stop flowing. Enormous amounts of water are pumped from the aquifer to supply the city of San Antonio and to irrigate farms to the west. This, combined with drought, applies great stress

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to the Edwards Aquifer. Rainfall refills this aquifer, however, creating a dependable source of water that can be used for years to come.

Another major aquifer with declining water levels is the **Ogallala** (oh•gah•LAH•lah) **Aquifer.** It lies under the Texas High Plains and cannot be refilled easily or quickly by rainfall. More than 5 million acres (2,025,000 hectares)—an area larger than New Jersey—are irrigated by the aquifer. Conservation programs and efforts to replenish the aquifer have been put into effect, but the future of the aquifer remains a matter of concern.

Soil Is a Valuable Resource

The rich soil of Texas is one of its most valuable resources. Huge areas of the state can be used for farming. Tons of cotton, watermelons, and spinach are harvested each year. Other leading crops include wheat, rice, corn, soybeans, vegetables, and peanuts.

Land that is not suited for farming can still be used for ranching. The state of Texas usually leads the nation in the number of cattle, sheep, and goats raised, and in the amount of wool and mohair (goat hair) clipped. Together, ranching, farming, and related businesses produce about $40 billion in income for the people of Texas each year.

✓**Reading Check** **Comparing** How is an aquifer different from a dammed lake?

Three Vegetation Regions

In general, Texas has three types of natural vegetation regions: forests, savannas, and grasslands. Three major forest regions are found in Texas, all in the eastern third of the state where rainfall is greatest. Hardwood trees, long-leaf pines, and oak-hickory forests are found in abundance.

Texas forests are an important natural resource. Timber is one of the top cash crops in Texas, usually outranked only by cotton. The lumber, plywood, and paper industries provide more than one-fourth of the manufacturing jobs in East Texas.

Exploring **Geography**

Water from the Edwards Aquifer comes to the surface at Barton Springs in Austin *(left)*. Water from the Ogallala Aquifer is pumped to the surface for irrigation *(below)*. Identify some uses for aquifer water.

Austin ★

Ogallala Aquifer

CONTENTS

Texas also has several **savanna** regions. Far West Texas is a desert shrub savanna. Only short grasses and small shrubs grow here, except in the mountains and along streams. This region supports only limited grazing of animals. Most of the center of Texas has savanna areas. The soil here is rocky, and the land is sometimes rugged.

The third vegetation region in Texas is **grasslands.** Early settlers established farms on the grasslands because they had to clear only a few trees before crops could be planted. Texas cities today echo the patterns of the early settlers. The grasslands stretching from Dallas to San Antonio and the grassy prairies around Houston are the most heavily settled regions.

Texas Leads in Energy Production

The main minerals in Texas are petroleum, natural gas, coal, sand, and gravel. Texas also produces building stone, such as limestone and granite. Gypsum is mined in many places in the state. It is used to manufacture drywall, a material used in construction. Texas is a leading producer of salt, mainly from mines near Grand Saline in Van Zandt County. Sand, gravel, clay, and coal are mined in East Texas.

Petroleum and natural gas are the most important mineral resources. Oil or gas has been found in all but 23 counties. As of 2001, the value of oil and gas produced in Texas is about $17 billion annually. These resources are important to

NATIONAL GEOGRAPHIC

Natural Vegetation Regions

Forest
Grassland
Savanna

Gulf of Mexico

0 mi. 100
0 km 100
Albers Equal-Area projection

TAKS PRACTICE

A region's soil and climate influence the kinds of natural vegetation found there.
Locating Place *Where are the state's major forests?*

the state and to the country. One-fourth of all the energy produced in the entire history of the United States has been produced in Texas.

✓**Reading Check** **Examining** In what ways are Texas forests an important natural resource?

SECTION 2 ASSESSMENT

Checking for Understanding

1. **Using Key Terms** Describe a trip through Texas using the following words: plain, barrier island, escarpment, fault, plateau, and grassland.
2. **Reviewing Facts** What river forms most of the southern boundary of the state?

Reviewing Themes

3. **Economic Factors** How do Texans use land not suited for farming?

Organizing to Learn

4. **Identifying** Complete a chart like the one shown below and identify a major river found in each region.

Region	River
Panhandle	
East Texas	
West Texas	
South Texas	

Critical Thinking

5. **Describing** In which natural vegetation region would you most like to live? What would that area look like?

TAKS PRACTICE

Understanding Geography Why are the three major forest regions all found in the eastern third of Texas?

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TAKS Skillbuilder

Understanding a Map Key

Why Learn This Skill?

Maps can show many kinds of information, including climate, cities, vegetation, and elevation. The information on maps is often shown by various symbols such as numbers, colors, lines, circles, and other shapes and pictures. To understand what the map is showing, look at the map key, or legend, which explains what the symbols mean.

Also included in the legend may be two other kinds of information. First, a compass rose is often placed on maps to point out the directions north, south, east, and west. Second, a scale is included to show the relationship between distance on the map and distance on the ground.

Learning the Skill

To use a map key correctly, follow these steps:
• Check the compass rose to determine the directions on the map.
• Check the scale of distance.
• Study all the symbols in the legend and find examples of each one on the map.

Practicing the Skill

Study the map and the map key. Then answer the following questions.

❶ In which direction is Austin from Dallas?

❷ Which city is shown in the far west part of Texas?

❸ How far is Brownsville from San Antonio?

❹ Traveling at 50 miles per hour, about how long would it take to drive from Dallas to Brownsville?

❺ How many interstate highways meet at Houston?

❻ What is the value of the type of geographical information that you have learned in this map exercise?

NATIONAL GEOGRAPHIC

Major Highways in Texas

Interstate Highways

TAKS Practice

Understanding a Map Key   Draw a simple map of your classroom. Create a map key that includes symbols for desks, doorways, and other room features. Add a compass rose showing true directions. Create a scale that reflects true measurements of the classroom. Compare your map to those of your classmates to see how many different symbols were developed.

Glencoe's **Skillbuilder Interactive Workbook,** Level 1, provides instruction and practice in key social studies skills.

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The Climate of Texas

Guide to Reading

Main Idea
Texas's climate varies greatly from one area of the state to the next. Elevation and nearness to the ocean affect climate patterns.

Key Terms
middle latitudes
norther

Reading Strategy
Organizing Information As you read this section, complete a chart like the one shown here about the effects of the climate conditions listed below.

Climate Condition	Effect
Cool air meets warm air	
Gulf Coast breezes	
Winds rise over the mountains	

Read to Learn
• how absolute location affects the Texas climate.
• how the Gulf of Mexico affects the Texas climate.
• how elevation affects climate.

Section Theme
Geography and History Texas's different climate regions impact where people live.

Preview of Events

♦c. 2 million B.C.

Ice Age advances make Texas's climate cooler and wetter

A Texas Story

". . . Texas contains, beyond any other state of the Union, the advantages of . . . climate, a soil of unsurpassed fertility, adapted to the production of all the most valuable staples, together with great mineral resources. This may seem to some an extravagant assertion, but it will be readily admitted by all who know any thing of this highly favored country."

—The Texas Almanac and Emigrant's Guide to Texas, 1869

Early Texas farmer

Absolute Location Affects Climate

The absolute location of Texas has important effects on its climate. Texas lies in what are called the **middle latitudes,** the region about midway between the equator and the North Pole. Because Texas is not very far north of the equator, it has mild winters. Even in Amarillo, the

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temperature rises above freezing most winter days. Because of the great north-to-south spread of the state, however, the climate of South Texas is much warmer than that of North Texas. In the Brownsville area, for example, farmers can expect freezing weather to occur perhaps only one or two days a year. South Texas is a popular winter vacation spot for many people because of its warm climate.

Despite its overall warmth, Texas is subject to periods of cold weather. In fact, the Texas climate has a reputation for being highly unpredictable. Tornadoes, hurricanes, dust storms, and **northers** may strike. Northers are sudden blasts of cold air that extend south from Canada and sweep across the plains. There are no mountains or other landforms to block these northers. They can drop temperatures below freezing, but they rarely last for more than two or three days. A powerful norther in 1899 froze Corpus Christi Bay so solidly that people could walk on it. A party of surveyors near Palo Duro Canyon in the Panhandle experienced a norther in December 1887:

❝It caught us in a few minutes. With a rush of ice cold wind, a snarl like an angry beast, an awful roar, changing into a long drawn out wail which continued to rise and fall—the yellow norther of the plains struck and enveloped us.

The air was full of ice needles that drove into the exposed flesh and stuck, but did not seem to melt. The snow seemed to parallel the ground in its flight; yet the plains grass was covered by it in a few minutes and it rolled along the ground with the wind. That wind didn't turn aside. When it hit you it just kept [going] right on through your body, as though your flesh offered no obstruction to it. There wasn't a hill between us and the North Pole and that wind must have come all the way—and gathering power at every jump.

We had been sweating ten minutes before. Now we pulled the wagon sheet over us huddling under it. But the wind and cold . . . cut and stung despite the cover.❞

Texas's absolute location affects its climate in another way. The middle latitudes are a meeting place of cool air moving from the north and moist warm air moving from the Gulf of Mexico. Especially in the spring and fall, violent storms sometimes result from this mixing of cold and warm air. Thunderstorms may bring heavy rain, lightning, and sometimes hail the size of baseballs. Tornadoes may form, causing tremendous damage or injury when they touch ground.

Texas has an average of 153 tornadoes each year. April, May, and June are the peak months of the tornado season, although the storms can strike in any month. When tornadoes strike cities, they can be particularly destructive. The greatest outbreak of tornadoes in Texas history occurred in September 1967, when a hurricane generated 115 tornadoes, 67 of them in one day.

✓**Reading Check** **Explaining** Name two ways Texas's absolute location affects climate.

Exploring Geography

Tornadoes, like this one that touched down in Pampa, occur in Texas most often in April, May, and June. The twisting tail, called a funnel, acts like a suction tube. How might tornadoes affect the economy of Texas?

Relative Location Also Affects Climate

The location of Texas relative to the Gulf of Mexico has a major influence on the climate of the state. Most of the year, winds blow inland from the south, southeast, or southwest for 200 miles (322 km) or more. These ocean breezes cool the land in summer and warm it in winter. Moisture from the Gulf of Mexico is the source of most of the rain that falls on the state. The city of Orange in East Texas averages about 59 inches (150 cm) of rainfall per year. Farther west, winds blow across the deserts and mountains of Mexico before entering Texas. This drier air brings less rainfall. El Paso, for example, averages only about 9 inches of rain per year.
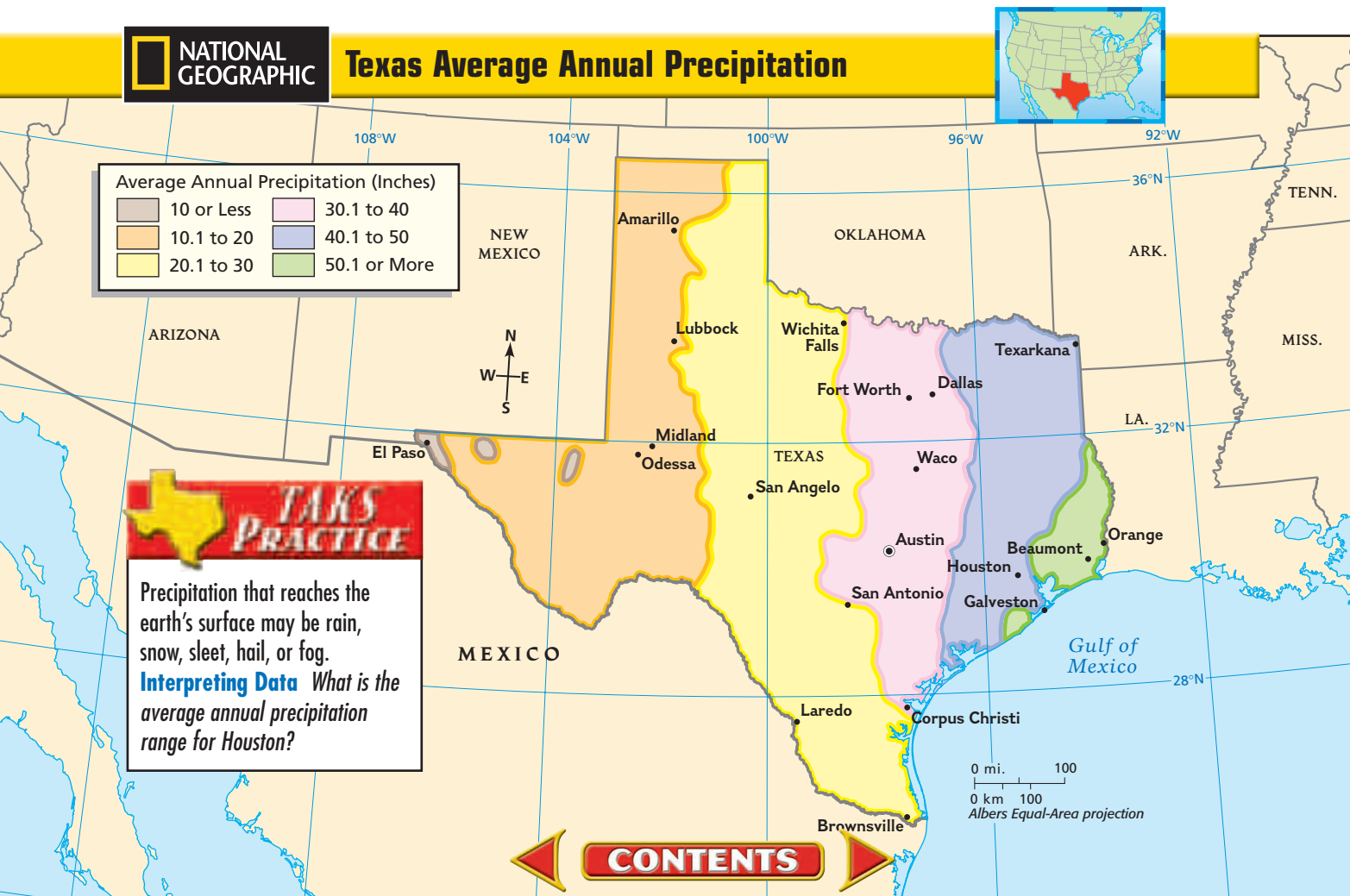
The Gulf is so far from some areas of Texas that it has little effect on climate there. Wichita Falls and other cities across the middle of the state broil in the summer sun. Similarly, winter temperatures in the Panhandle or in the Dallas–Fort Worth area get little warming from Gulf breezes.

Exploring **Geography**

This group of students experienced a norther on election day in Lubbock, Texas. **How could weather affect election results?**

The location of Texas next to the Gulf of Mexico—with its hundreds of miles of coastline—has negative effects, too. Destructive storms sometimes sweep in from the Gulf and do great damage to the state. The hurricane of Galveston in 1900 left more than 6,000 dead, and great storms

NATIONAL GEOGRAPHIC

Texas Average Annual Precipitation

Average Annual Precipitation (Inches)

10 or Less	30.1 to 40
10.1 to 20	40.1 to 50
20.1 to 30	50.1 or More

NEW MEXICO

OKLAHOMA

TENN.

ARIZONA

ARK.

MISS.

Amarillo

Lubbock

Wichita Falls

Texarkana

Fort Worth

Dallas

LA.

El Paso

Midland

Odessa

TEXAS

Waco

San Angelo

Austin

Beaumont

Orange

Houston

San Antonio

Galveston

MEXICO

Gulf of Mexico

Laredo

Corpus Christi

Brownsville

TAKS PRACTICE

Precipitation that reaches the earth's surface may be rain, snow, sleet, hail, or fog. **Interpreting Data** *What is the average annual precipitation range for Houston?*

0 mi. 100
0 km 100
Albers Equal-Area projection

CONTENTS

struck Corpus Christi in 1916, 1919, and 1970. Houston was struck by a hurricane in 1983.

Any part of the state can be affected by hurricanes. In 1921 a hurricane moved from Mexico across south and central Texas, causing the greatest flood in the state's history. During that storm, more than 36 inches (91 cm) of rain fell at Thrall in 18 hours—setting a record for rainfall in American history.

Elevation and Climate Patterns

Besides absolute and relative location, the Texas climate is also affected by elevation. In general, the temperature cools about 3 degrees for each 1,000-foot (305-m) rise in elevation. Similarly, the average temperature rises as elevation decreases. This fact affects the Texas climate in several ways.

If distance from the ocean were the only factor determining climate, El Paso would be the warmest city in the state. This is not the case, however. Because El Paso lies at an average elevation of about 3,700 feet (1,128 m), its temperatures are generally cooler than cities at a lower elevation but located at about the same latitude.

The warmer temperatures at lower elevations help Texans in winter. Northers that chill residents of Amarillo, at an elevation of about 3,650 feet (1,113 m), warm as they blow south. By the time a

TEXAS FICTION

Anyone who thinks Texas weather is all dry is "all wet." The image of Texas as a parched, sunbleached wasteland persists in the popular imagination, but more of Texas is humid than dry. The state's three largest cities, Houston, Dallas, and San Antonio, have average relative humidity percentages of 77, 70, and 70, respectively. Houston gets 46 inches of precipitation a year, more than Boston; Chicago; Washington, D.C.; New York City; or even Key West, Florida.

norther reaches Austin, at an elevation of approximately 500 feet (152 m) above sea level, the temperature may be 20°F (11°C) warmer.

Elevation also affects rainfall. Warm air holds more moisture than cool air. The mountains of West Texas receive more rainfall than the surrounding desert because moisture-filled air moving up the mountains is cooled. As the air becomes cooler and less able to hold moisture, some of the moisture falls as rain. The Davis Mountains receive up to 18 inches (46 cm) of rain a year. The lower desert several miles away gets only 8 to 12 inches (20 to 30 cm).

✓ **Reading Check** **Explaining** How does elevation affect climate?

SECTION 3 ASSESSMENT

Checking for Understanding

1. **Using Key Terms** Define norther and middle latitudes.
2. **Reviewing Facts** On average, how many tornadoes does Texas experience each year?

Reviewing Themes

3. **Geography and History** If you like cool summer temperatures, where in Texas should you live? Where should you live if you like warm winter temperatures?

Organizing to Learn

4. **Comparing** Complete a chart like the one shown below and write the positive and negative effects of the state of Texas being located near the Gulf of Mexico.

Positive Effects	Negative Effects

Critical Thinking

5. **Evaluating Location** How does the mild climate of South Texas favorably affect the economy of that part of the state?

TAKS PRACTICE

Analyzing Climate Texas experiences many types of weather. What type of weather conditions occur in the middle latitudes?

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Chapter Summary

Land of Contrasts

Main Idea

The six elements of geography are:

- Location
- Places and regions
- Human-environment interaction
- Human systems
- Physical systems
- Uses of geography

Main Idea

The major landforms in Texas are:

- Plains
- Escarpments
- Plateaus
- Mountains

Main Idea

Texas's water resources include:

- Gulf of Mexico
- Rivers and man-made lakes
- Aquifers

Main Idea

Natural vegetation regions are:

- Forests
- Savannas
- Grasslands

Main Idea

Important mineral resources in Texas include:

- Coal
- Natural gas
- Petroleum

Reviewing Key Terms

Write the definition of each key term. Then list a geographical place, or name, to which the term relates.

1. plain
2. barrier island
3. escarpment
4. fault
5. plateau
6. aquifer
7. savanna
8. grassland

Reviewing Key Facts

9. Describe the size of Texas, north to south and east to west.
10. How was the Balcones Escarpment formed?
11. Identify where mountains are located in Texas. What is the highest point in the state?
12. Explain why so many Texas rivers flow in a generally southeastern direction.
13. How were most Texas lakes formed?
14. What three natural vegetation regions are found in Texas?
15. List the main minerals found in Texas. Of those listed, which are the most important?
16. Describe the effects of a norther.

Critical Thinking

17. **Locating** Describe your town or community in terms of absolute and relative location.

18. **Analyzing** Describe your town or community in terms of place. What are specific characteristics that make it a unique place?

19. **Making Generalizations** What are some of the ways in which people in your area interact with the environment? Think in terms of work or recreation.

20. **Determining Cause and Effect** How does Texas's great size contribute to its varied climate?

21. **Making Generalizations** How have the rivers of Texas affected the lives of Texans?

22. **Evaluating** Do you think the Ogallala Aquifer is a renewable water source? Explain your answer.

CONTENTS

Geography and History Activity

Identify the physical features found in Texas by matching the terms below with the letters on the map.

23. plateau   **25.** barrier island

24. mountains   **26.** plains

Economics and History Activity

27. Cities In what part of the state of Texas are most large cities located? How did the location affect the cities' growth?

Cooperative Learning Activity

28. Creating a Model Working in groups, create a model of an ideal community. The plans for your community should include a map of the area, indicating the important geographical features and where the major industries and commercial areas will be developed. Then write a brief description of what your ideal community would be like.

Practicing Skills

29. Understanding a Map Key Draw a street map of an area near your school or home. Include such things as highways, railroad tracks, bridges, or other landmarks. Be sure to add a map key. For an added challenge, create a scale that reflects the actual distances you have mapped.

TEXAS HISTORY Online

Self-Check Quiz
Visit the texans.glencoe.com Web site and click on **Chapter 1—Self-Check Quizzes** to prepare for the chapter test.
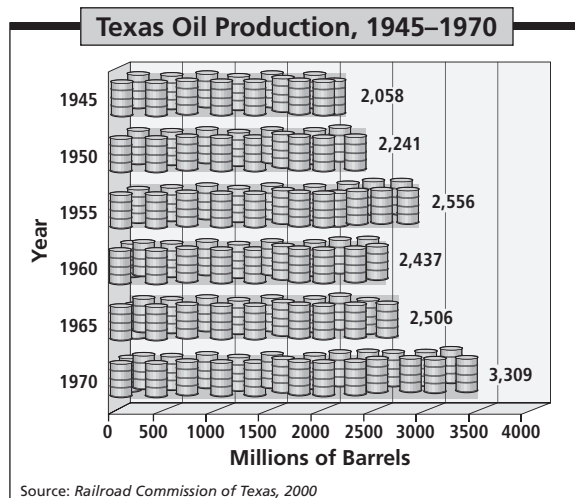
CLICK HERE

Building Technology Skills

30. Using the Internet Search online to find a picture or photograph of either Palo Duro or Tule Canyon that you can print. Write a caption describing the physical characteristics of the image.

TAKS PRACTICE

Use the graph to answer the following question.

Texas Oil Production, 1945–1970

Year	Millions of Barrels
1945	2,058
1950	2,241
1955	2,556
1960	2,437
1965	2,506
1970	3,309

Source: *Railroad Commission of Texas, 2000*

Which of the following statements can be determined from the information in this graph?

A The Civil War created an enormous demand for oil.

B An increase in the number of cars contributed to higher demand for fuel.

C The greatest increase in oil production occurred between 1965 and 1970.

D Oil refineries were more efficient between 1945 and 1970.

Test-Taking Tip:

Look for a statement that is supported by the graph. For example, answer A is not supported by the data.

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Economics & History

Migrant Workers Provided Needed Labor

Did you know that cotton is Texas's number one crop? Or that one out of every five bales of cotton produced in the United States is grown in Texas? The production of cotton is vital to the state's economy.

Texas Has What Cotton Farmers Need

What you may not have thought much about was why so much cotton is planted in Texas. The answer is that the geography of Texas favors the growth of cotton. Texas has the climate, the soil, and the labor needed to make cotton growing profitable. Texas is so large north to south that it takes a while for the warm temperatures needed to begin the planting season to work their way up the state. This was very important for cotton farmers because it meant that the farm workers needed to pick the cotton could start in the southern part of the state and move northward as the cotton plants grew ready for harvesting.

Migrant Families

Farmers during the 1920s through the 1950s needed thousands of temporary workers, or "hands," to harvest the cotton. The demand for labor was filled by poor people who needed work to survive. By joining the **Big Swing**—migrating work that took them from southern Texas to the High Plains—these people could earn a living.

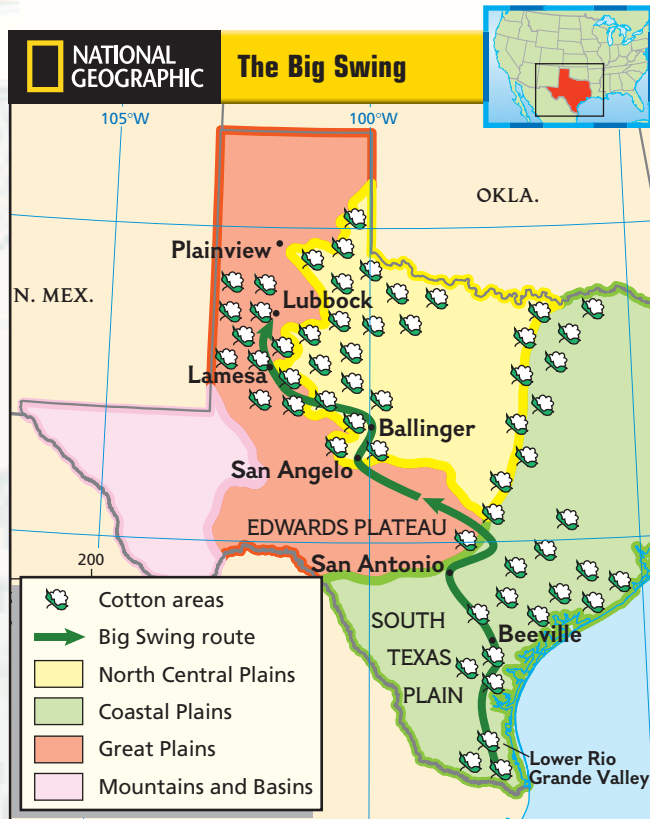Entire families made up the force of cotton pickers. Most were of Mexican descent, either having been born in Texas, having lived in the United States for many years, or having recently arrived from their home country. They traveled to farms in their own cars, or with individuals who drove them from farm to farm on a platform truck. In Spanish, this driver was called *el troquero.* The bed of the truck became "home" for families as they moved from farm to farm. The *troquero* was responsible for finding work for his "crew" on the route north.

The Big Swing

Migrant workers began their yearly migration in southern Texas. The weather was warm enough in the Lower Rio Grande Valley for farmers to plant their cotton crop in late February and early March.

Mexican workers board the train for transport to U.S. farms.

NATIONAL GEOGRAPHIC — The Big Swing

From the 1920s to the early 1960s the route for picking cotton was known as the Big Swing. The route took migrant workers from the warmer climates of southern Texas to the cooler dry climates of northern Texas.

Map legend:
- Cotton areas
- Big Swing route
- North Central Plains
- Coastal Plains
- Great Plains
- Mountains and Basins

By April or May, workers started the process of thinning the young plants. During late June and continuing into the next few weeks, the cotton-picking season began.

From southern Texas, the migrants drove to central Texas. In farms surrounding San Marcos, New Braunfels, and Lockhart, men, women, and children toiled in temperatures of more than 100 degrees to make an average of $1.75 per day. By late August, the migrant laborers prepared to move again, this time to West Texas farms located around San Angelo and Ballinger. In that section of the state, the colder climate postponed the planting, so that the cotton did not mature until August and the early fall.

The final stopping point for the cotton pickers was the High Plains. When the crews arrived around September and October, the late-planted cotton was ripe for picking. By November, many migrant families were on their way home.

Settling Down

Many of the migrants, however, did not travel back to their places of origin in Mexico or South Texas. They began new Spanish-speaking communities in towns such as Lamesa, Lubbock, and Plainview. They found jobs, married, and raised families. In this way, Mexican American culture was transplanted to new geographical areas, where it remains today.

TAKS PRACTICE

1. **Drawing Conclusions** How does the geography of Texas help to support migratory work?
2. **Analyzing** What were some benefits and drawbacks for migrant workers during cotton-picking season?
3. **Writing About Economics** Write a paragraph that develops one of the themes listed below. Use standard grammar, spelling, sentence structure, and punctuation. Include information and examples from the feature as details to support your argument.
   a. People rely on a variety of jobs to earn a living.
   b. Family members make contributions in different ways.
   c. People make sacrifices to earn a living.

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