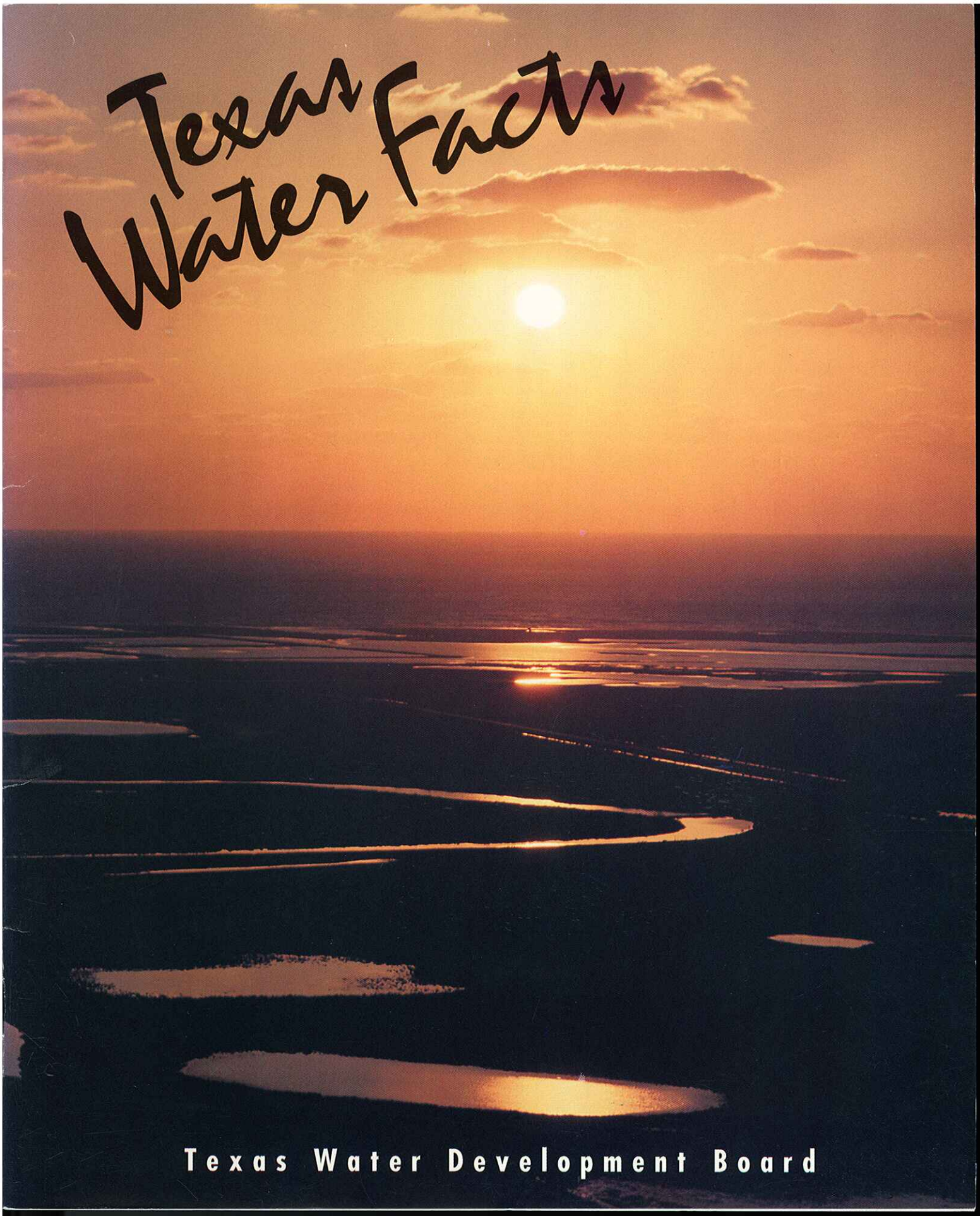
Texas Water Facts



Texas Water Development Board

About the Cover

The sun rises over flooded oxbows at the mouth of the Rio Grande as it winds its way into the Gulf of Mexico on the tip of the Texas coast.

photo by Bob Parvin

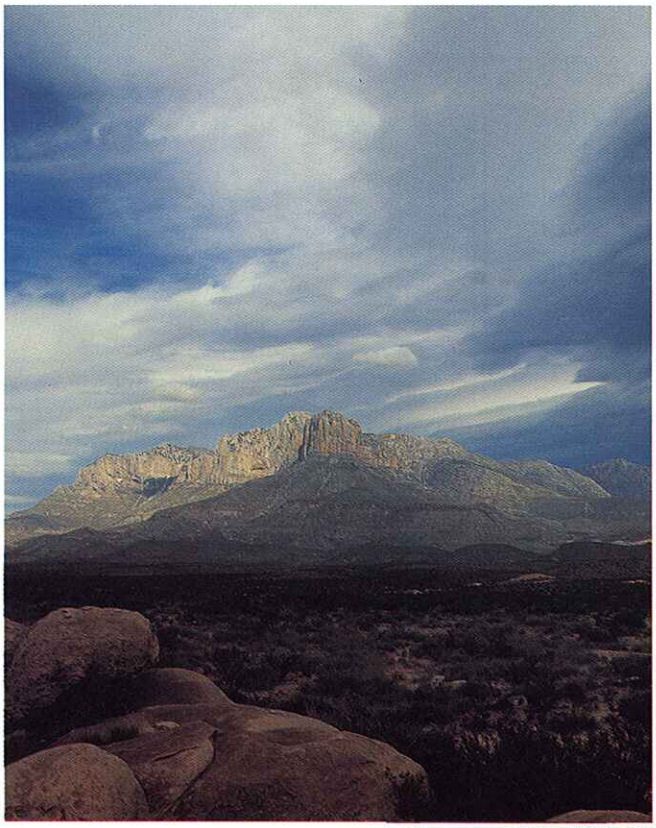
Lake Livingston, Photo by Sebastian Vega

Welcome to *Texas Water Facts*—a primer on water in Texas, a way to gain an understanding and appreciation of one of Texas' most valued and interesting natural resources.

Water in Texas is an indispensable resource spread across a geographically diverse state. The state's physical features range from the high peaks and great Chihuahuan desert of West Texas to the piney woods of East Texas...from the famous High Plains to the flat coastal regions along the Gulf of Mexico.

Annual rainfall varies dramatically from one border to another, and drought is a common, but unpredictable, occurrence. Water has at times been abundant and at other times scarce. In fact, nearly every Texas community has experienced both drought and severe flooding at one time or another.

From border to border, Texans may have either an abundance, or a notable lack, of water. *Texas Water Facts* will help you see why.



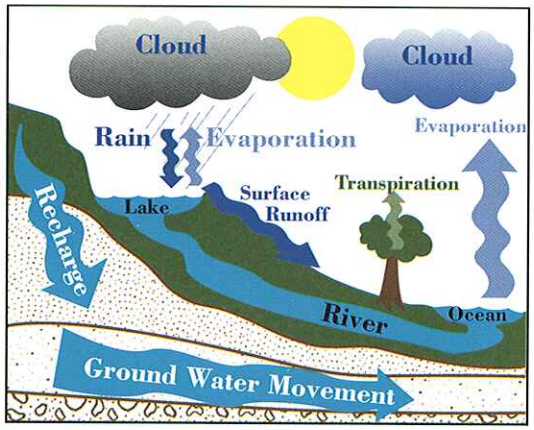
Guadalupe Mountains National Park

Caddo Lake State Park

Rainfall

Water has always had a magical quality. People once believed that water flowed mysteriously from the ground, from a never-ending wellspring deep beneath the earth. Today, however, we know there is no such magical source.

All water ultimately comes from *precipitation* (mainly rain and snow), a source that varies widely across Texas and can be sporadic, at best, in certain areas. El Paso, for example, averages a mere 8 inches of rainfall each year while the Texas-Louisiana border averages 56 inches.



The never-ending exchange of water from the atmosphere to the oceans and back to the atmosphere again is known as the *hydrologic cycle*.

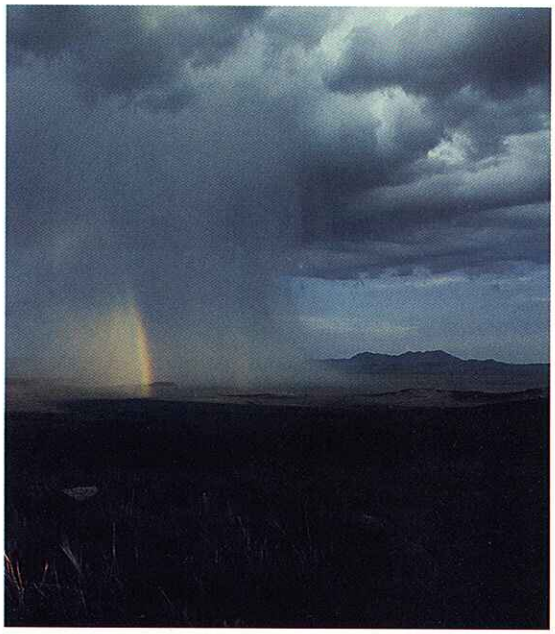
This cycle is the process that causes hail, rain, sleet and snow–the sources of water in Texas.

Texas has experienced at least one serious drought in every decade of the twentieth century.

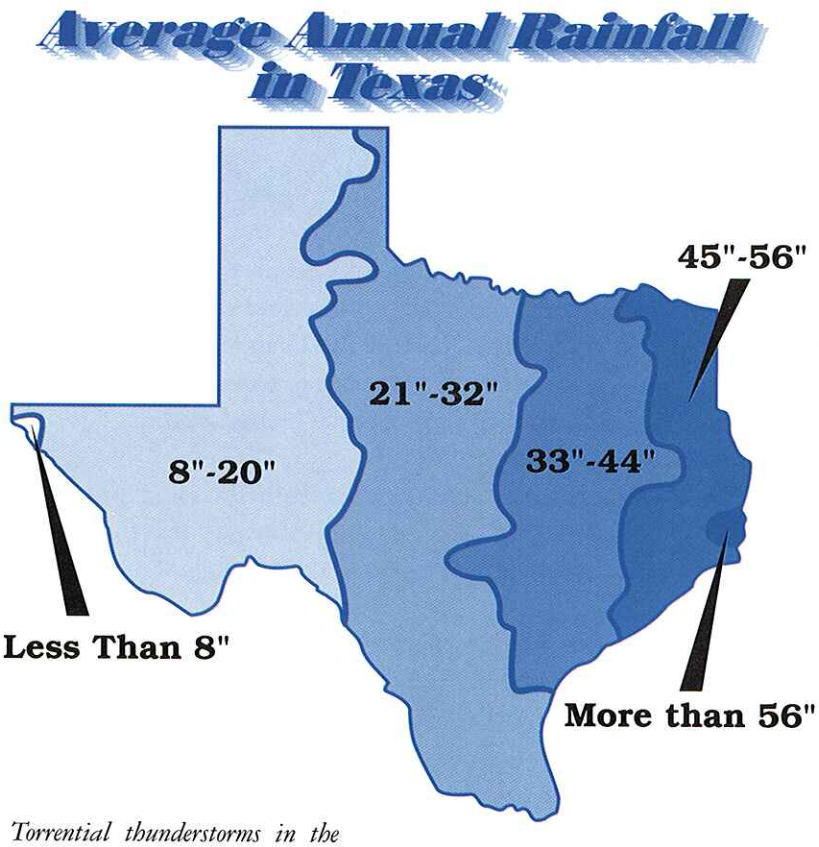
The incredible magnitude and variety of rainfall in Texas is documented by the state's historical records.

- Presidio, in West Texas, had only 1.6 inches of rainfall in 1956.
- Clarksville, in Northeast Texas, experienced 109 inches of rainfall in 1873.
- Officially, the most rainfall recorded in a single day was 29 inches in Albany, in North Central Texas, in August of 1978; unofficially however, residents reported 38 inches of rain in Thrall in 1921.
- The largest non-stop rainstorm lasted three days and dropped 45 inches of rain on Alvin, located on the Upper Gulf Coast, in July of 1979.
- From 1950 to 1956, Texas experienced a drought so severe that 94 percent of its counties were declared national disaster areas. It ended abruptly with serious flooding in the spring of 1957.
- Flash floods between the West Texas towns of Sheffield and Langtry, in June of 1956, produced an 86-foot-high wall of water that rampaged down the Pecos River Canyon.
- In September of 1900, Galveston was hit by the "West India Hurricane", which claimed between 5,000 and 8,000 lives and created the largest natural disaster in the history of the United States.

So if you aren't enjoying the torrential rain, the floods or the droughts, just wait a minute, it'll change—you're in Texas.



Davis Mountains



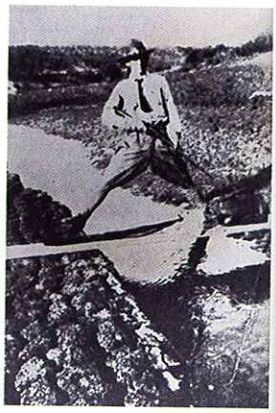
Torrential thunderstorms in the North Texas area in May 1990 caused record flooding along the Trinity and other rivers.

Surface Water

As you look around, you can see the vast water resources Texas has in its lakes, streams and reservoirs. These visible resources are called *surface water.*

Because the ground often cannot absorb all the water from rainfall, the excess water, or *runoff*, flows downhill to form pools, streams, creeks, and rivers.

On the average, this runoff totals an astonishing 49 million acre-feet per year. Since one acre-foot is equal to 325,851 gallons (an area about the size of a football field covered with one foot of water), Texas experiences 15.9 trillion gallons of runoff during an average year (or one football field covered with water 9,280 miles deep!). Most of this runoff, however, is flood flow that is eventually passed into the Gulf of Mexico through the 80,000 miles of Texas' streams and rivers.



A soldier straddles the width of Lake Austin after water had been released to rice farmers downstream during the drought of 1918.

Texas' river system is long enough to circle the earth three times. It consists of 15 major river basins and is second only to Minnesota in total surface miles of inland waterways.

River Facts

- The longest river in Texas is the *Rio Grande*, which begins its 1,896 mile course as the runoff from melted snow in Colorado. In the continental U.S., the Rio Grande is second in length only to the Missouri and is one of the world's longest rivers. It also forms a major part of the United States' international border with Mexico.
- The *Red River* is the second longest river in Texas and forms state boundaries along Oklahoma and Arkansas. It is the only major Texas river that is part of the Mississippi drainage basin.
- The *Sabine River,* which forms part of the Louisiana/Texas border, discharges more water into the Gulf of Mexico than any other river along the Texas Gulf Coast.
- The 600 mile-long *Colorado River* is the longest river located completely within the state.
- The *Comal* is the shortest river in Texas, being only two and one-half miles long.

This system of rivers and lakes provides several benefits for Texans:

...Storage for the 6 million acre-feet (1.95 trillion gallons) of surface water we use each year.

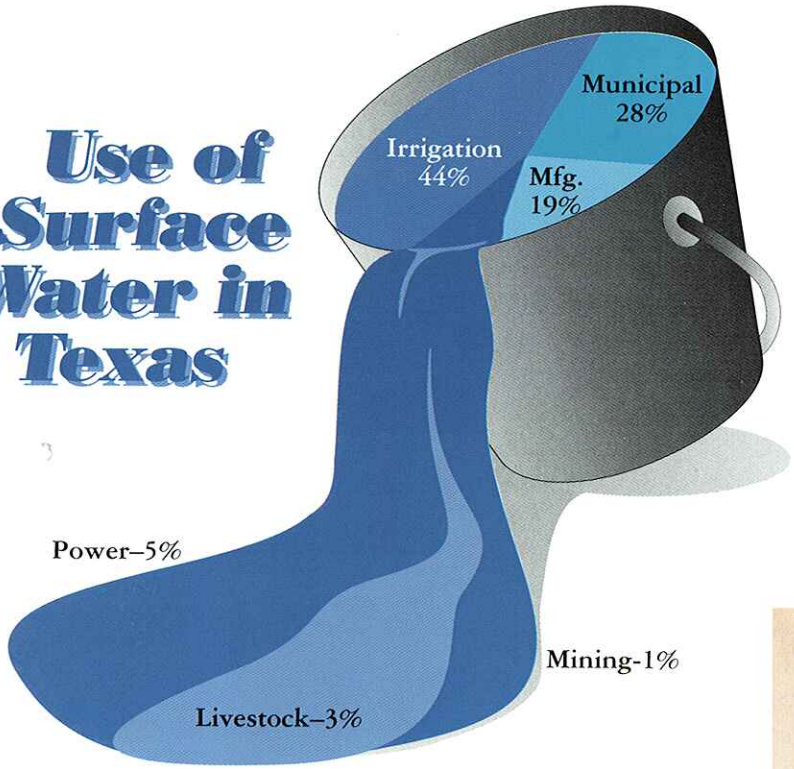
...Water for recreation and wildlife habitat.

...An emergency "safety valve" to stop or slow down flood waters.

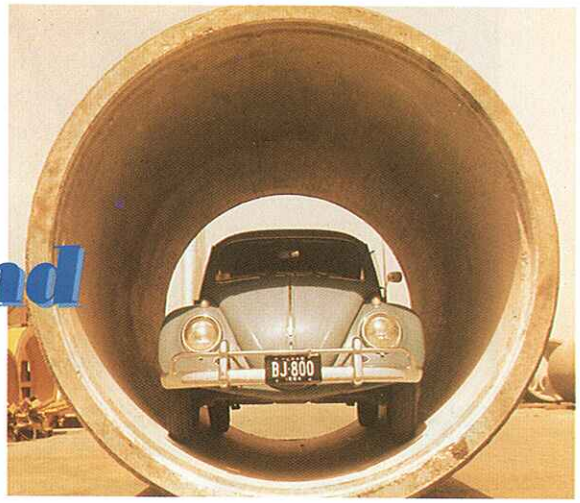
...Electric power through hydroelectric generators.

All told, there are 5,700 reservoirs in the Texas river system, including 188 major reservoirs—massive "holding tanks" that contain more than 5,000 acre-feet of water each. A mere 74 of these major reservoirs contain 98% of Texas' *conservation storage,* which is the state's usable surface-water supply.

Use of Surface Water in Texas



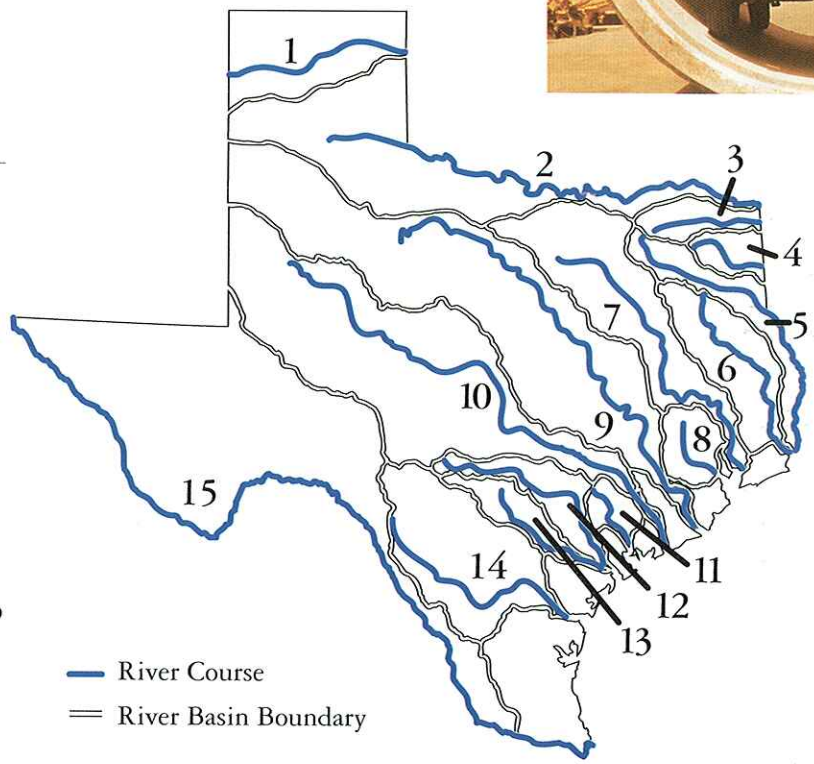
Because of recurring droughts in Texas, we measure our available surface water supply as the *dependable yield*, which is the amount of surface water that can be called upon during an extended drought. Texans currently use about 6 million acre-feet of surface water each year while our dependable yield of surface water is 11 million acre-feet per year. Unfortunately, the majority of this excess water is not located where it is most needed.



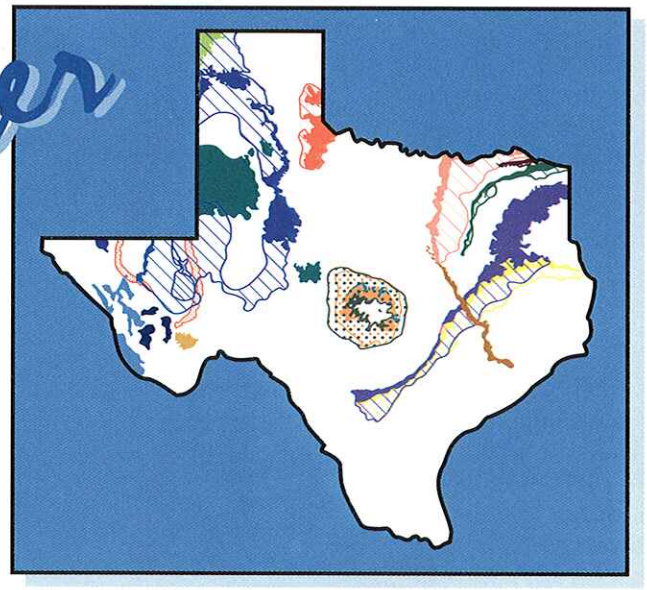
Contrary to popular lore, cars were not used to inspect water pipelines. In the mid-sixties, however, inspectors for the Bureau of Reclamation rode bicycles through 90 miles of concrete pipe. The underground "pipe pedaling" was done in an aqueduct built to serve the 11 member cities of the Canadian River Municipal Water Authority in the Texas panhandle.

Major Rivers and Their Basins

Name
1. Canadian
2. Red
3. Sulphur
4. Cypress
5. Sabine
6. Neches
7. Trinity
8. San Jacinto
9. Brazos
10. Colorado
11. Lavaca
12. Guadalupe
13. San Antonio
14. Nueces
15. Rio Grande

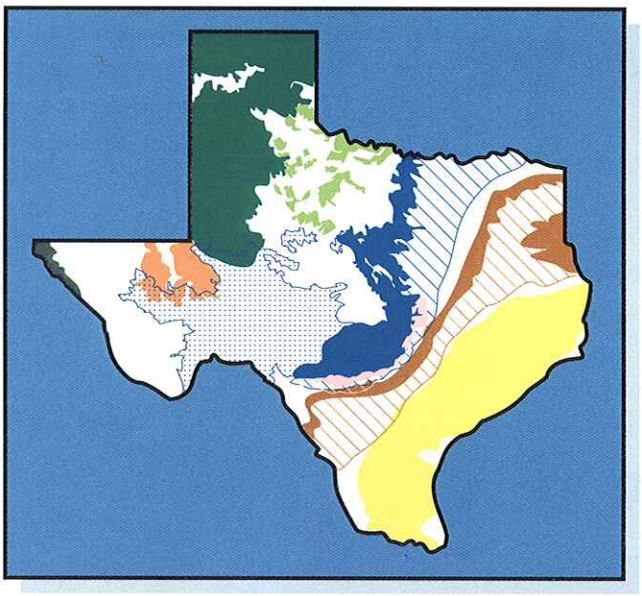


Ground Water



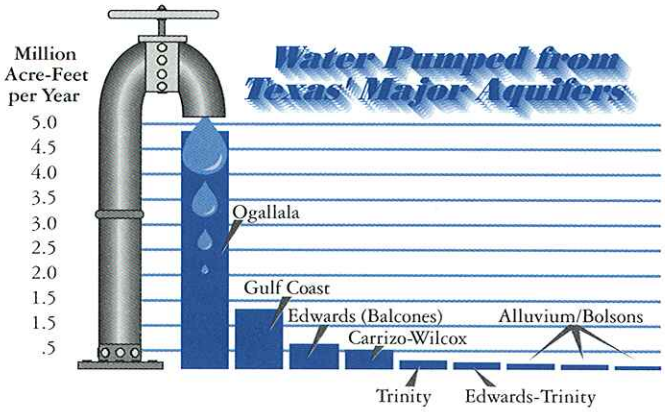
Texas' Minor Aquifers

- West Texas Bolsons
- Igneous
- Lipan
- Marathon
- Hickory
- Ellenburger-San Saba
- Woodbine
- Brazos River Alluvium
- Sparta
- Edwards-Trinity (High Plains)
- Rustler
- Capitan Reef Complex
- Bone Spring-Victorio Peak
- Marble Falls
- Rita Blanca
- Blossom
- Nacatoch
- Dockum
- Blaine
- Queen City
- Aquifer Downdip Areas



Texas' Major Aquifers

- Edwards (Balcones)
- Ogallala
- Seymour
- Gulf Coast
- Carrizo-Wilcox
- Trinity
- Edwards-Trinity (Plateau)
- Hueco-Mesilla Bolson
- Cenozoic Pecos Alluvium
- Aquifer Downdip Areas



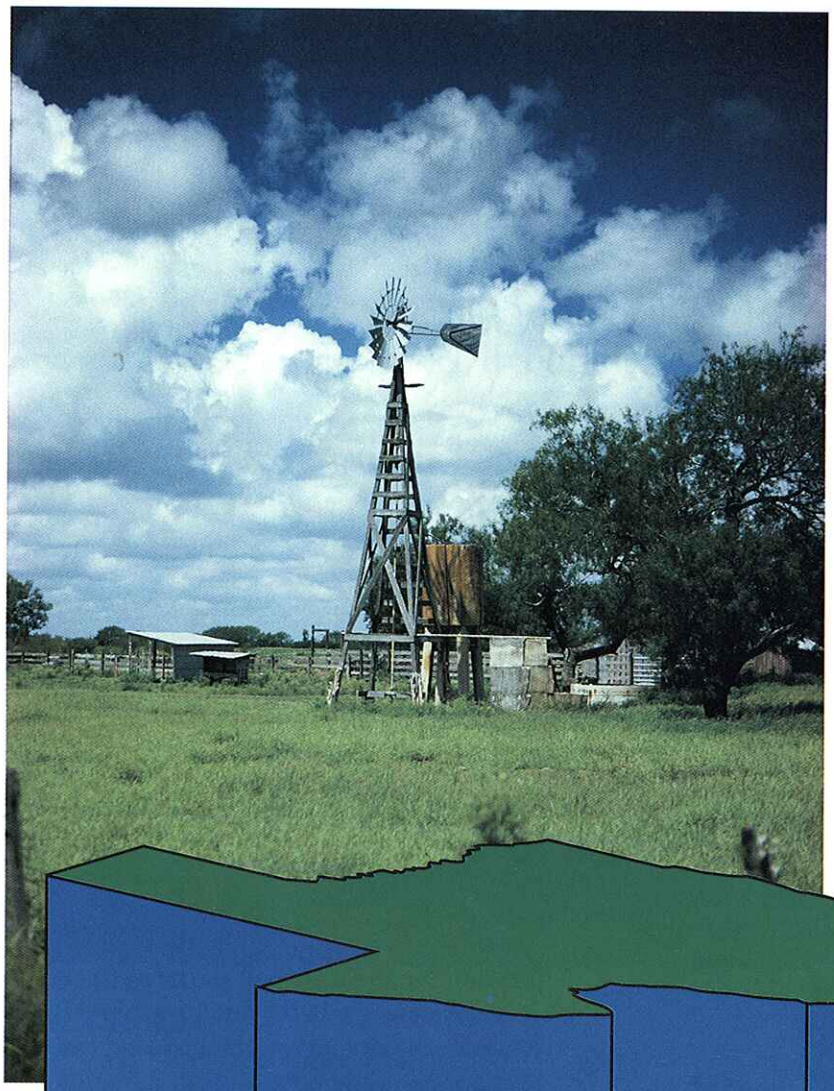
Great underground reservoirs of water are called *aquifers.* Although they are not visible on the surface, aquifers play a major part in providing Texans with the water they need. Water in these aquifers is called *ground water,* today's primary source of water for Texas. In fact, approximately 80% of the state is situated over these aquifers which are categorized as major or minor.

Texas' nine major and 20 minor aquifers come in a variety of sizes. Each is characterized by its area, thickness, depth from the land's surface, water quality, and the different quantity of water each supplies.

Texas' major aquifers supply a great deal of water over a large geographic area; overall, about 96% of all the ground water currently used in Texas comes from its nine major aquifers.

Although ground water use has dropped more than 20% since 1974 (when ground water accounted for almost

By allowing Texans cheap and easy access to ground water, the windmill made settlement possible in many areas of Texas that had no other reliable sources of water.



three-fourths of the water used throughout the state), aquifers still provide more than half of all the water used in Texas.

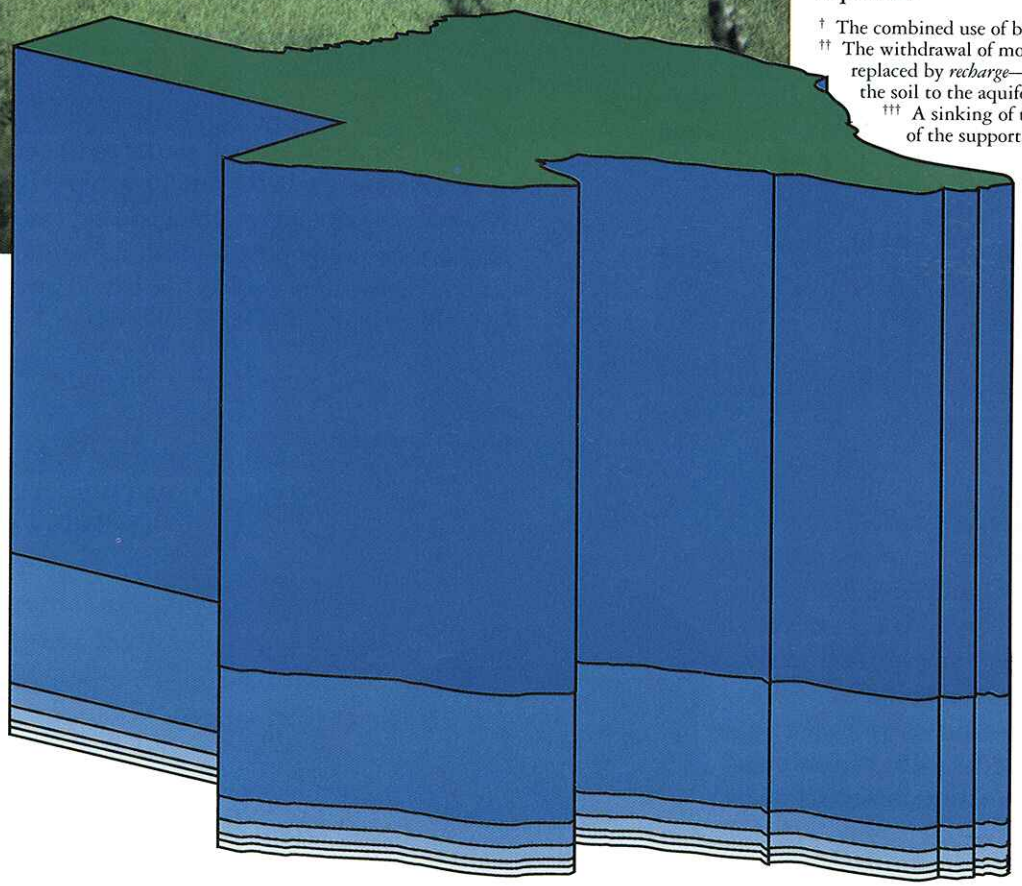
This trend is mainly attributable to two changes in water usage in Texas. First, there has been a substantial decline in the amount of ground water being used for irrigation purposes. Also, more of the large metropolitan areas are converting their water supplies from ground water to surface water or are using less ground water because of *conjunctive use*†.

Ground water in Texas, however, suffers from declining levels caused by years of *mining*††. In some areas, the declining water pressure has caused *subsidence*††† of the land surface while in others it has allowed the encroachment of poorer quality water, making this resource less desirable and more expensive to use. Likewise, contamination from the introduction of agricultural chemicals, sewage, and industrial and oil-field wastes is causing localized problems in some aquifers.

† The combined use of both ground and surface water.

†† The withdrawal of more water from an aquifer than can be replaced by *recharge*—the downward flow of rainfall through the soil to the aquifer.

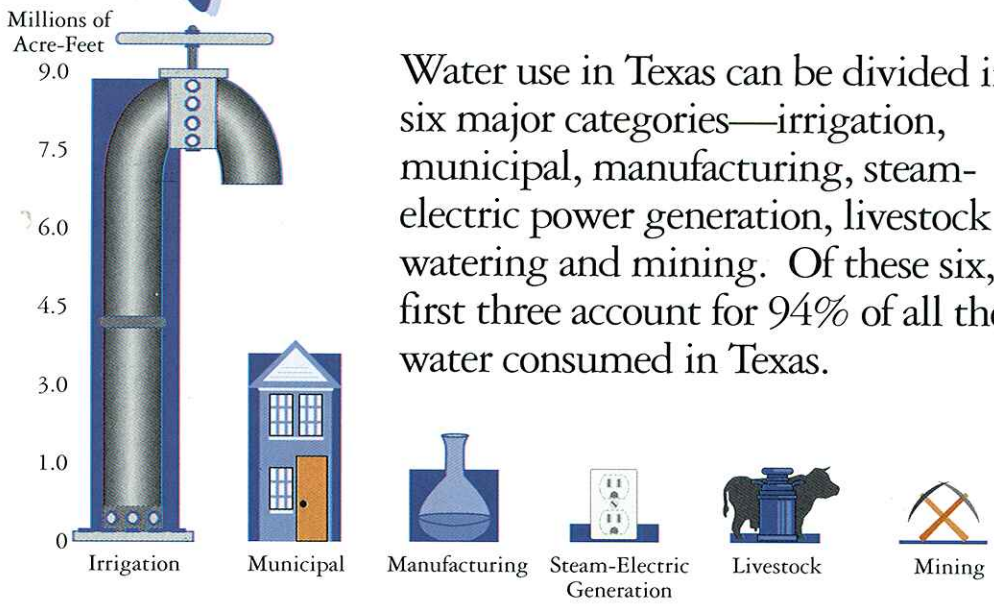
††† A sinking of the land surface due to the compaction of the supporting layers of clay.



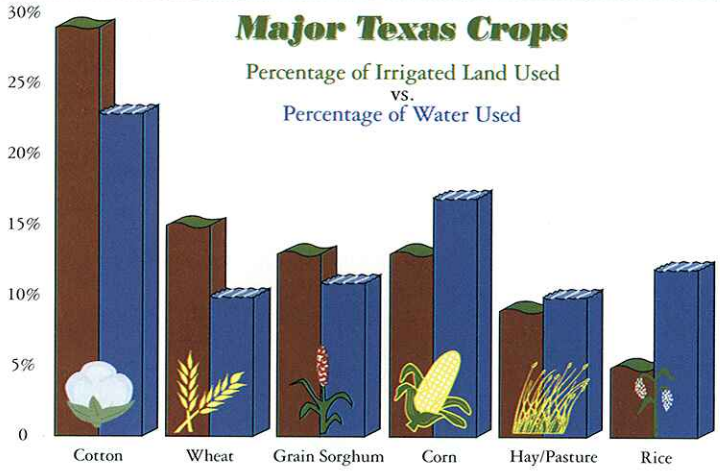
Use of Ground Water in Texas

Irrigation—72%
Municipal—21%
Mfg.—3%
Livestock—2%
Mining—1%
Power—1%

State Water Use



Water use in Texas can be divided into six major categories—irrigation, municipal, manufacturing, steam-electric power generation, livestock watering and mining. Of these six, the first three account for 94% of all the water consumed in Texas.

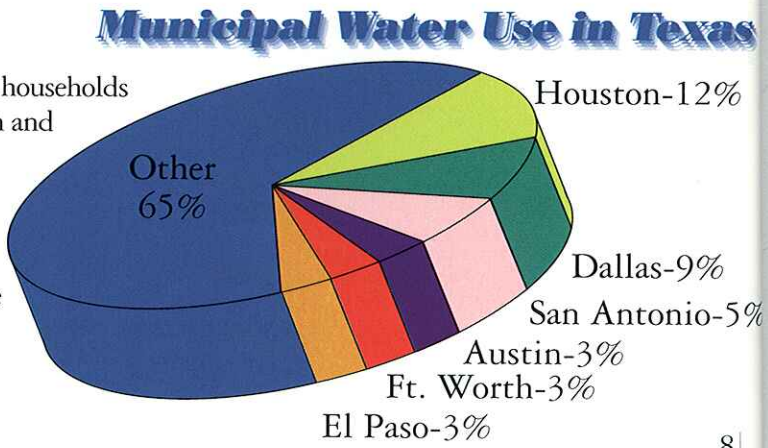


Irrigation

Irrigation of cotton, wheat, grain sorghum, corn, hay, rice and other crops accounts for about 60% of all the water used in Texas annually. In the last 15 years, however, the amount of irrigated land has declined by nearly 30%—about 2.5 million acres. Almost all of this decline has occurred in land once irrigated by ground water.

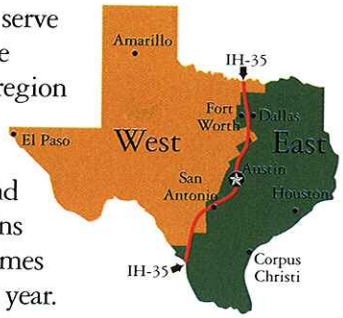
Municipal

Municipal water use generally includes water for households and businesses, restaurants and public offices, sanitation and landscaping, and of course, fire protection. Both the amount and type of water used depends a great deal on geographic location. Dallas, for example, relies solely on surface water for its municipal supplies while San Antonio currently uses only ground water from a single aquifer. Houston, however, divides its municipal supplies almost equally between ground and surface water.



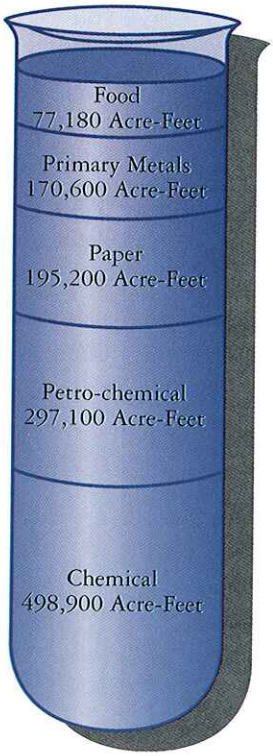
Population and Water Use Distribution

Interstate Highway 35 (IH-35) runs roughly parallel to the county lines that serve as a convenient divider for describing the distribution of water use in Texas. The region east of IH-35 accounts for nearly 80% of Texas' 17 million residents and 56% of the state's water use. The more arid and agricultural region west of IH-35 contains 20% of the state's inhabitants and consumes nearly 44% of the water Texans use each year.



Manufacturing

Five major manufacturing groups account for nearly 90% of the 1.4 million acre-feet of surface and ground water used by industry each year. In fact, a mere 20 companies account for more than half the water used in manufacturing.



In addition to the more than three-quarters of a million acre-feet of fresh water used annually, the chemical industry also uses an additional 1.6 million acre-feet of salty bay water each year.

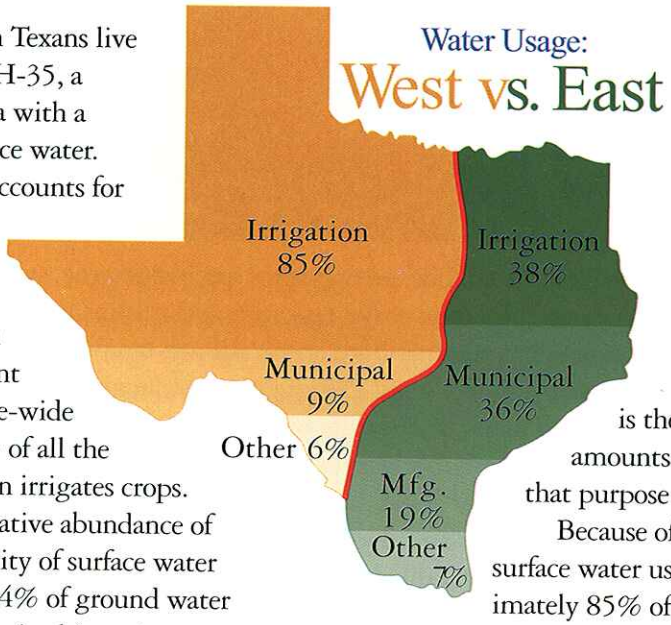
Chemical Row, Orange

The West

Some 3.2 million Texans live in the region west of IH-35, a typically semi-arid area with a noticeable lack of surface water.

While the west accounts for relatively little of the state's manufacturing or municipal use, irrigation in the region accounts for a significant proportion of total state-wide water use. In fact, 85% of all the water used in the region irrigates crops.

Because of the relative abundance of ground water and scarcity of surface water west of IH-35, about 74% of ground water usage in the state occurs in this region.



The East

Home to about 13.6 million Texans, the eastern region is relatively rich in surface water, generally has abundant rainfall, and is home to many major cities as well as large industrial concerns.

In fact, almost 95% of the state's manufacturing water use and over 80% of the state's municipal use occur east of IH-35. While irrigation is the dominant water use in the west, it amounts to less than half of the water used for that purpose in the east.

Because of its relative abundance east of IH-35, surface water used in the east accounts for approximately 85% of the total surface water used in Texas.

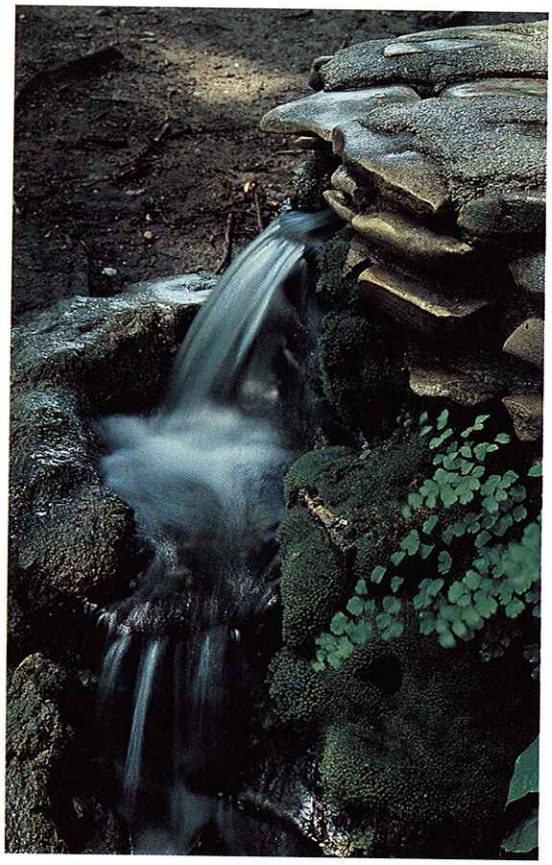
Water Quality

"Don't drink the water." It's a common enough piece of advice to people travelling abroad, but you wouldn't think that sometimes it applies at home as well—Texans will always have good quality water, right?

Not necessarily. The quality of the water we have determines whether or not we can use it. Even though there may be enough water, it can become contaminated and no longer usable. It is important to remember that our ground and surface water resources are susceptible to contamination and need to be continuously monitored and protected to ensure their quality. Because of this, water quality standards have been developed.

Surface water quality standards are established to protect specific uses (i.e. swimming, fishing, aquatic life and public drinking water) for most major reservoirs and streams in the state. More general criteria protect even small streams and tributaries from excess salinity, temperature, nutrient levels, toxicity, bacterial levels and other activities of man. The majority of water bodies that fail to meet standards do so because of pollution from major metropolitan areas.

Similar standards do not exist for ground water unless it is being used as community drinking water. Ground water is tested for various degrees of suitability (i.e. irrigation, industrial process water and municipal use) depending on its *chemical* content. Drinking water tests evaluate bacterial content, odor and chemical constituents. Private wells for individual consumption and agricultural use, however, are largely unregulated.



Natural springs abound in Texas and, in many cases, feed the rivers that provide both beauty and recreation for Texans from all walks of life. (Photo: Krause Springs)

Some of the newer or more innovative protective measures for water quality include:

- Application of "oil eating" microbes after an oil spill. This is one example of an emerging field known as *bio-remediation*.
- *Bioassay* tests performed on living organisms to determine if treated wastewater is toxic to aquatic life.
- Using marsh grasses to filter pollutants from wastewater and the runoff from landfills (leachate) near coastal wetlands areas.
- Requiring clay or plastic liners under wastewater and hazardous waste ponds to prevent ground water contamination.
- Using grassy swales and detention ponds to first filter, then settle, stormwater runoff prior to releasing it to streams, in order to prevent *nonpoint source* pollution.
- Using computer models to predict required levels of wastewater treatment in different bodies of water.
- Limiting certain land use practices through the use of *wellhead protection programs* in order to protect underground drinking water supplies.
- Using ozone, ultra-violet light, microwaves and other non-traditional methods of disinfecting wastewater sludge prior to disposal.

Whatever the methods used, the challenge is to protect the quality of our state's water and to ensure its availability for all Texans for generations to come.

Talking Water Quality

Water Quality: The characteristic of water that describes its suitability for a specific use based upon the amount and type of minerals, sediments and organisms found within it.

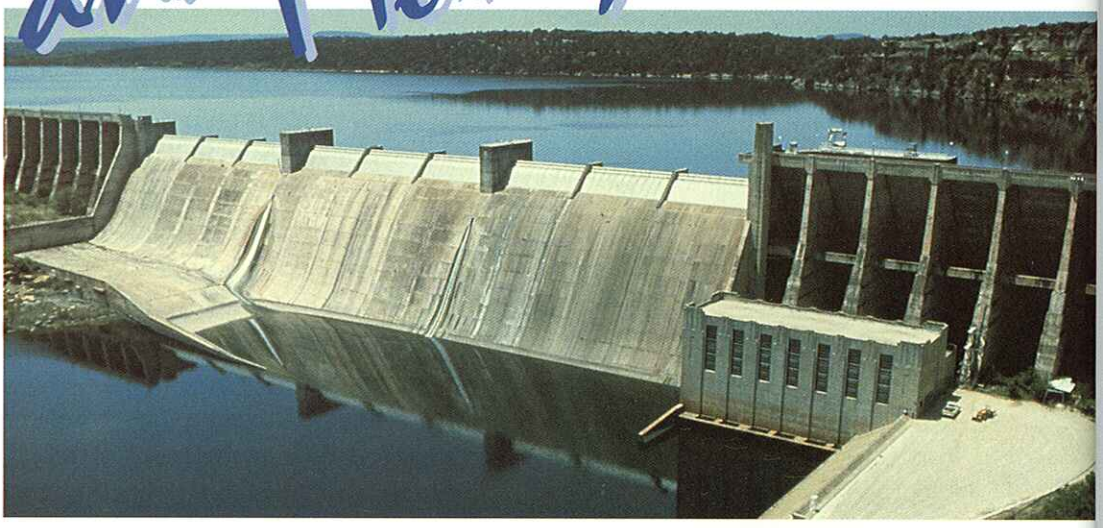
Contaminant: Any substance, whether natural or foreign, that makes water unfit for a specific use. Water that is high in nitrates, for example, is unfit for drinking but may be suitable for irrigation. It is therefore considered "contaminated drinking water" yet at the same time considered "suitable irrigation water."

Pollutant: Something that causes water to be altered from its pure state. Pollutants can be natural or man-made.

Point Source Pollution: Pollution that is being discharged from one discrete location or point. Discharge from industrial or city wastewater treatment plants is a prime example.

NonPoint Source Pollution: Pollution that cannot be identified as coming from one discrete location or point. Examples are urban and agricultural runoff.

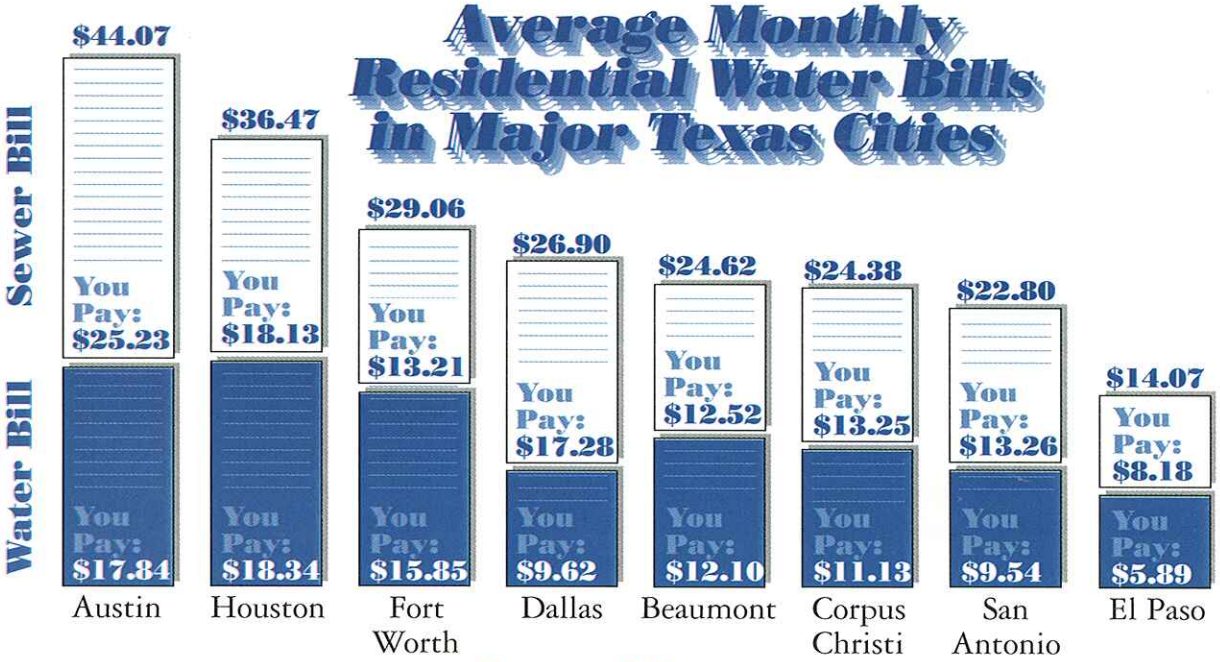
Water and Money



Texans currently spend about $1 billion each year on new water, sewage and drainage facilities. Additional money, however, will be needed to replace, expand and upgrade existing facilities, provide for localized flood protection and satisfy new federal regulations.

In fact, the next ten years will require one and a half times Texas' current rate of expenditure just to meet our basic needs for safe drinking water, sewers, wastewater treatment and flood control.

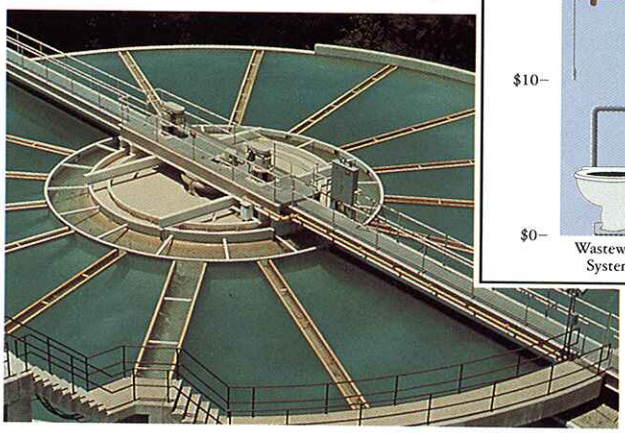
Average Monthly Residential Water Bills in Major Texas Cities



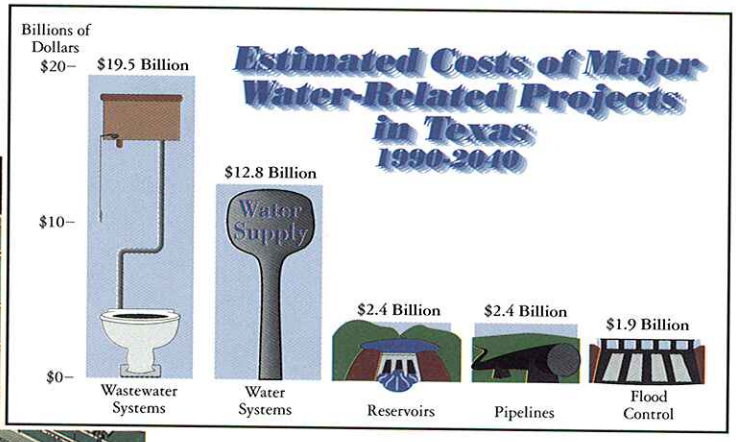
Ernst and Young
1990 National Water & Wastewater Rates Survey
Rates based on standard residential meter—7,480 gallons per month

Furrow diking is one way to reduce water use in agriculture.

Financing of projects for the next 50 years of growth, however, will cost Texans more money as the federal government withdraws large portions of its funding for state water-related projects. From 1978 to 1989, for example, federal funding of total state water-related facility financing declined from 40% to 17%. State and local governments will have to address this decline in funding.



Money spent today to maintain water treatment plants like this one can help communities postpone the large capital outlay required to replace the system.



A positive economic return results from having good water quality. For every $100 million spent on water quality, Texas receives $259 million in indirect benefits.

Saving Water Saves Money

If Texans want an adequate water supply in the future, water will have to be used more efficiently. If our state's current growth rate continues, adequate water supplies for all areas of Texas cannot be provided by simply building new water projects.

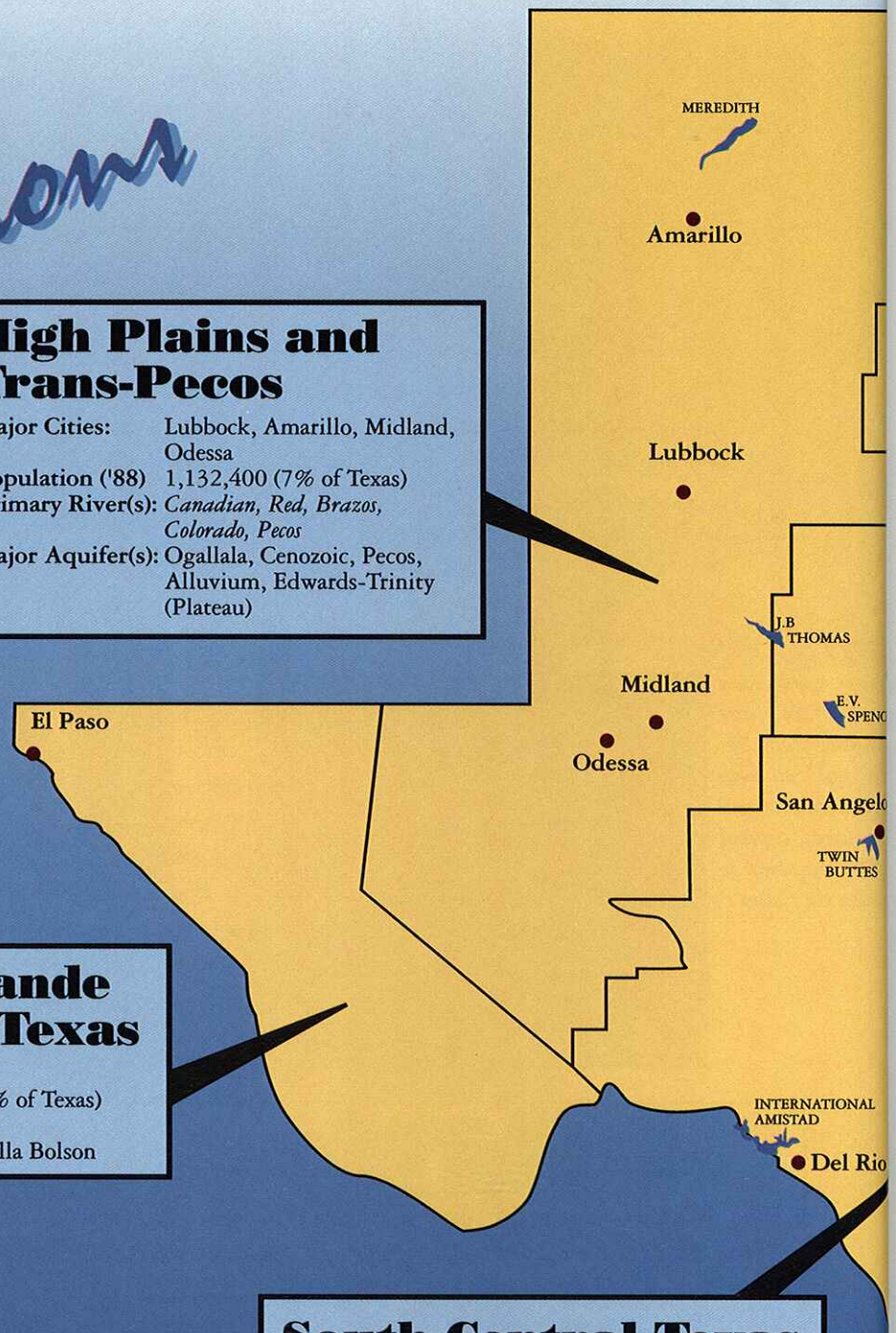
Water conservation addresses this problem in several ways. First, water conservation reduces water use, which in turn extends the usefulness of our water supplies and decreases operating expenses.

Second, conserving water in the home means less wastewater down the drain.

And finally, water conservation benefits Texans by saving them money. Conservation extends the current water supplies, thereby postponing the need for building new, increasingly expensive, projects. Even a modest urban conservation program can reduce water use by 15%, saving upwards of $25 billion during the next 50 years. Similar savings are possible in the industrial sector and even more dramatic savings are possible through reduced use of water for irrigation. Energy savings are also realized through lower water heating, treatment and pumping costs.

Saving water now not only protects us and our children, it helps guarantee clean, usable water for the future of Texas.

Water Regions



High Plains and Trans-Pecos

Major Cities: Lubbock, Amarillo, Midland, Odessa
Population ('88) 1,132,400 (7% of Texas)
Primary River(s): *Canadian, Red, Brazos, Colorado, Pecos*
Major Aquifer(s): Ogallala, Cenozoic, Pecos, Alluvium, Edwards-Trinity (Plateau)

Upper Rio Grande and Far West Texas

Major Cities: El Paso
Population ('88): 607,200 (4% of Texas)
Primary River(s): *Rio Grande*
Major Aquifer(s): Hueco-Mesilla Bolson

South Central Texas

Major Cities: San Antonio, Austin, San Angelo, Del Rio
Population ('88): 2,716,600 (16% of Texas)
Primary River(s): *Colorado, Guadalupe, San Antonio, Nueces, Rio Grande*
Major Aquifer(s): Edwards-BFZ, Edwards-Trinity (Plateau), and Carrizo-Wilcox

West Central Texas

Major Cities: Abilene, Wichita Falls
Population ('88): 537,200 (3% of Texas)
Primary River(s): *Red, Colorado, Brazos*
Major Aquifer(s): Seymour

North Texas

Major Cities: Dallas, Fort Worth, Denton, Sherman, Temple, Waco
Population ('88): 4,720,900 (28% of Texas)
Primary River(s): *Red, Trinity, Brazos*
Major Aquifer(s): Trinity

Northeast Texas

Major Cities: Texarkana, Tyler, Longview
Population ('88): 901,300 (5% of Texas)
Primary River(s): *Red, Sulphur, Cypress, Sabine, Neches*
Major Aquifer(s): Carrizo-Wilcox

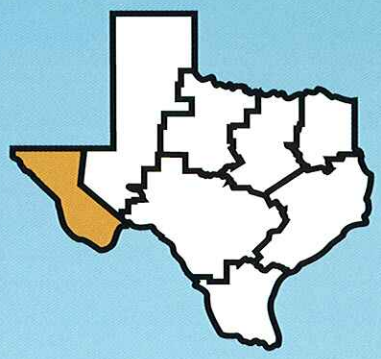
Southeast Texas and Upper Gulf Coast

Major Cities: Houston, Galveston, Beaumont, Orange, Port Arthur, Victoria
Population ('88): 4,866,600 (29% of Texas)
Primary River(s): *Sabine, Neches, Trinity, San Jacinto, Brazos, Colorado, Lavaca, Guadalupe*
Major Aquifer(s): Gulf Coast

South Texas and Lower Gulf Coast

Major Cities: Corpus Christi, Laredo, McAllen, Brownsville
Population ('88): 1,366,300 (8% of Texas)
Primary River(s): *Nueces, Rio Grande*
Major Aquifer(s): Gulf Coast

Upper Rio Grande & Far West Texas



Major cities: El Paso
Cuidad Juarez, one of the largest Mexican cities, lies directly across the *Rio Grande* from El Paso.

Population ('88): 607,200 (4% of Texas' total population).

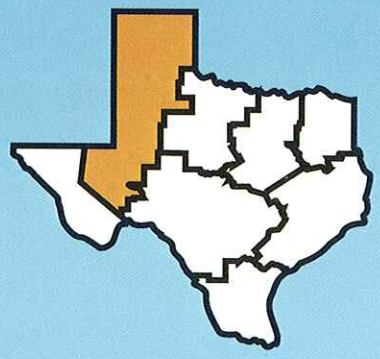
Primary River(s): *Rio Grande*

Water Facts:

- Because of the dry climate and high evaporation rate, there are no major reservoirs in this region, and currently none are planned for the future.
- The earliest record of irrigation in Texas was reported in 1541 near what is now El Paso by the Spanish explorer Coronado, who found Indians irrigating their crops.
- The first record of drought in Texas was made by the Spanish explorer Cabeza de Vaca. Mistaken for a god by local Indians, Señor de Vaca was asked to bring rain to the Presidio area which had been untouched by rain for two years.
- The Elephant Butte Dam, built in New Mexico in 1916 on the Rio Grande, resulted in the development of an irrigated agricultural region in the river valley near El Paso.
- This region contains Texas' tallest waterfall, Capote Falls, with a height of 170 feet.
- Prior to the 1950's, the dry Salt Flat lakes in Culberson and Hudspeth Counties had produced salt as a commercial mineral.
- The water levels in the Hueco-Mesilla Bolson aquifers have been steadily dropping because of the water consumption of both El Paso, Texas and Ciudad Juarez, Mexico. El Paso has begun an intensive water conservation program (started in 1968), and is currently the only Texas city to recharge an aquifer with specially treated wastewater.
- The Rio Grande, the largest river in this region, is often dry below Fort Quitman. The large withdrawals of water upstream for municipal use and irrigation reduce the flow. Flow is further reduced by the proliferation of salt cedar, an imported plant that consumes a great deal of water. The river is replenished, however, when the Rio Conchos (from Mexico) meets it just above Presidio, Texas, some 135 miles downstream from Fort Quitman.
- *Tinajas* are small depressions in rock formations that sometimes fill with rainfall. These are an important source of water for wildlife in this region. (*see photo below*)

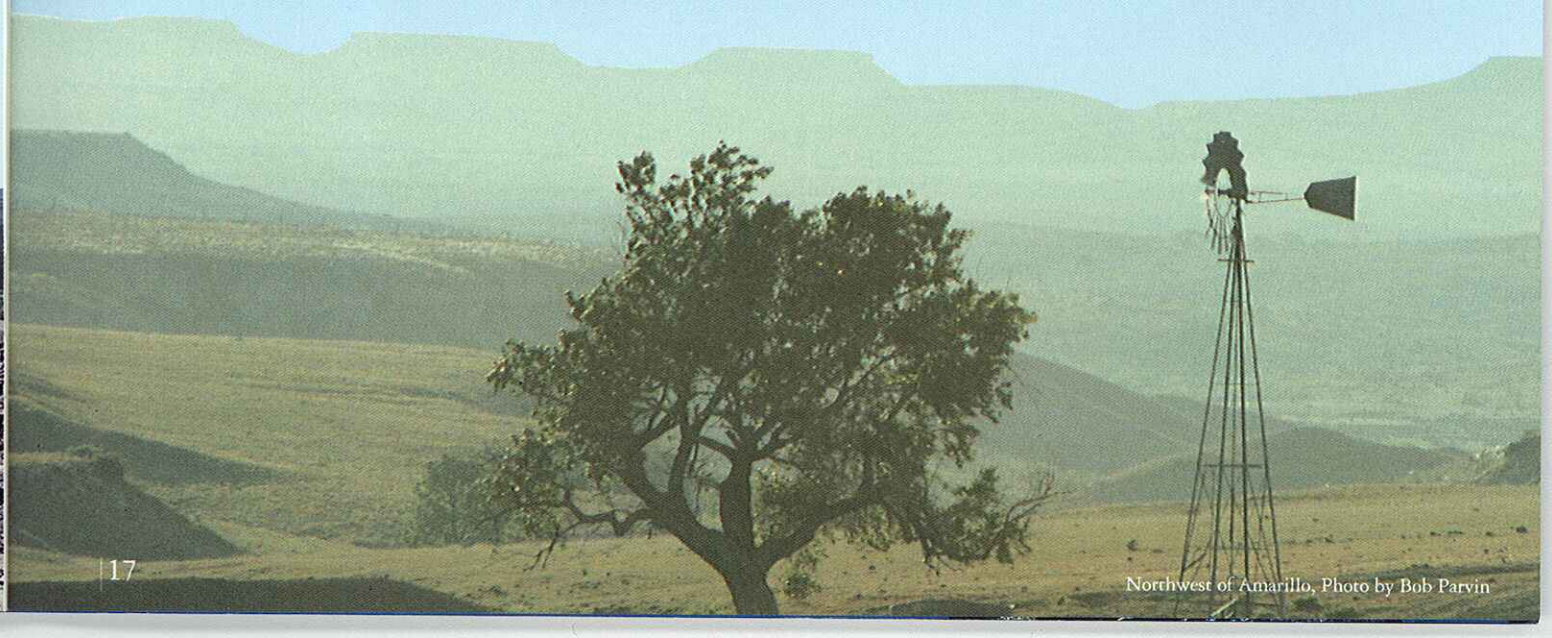
Hueco Tanks near El Paso

High Plains & Trans-Pecos Region



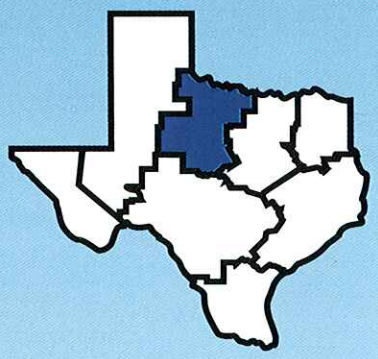
Major cities: Lubbock, Amarillo, Midland, Odessa.
Population ('88): 1,132,400 (7% of Texas' total population).
Primary River(s): *Canadian, Red, Brazos, Colorado, Pecos*
Water features:

- *Playa lakes*, shallow depressions that temporarily hold rainwater and irrigation runoff, serve as important water supplies for wildlife and migratory waterfowl. The feasibility of using these lakes to artificially recharge the Ogallala aquifer, the region's most important source of water, continues to be investigated.
- Reeves County contains the largest spring-fed irrigation district in the state. San Solomon, the largest spring in the area, feeds the state's largest outdoor swimming pool—located in Balmorhea State Park.
- Comanche Springs, which supplied Indians and early settlers with water and was once considered one of Texas' largest springs, went dry in 1961 because of heavy ground-water mining in the area.
- The Canadian River has the greatest amount of quicksand in the state.
- During the 1960's, an aqueduct system was built with 322 miles of pipeline, ten pumping plants, and three regulating reservoirs to supply water to 11 cities in the High Plains region. After the system was completed, inspectors rode bicycles through 140 miles of the pipeline before pumping any water into it.
- There is a 200-mile-long pipeline network that furnishes water to the cities of Odessa, Big Spring, and Snyder.
- The first project to reuse treated wastewater in Texas began in Lubbock in 1925.
- Post, Texas was the site of early and unsuccessful rainmaking experiments from 1911 to 1914. The experiments involved shooting cannons into the sky in hopes of affecting rainfall in the area. Although later experiments in cloud seeding are believed to have increased rainfall slightly, attempts to modify weather have generally been met with controversy.
- Sinkholes, areas where the ground has collapsed (at times as much as 100 feet), are common in the Trans-Pecos region.



Northwest of Amarillo, Photo by Bob Parvin

West Central Texas



Major cities: Abilene, Wichita Falls
Population ('88): 537,200 (3% of Texas' total population)
Primary River(s): *Red, Brazos, Colorado*
Water features:

- There is a long-standing boundary dispute between Texas and Oklahoma because of the constantly shifting course of the Red River.
- The Seymour aquifer supplies ground water that makes irrigated farming possible in this region.
- Wichita Falls was named for a 5-foot waterfall on the Wichita River. Although the waterfall washed away many years ago, the city has reconstructed it on the original site.
- Wichita Falls' entire water supply and 99% of Abilene's water supply comes from six local lakes.
- There is a problem with using this region's springs, rivers and streams because of the naturally salty water and the existence of many large salt deposits in the area. To combat this problem, the federal Truscott brine storage reservoir was constructed, and several similar projects proposed, in an effort to help control the flow of salty water into local rivers and reservoirs.
- In the average year, Texas experiences more tornadoes than any other state. Witchita Falls, one of the two major cities in this region, lies along a frequently hit path that has been aptly named "tornado alley."

Red River, North of Wichita Falls,
Photo by Paul Montgomery

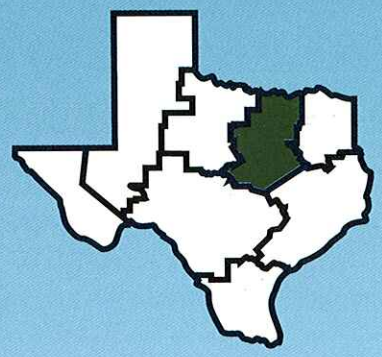
South Central Texas

Major cities: San Antonio, Austin, San Angelo, Del Rio
Population ('88): 2,716,600 (16% of Texas' total population)
Primary River(s): *Colorado, Guadalupe, San Antonio, Nueces, Rio Grande*
Water features:

- All of the largest springs in Texas are located in the Edwards (BFZ) or the Edwards-Trinity (Plateau) aquifers, and 13 of these springs are located within this region, including the two largest—San Marcos and Comal Springs.
- The first large reservoir in Texas was Lake McDonald. First built in 1890, it is now known as Lake Austin. The reservoir's dam was damaged or destroyed four times by floods between 1900 and 1935. The current dam (Tom Miller) was built in 1940.
- San Antonio, the third largest metropolitan area in the state, currently is the only major city in the U.S. that obtains its entire water supply from a single aquifer.
- The longest dam in Texas is the 8-mile-long dam at Twin Buttes Reservoir in San Angelo.
- The Medina Dam is the largest all-concrete dam in the state. It was completed in 1913 and created Medina Lake, at that time the largest reservoir in the state.
- The oldest continuously used irrigation system in the U.S. is the Mission San Francisco de la Espada aqueduct in San Antonio. Built between 1740 and 1745, it still conveys water from the San Antonio River to the mission's crops.
- The Amistad Reservoir on the Rio Grande, which Texas shares with Mexico, is the world's third largest man-made international reservoir. It is fed by the Devils River, the Pecos River, and the Rio Grande.
- The once spring-fed San Antonio River would be dry within the city of San Antonio if not for well water pumped into it from the Edwards (BFZ) aquifer.

Lake Austin. Photo by Chris Clymer-LCRA

North Texas Region

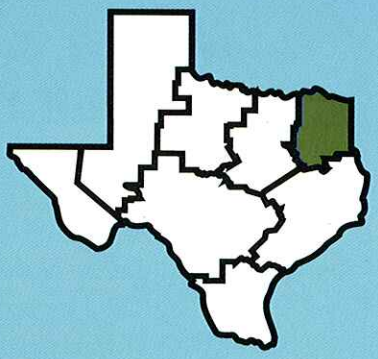


Major cities: Dallas, Fort Worth, Denton, Sherman, Temple, Waco
Population ('88): 4,720,900 (28% of Texas' total population)
Primary River(s): *Red, Trinity, Brazos*
Water features:

- The greatest concentration of desalinating plants in Texas is in the Dallas-Fort Worth area, totalling seventeen plants in all. Thirteen plants provide 4.1 million gallons of fresh water each day for industrial concerns such as electronics. Only four currently contribute to municipal water supplies, although a fifth municipal plant is under construction and will produce nearly as much fresh water alone as the other four plants combined. When this fifth plant is completed, it will be the largest desalinating plant in Texas.
- The Dallas-Fort Worth metroplex is served by four large regional sewage treatment plants. One of these plants, the Wilson Creek plant, discharges specially treated wastewater into Lake Lavon where it is recycled into the municipal water supply.
- The oldest municipal reservoir in Texas is Lake Worth in western Tarrant County. It was built in 1914.
- Tarrant County has more lakes than any other county in Texas. Fort Worth (the county's major city) has more lakes than any other city in Texas.
- The highest capacity lake in Texas is Lake Texoma on the Red River. It is the 10th highest capacity lake in the U.S. and can hold 5,382,000 acre-feet of water. Texas shares this lake with Oklahoma and has rights to about half of the water in it.
- There are more large cities, more people and more industrial developments along the Trinity River than there are along any other river in Texas.
- If it were not for the treated wastewater from the Dallas area, the Trinity River below Dallas would often be dry in the summer.
- The largest Texas lake that lies entirely within a city's limits is Lake Waco in Waco.

Near Glen Rose, Photo by Paul Montgomery

Northeast Texas Region

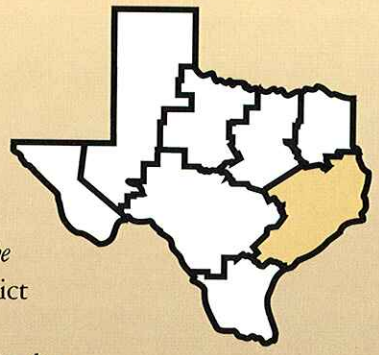


Major cities: Texarkana, Tyler, Longview
Population ('88): 901,300 (5% of Texas' total population)
Primary River(s): *Red, Sulphur, Cypress, Sabine, Neches*
Water features:

- The largest natural lake in Texas, and one of the largest in the South, is Caddo Lake in Harrison and Marion Counties. Indian myths say the lake was created by an earthquake, sent by the Great Spirit in retaliation for a Caddo Indian chief's disobedience. Current explanations cite an enormous log jam, known as the *Red River Raft,* which blocked the river and created a natural reservoir. The current lake was formed when the log jam was replaced by a federal dam near Mooringsport, Louisiana in about 1900.
- Jefferson, the county seat of Marion County on the Texas-Louisiana border, was the site of the first riverboat port in Texas. Located on Cypress Creek, it's proximity to the Red River made it a principal river port in Texas around 1836, even though it was more than 200 miles from the coast.
- Water resources in this region are shared among four states: Texas, Louisiana, Arkansas and Oklahoma.

Caddo Lake, near Potter's Point, Photo by Witold Skrypczak

Southeast Texas & Upper Gulf Coast Region

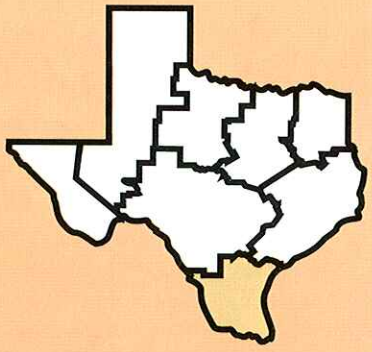


Major cities: Houston, Galveston, Beaumont, Orange, Port Arthur, Victoria
Population ('88): 4,866,600 (29% of Texas' total population)
Primary River(s): *Sabine, Neches, Trinity, San Jacinto, Brazos, Colorado, Lavaca, Guadalupe*
Water features:

- The Harris-Galveston Coastal Subsidence District was the first district created to combat land subsidence in Texas.
- Sam Rayburn Reservoir is the largest reservoir located entirely within the state.
- Houston is considered a major world port. Currently, the Port of Houston ranks third in the nation in terms of tonnage.
- Houston's 69th Street Wastewater Treatment Plant is the largest such plant in Texas. It covers the area of three city blocks and is capable of treating 200 million gallons of sewage every day. There are 92 *more* sewage treatment plants in the City of Houston.
- The pipelines that feed into Houston's wastewater system range from a mere 4 inches in diameter to an enormous 10 feet in diameter.
- The longest seawall in the U.S. is the Galveston Seawall at 10.4 miles.
- Beaumont has the distinction of being the only city in Texas to have combined its storm and sanitary sewers into one system. Recently, however, the city spent $28 million to separate the two wastewater systems.
- The largest *industrial* desalination plant in the state is in Texas City. It produces 4 million gallons of fresh water each day.
- The Gulf Intracoastal Waterway, once known as the Intracoastal Canal, extends from Florida to Brownsville, Texas. The segment in Texas parallels the coastline for a distance of about 423 miles and is about 12 feet deep by 125 feet wide. It is one of the most important shipping lanes in the U.S.
- Sea Rim State Park is the largest salt marsh parkland in Texas. Located in Jefferson County, it contains five miles of Gulf shoreline.

South Padre Island, Photo by Bob Parvin

South Texas and Lower Gulf Coast



Major cities: Corpus Christi, Laredo, McAllen, Brownsville
Population ('88): 1,366,300 (8% of Texas' total population)
Primary River(s): *Nueces, Rio Grande*
Water features:

- The deepest Texas port is the Port of Corpus Christi at 45 feet.
- The Padre Island National Seashore is the longest national seashore in the United States. It covers 66.5 miles of Gulf shoreline on the South Texas coast.
- This region contains large quantities of brackish ground water that could be made useful for water supplies through desalination.
- The Aransas National Wildlife Refuge provides the only wintering grounds in the United States for the endangered whooping crane.
- The Lower Rio Grande Valley is one of the world's largest producers of citrus fruit crops. Without water from the Rio Grande and the region's extensive network of irrigation canals, this area would be unable to support these valuable crops.
- International Falcon Dam is the oldest major man-made dam along the U.S.-Mexico border.
- The channel dams along the Rio Grande were built to divert water from the river for municipal, industrial and agricultural water supplies.
- Laguna Madre, between Padre Island and the Texas mainland, is one of only four hypersaline (more salty than seawater) marine lagoons in the world. The others are located on the western coasts of Africa and Australia, and on the Crimean Coast of the Soviet Union.

Laguna Atascosa National Wildlife Refuge, Photo by Bob Parvin

Water and the Environment

Without water, all living things would disappear. So it is no wonder that all of us are becoming increasingly aware and concerned about the consequences of altering our environment to provide people with an adequate, clean supply of water. Texans are aware that some trade-offs will be required in the future if all the users of water– humans, plants, and animals–are to receive their fair share.

As our water supply winds its way to the Gulf, the water is used and reused. . . cities and industries treat their used water before allowing it to flow downstream to the next user.

Houston 69th Street Wastewater Treatment Plant

Photo by Chris Clymer-LCRA

Both water-efficient equipment and new methods of irrigation that return water downstream will help ensure an adequate water supply for all in the future. (Photo: Matagorda County)

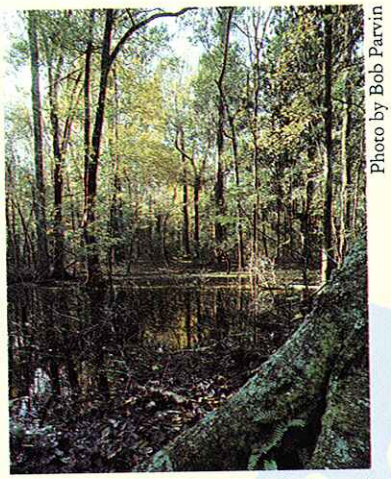


Photo by Bob Parvin

Increasingly, we are aware of the need to protect Texas' unique environments including bottomland hardwoods, scenic rivers, the bays and estuaries and other special wildlife habitats.

Today, the consequences to downstream users and the environmental impact on plant and animal life are strongly considered before a new reservoir is built. More and more, natural habitats are being recognized as legitimate users of water—just like people, industry, and agriculture. (Photo: Lake Travis near Martin Dies State Park)

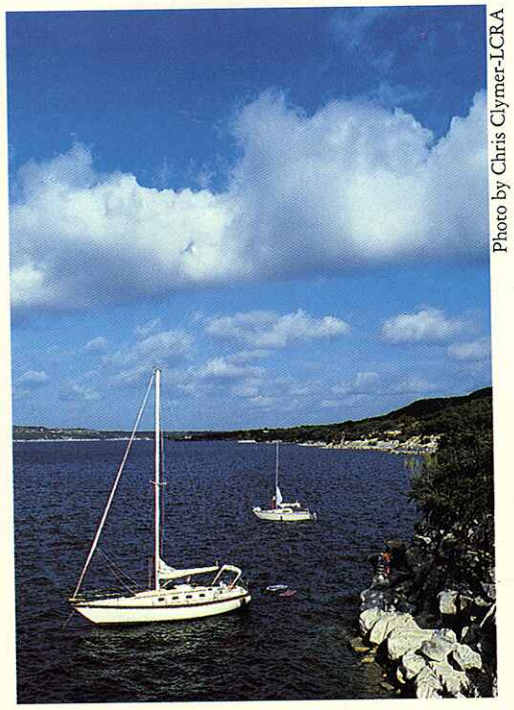
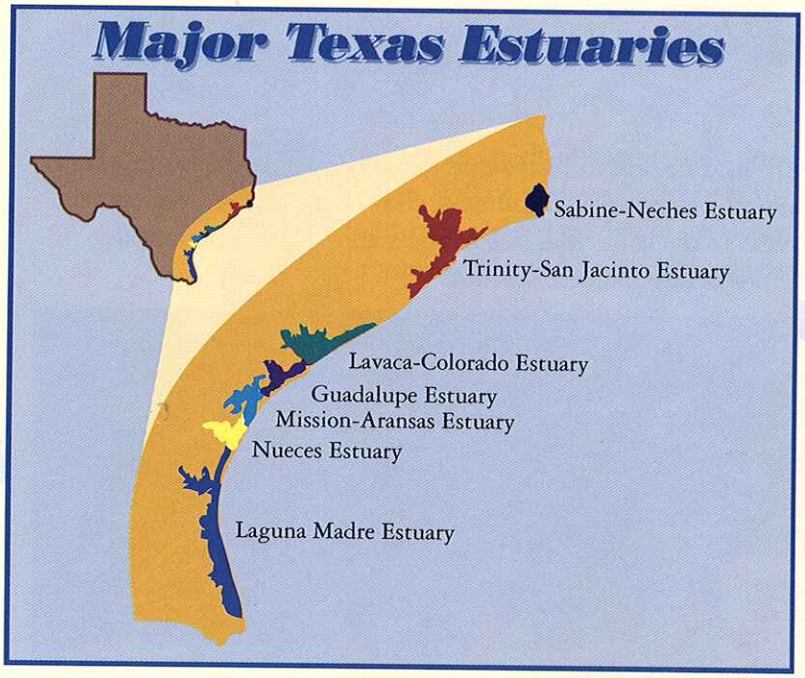
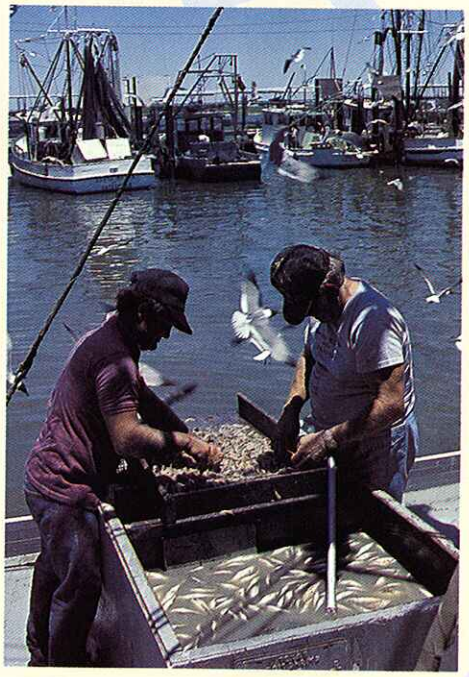


Photo by Chris Clymer-LCRA



A special, sensitive environment called an estuary lies in the tidal waters between the Texas coast and the fragile barrier islands. Here, freshwater mixes with saltwater to create the breeding grounds for many species of marine life including red drum, spotted seatrout and shrimp. The productivity of Texas' seven major estuaries depends greatly upon the inflow of fresh water from rivers and streams.

Texas' bays and estuaries are not only environmentally valuable, they are also important contributors to the state's economy. The commercial, sport fishing and other recreational activities along the coast generate almost $3 billion each year. (Photo: Galveston)



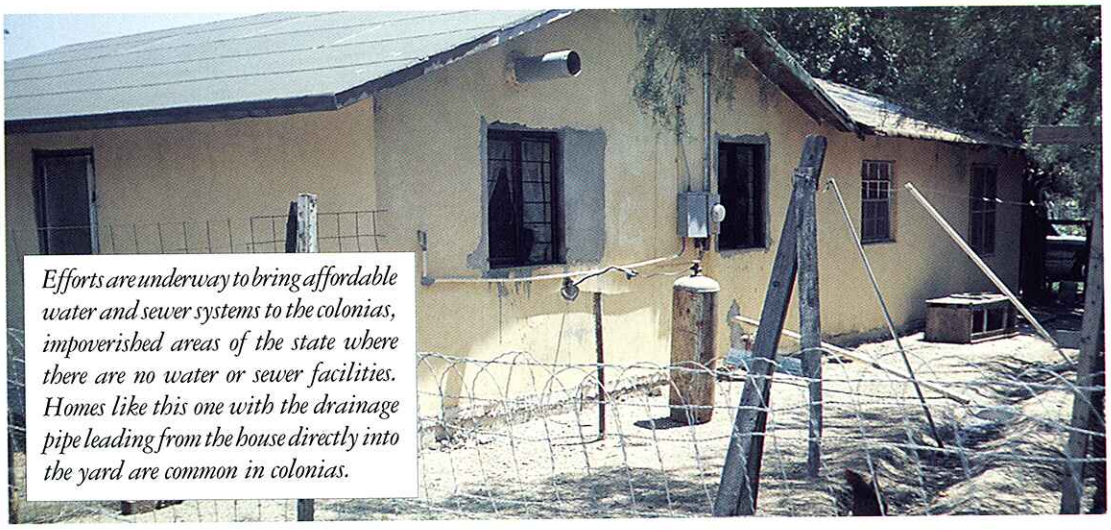
Bays, estuaries and coastal wetlands provide protected habitat for waterfowl such as the endangered whooping crane and the brown pelican as well as the millions of ducks and geese that use the Central Flyway of North America each year. (Photo: Near Rockport)

"If we're to be responsible, we must accept the fact that we owe a massive debt to our environment. It won't be settled in a matter of months, and it won't be forgiven us."

- Russell Train

Water Issues

How we handle water issues in the next decade will have a profound impact on the future of our state. Pollution, water conservation, environmental concerns, and water resource development need to be addressed. Our answers to the issues that face us today are vitally important in setting the priorities that will take us into the next century.



Efforts are underway to bring affordable water and sewer systems to the colonias, impoverished areas of the state where there are no water or sewer facilities. Homes like this one with the drainage pipe leading from the house directly into the yard are common in colonias.

- Will there be enough water to meet the needs of Texans for the next 50 years and will it be where it is needed?
- What uses will be competing for water in the future?
- How can we use our water resources more efficiently?
- What will it cost to develop new water supply sources and where will they be needed?
- How are we going to pay for building, repairing, and expanding the facilities needed to provide safe drinking water, thorough sewage treatment, and adequate flood control?
- What are the best ways to prevent contamination of our water supply from industrial and urban wastes?
- What are the best methods for disposing of solid and hazardous waste in order to prevent water and other forms of environmental pollution?
- How can we reduce nonpoint source pollution?
- Are changes needed in current laws governing water?
- How can we strike a balance between our water needs and those of aquatic life and wildlife?
- Are we doing all we can to explore alternative sources of water?

The 1990's will prove to be an important time for Texans...a time when planning for our future water supply must take precedence. The future depends strongly on the decisions made today.

The Future

Water can be both a blessing and a curse—at times there is too little, sometimes too much, and often, it's not in the right place at the right time. However, one thing is certain...the future of our state and our quality of life depends upon how seriously each of us takes our responsibility for managing and protecting our water resources.

So what's in store for Texas?

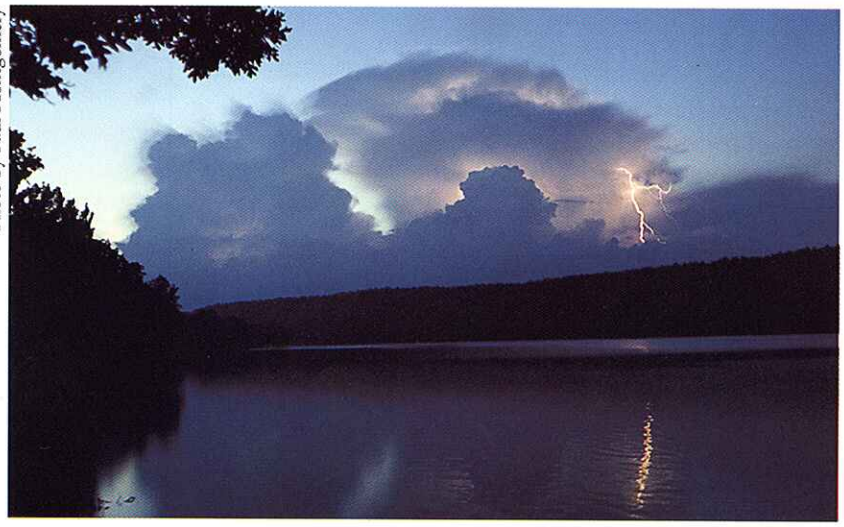
- *Conservation will be more important than ever.* Water conservation is the cornerstone of good water management. By using our existing supplies more efficiently, we help reduce our current costs, guarantee our future water supplies and reduce the need for, and the cost of, future water projects.

- *We will have to pay more for clean water.* Adequate, dependable supplies of clean water will be more costly in the future. Stricter water quality standards, limited opportunities for developing new water supplies and less federal financial support will mean higher water costs for most communities.

- *We will have to develop alternative water supplies.* Previously unusable water sources, like saline aquifers, can now be used by applying advanced technologies such as desalination. We need to explore water and wastewater reuse as an alternative to help supplement the state's water resources.

- *We will have to learn more about water in Texas.* Education is the key to making the whole system work. Learning to understand and appreciate the importance of water as it relates to the economy and the environment will encourage active, continuing participation in protecting this vital natural resource.

Photo by Paul Montgomery



Our future depends upon our ability to conserve and manage our water resources, to educate our citizens, and to actively take part in protecting the water we have.

B.A. Steinhagen Reservoir in East Texas

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Lower Colorado River Authority	*pp. 4,19,24*
Texas Department of Public Safety Emergency Management Division	*p. 3*
Texas Highways Magazine	*pp. 1-3,9,11,16,25*
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Water Facts

If you know an interesting fact about water in Texas and you're willing to share it, please send it to:

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Austin, Texas 78711-3231

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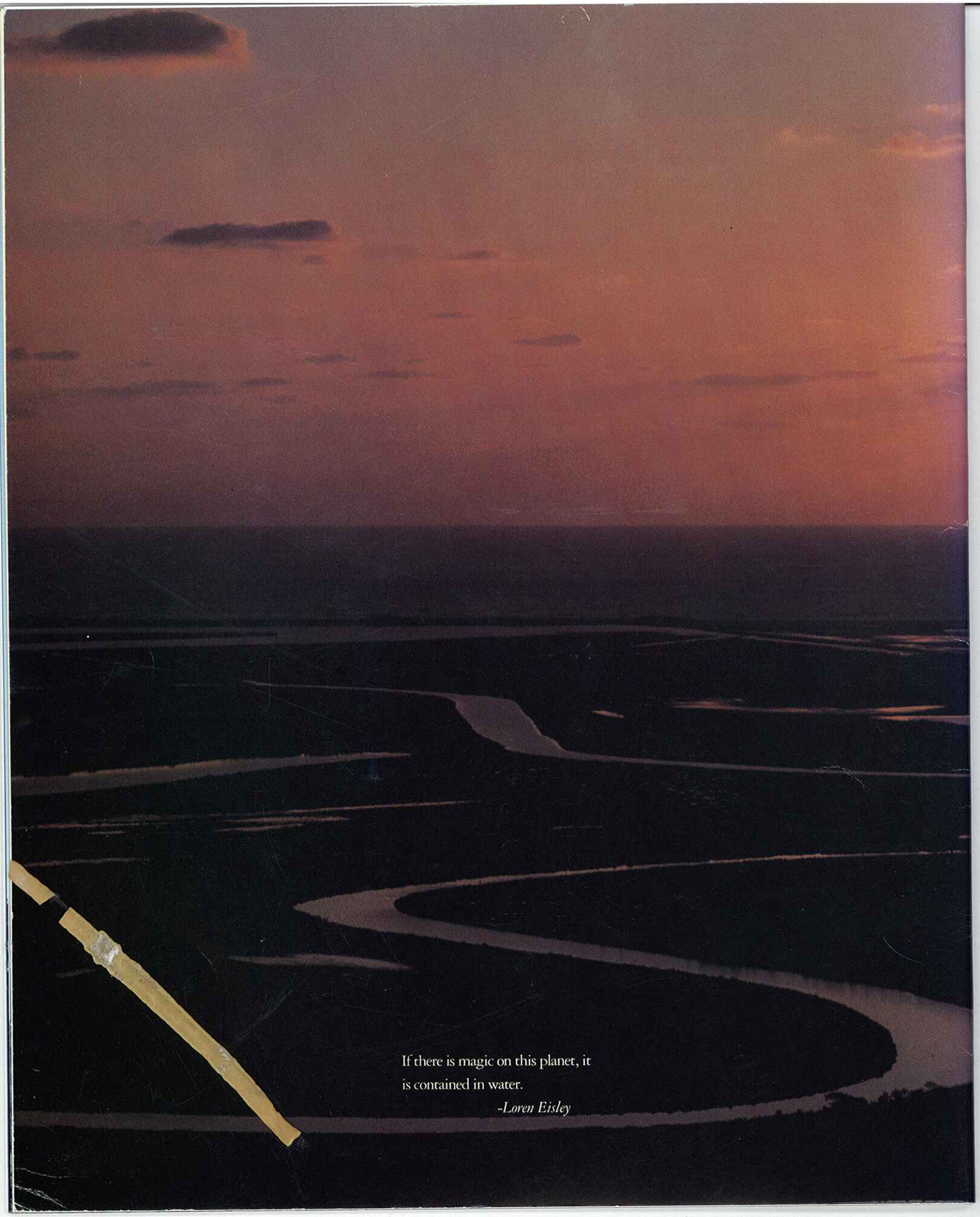

If there is magic on this planet, it
is contained in water.

-Loren Eisley