

The Last Great Habitat

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Introduction

Concerns about conservation of the tropical rainforests and other well-known regions of the world are widely publicized, yet a region of inestimable biological wealth lies relatively unrecognized on the back doorstep of North America. The region lying south of a line from Port O'Connor to Victoria, northwest to San Antonio and west to Del Rio known as "South Texas" is one of the most biologically diverse regions in the world (Fig. 1). In fact, it is termed "hyper-diverse" by many ecologists. We feel that conservation of this biological treasure is of urgent concern to policy makers, nature enthusiasts, and the general public throughout the region and nation.

We at the Caesar Kleberg Wildlife Research Institute fondly call South Texas the "Last Great Habitat." It is considered the "*Last* Great Habitat" because South Texas is one of the last regions in the State that contains extensive tracts of contiguous wildlife habitat. Urbanization, industrialization, fragmentation of the land into small "ranchettes," and large-scale cultivated agriculture are rapidly enveloping other great habitats such as the Edward's Plateau, Rolling Plains, Panhandle, and Piney Woods regions of Texas. South Texas is a "*great*" habitat because of the diverse assemblage of plants and animals that it supports, which makes it special by uniqueness and rarity.

Whereas, locations such as the tropical rain forests or the Everglades receive most of the world's attention for their biodiversity, the number of vascular plant species in South Texas exceeds the number of species in the Florida Everglades (Table 1). The Lower Rio Grande Valley Wildlife Refuge at the southern tip of South Texas is 1/17th the size of Everglades National Park, but it has more combined amphibian, bird, mammal, plant, and reptile species based on refuge records. South Texas is home to more plant, butterfly, and vertebrate species than any other ecological region of Texas.¹

Many of the plants and animals of South Texas are found nowhere else in the United States. Aransas, Kleberg, and Starr counties in South Texas are considered to be "hotspots" for endangered species in the United States.² Five South Texas counties (Nueces, Kleberg, Kenedy, Willacy, and Cameron) have 87 species of rare, threatened, and endangered species of plants and animals.³

South Texas is also a "great" habitat because it is of keystone importance to migratory birds in North America. Populations of Neotropical migratory birds in North America would precipitously decline without the oak mottes, woodlands, and wetlands this region provides for resting and feeding during migration.

The catalysts for this great diversity, uniqueness of fauna and flora, and importance for migratory birds include large, well-managed private ranches whose vast landscapes are relatively undisturbed; a mixture of habitats ranging from woodland and wetland to prairie and desert;⁴ a subtropical climate with mild winters; a range in average annual rainfall from 34 inches near Victoria to only 17 inches near Zapata (a distance of only 169 miles);⁴ a variety of soils ranging from heavy clays to fine sands; and the Laguna Madre and its influences on weather and wildlife. These factors collectively make South Texas a region of *hemispheric* importance for plants and animals.

Forces that would change it forever, for the sake of "economic development," increasingly threaten this Last Great Habitat. Proposals have included development of an extensive bombing range for the United States Navy, a spaceport, wider highways, and upland disposal of spoil from dredging of the Gulf Intracoastal Waterway. These proposals to "develop" the "empty" portions of the region fail to recognize (1) the economic importance of the region's renewable natural resources including fish, forage, and unique native plants and animals; (2) the

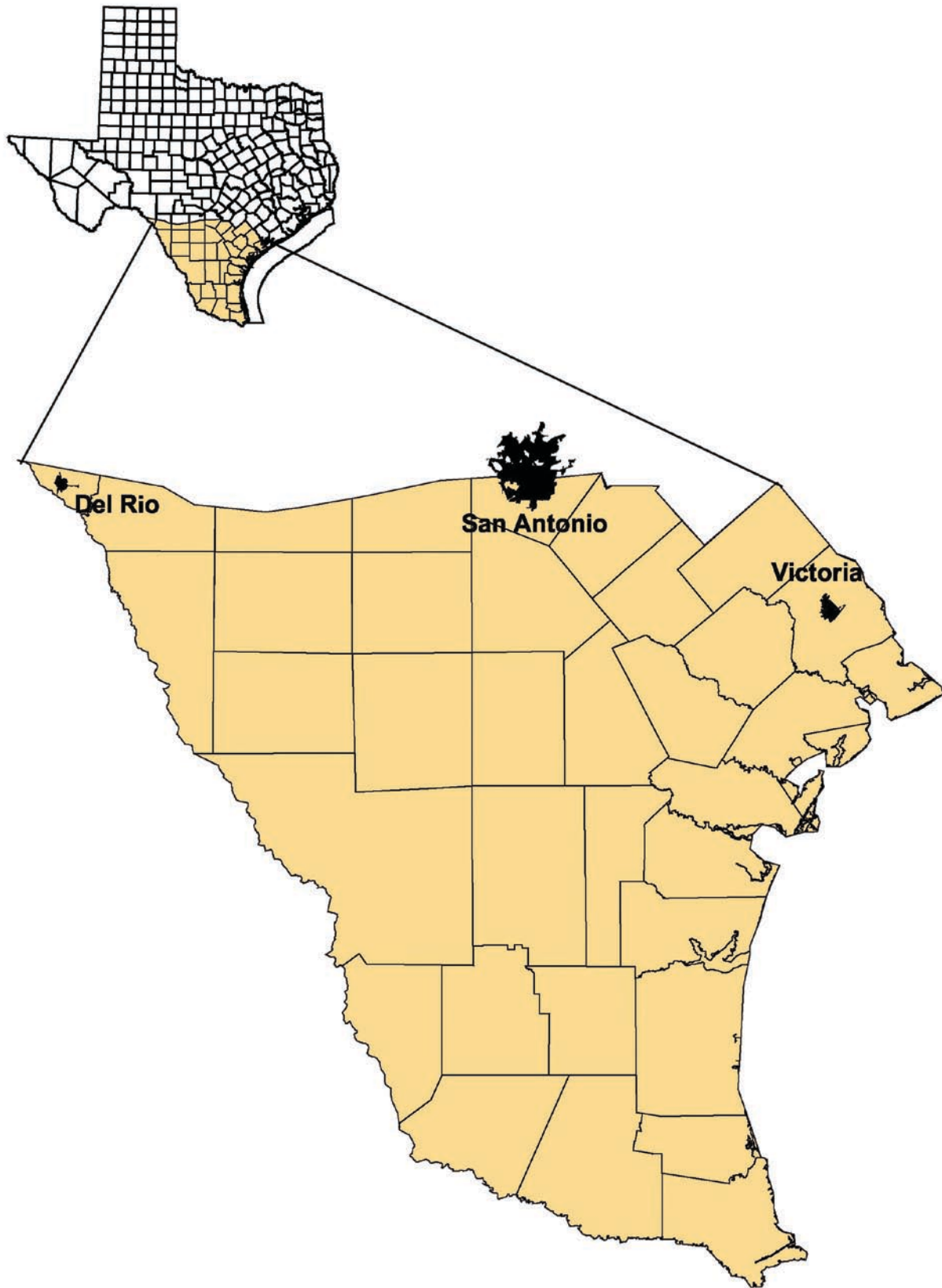


Figure 1. Map showing South Texas. Map data courtesy of Texas Natural Resources Information System, Texas Water Development Board, Austin, Texas.

Table 1. Biodiversity of South Texas in comparison with other regions in the United States.

Ecosystem	Area (mi²)	Plant Species	Vertebrate Species
South Texas			
Lower Rio Grande Valley National Wildlife Refuge ⁵¹	141	1,100	700
Other Regions Noted for Diversity			
Everglades National Park ⁵²	2,356	1,033	633
Hawaii Volcanoes National Park ⁵²	328	807	66
Yellowstone National Park ⁵²	3,468	1,151	328

value contributed by wildlife-related recreation; (3) the calming solitude of driving 95 miles from Orange Grove to Cotulla and only seeing a couple of ranch homes; and (4) the aesthetic and biological value of the longest stretch of undeveloped shoreline remaining (from Corpus Christi to Port Mansfield) in the contiguous United States. The economic importance to the region resulting from nature- and wildlife-related recreation likely approaches potential monetary benefits derived from “development.” We offer the following information in this publication describing what separates this remarkable region from others to help people understand the reasons why South Texas is so diverse and important.

Land Ownership Patterns

Habitat fragmentation is the separation of contiguous wildlife habitat into smaller and smaller pieces that may also be farther and farther apart. Creating a piecemeal of habitat patches subsequently renders it unsuitable for many wildlife species. Highways, urban development, cultivation, and numerous other human influences result in fragmentation of wildlife habitat. Habitat fragmentation is detrimental to wildlife because it isolates animals from some portion of their habitat that is essential for its survival, or it might isolate a species into populations that are too small to survive.

Habitat fragmentation also results from the conversion of large private land ownerships into smaller ownerships. Smaller land ownerships result in more roads, fences, houses, and other forms of human impact. Whereas, 80% of Texas’ farms and ranches are less than 500 acres,⁵ many of the last remaining large, contiguous ranches in the United States are in South Texas. Examples include the 825,000 acre King Ranch (Brooks, Jim Wells, Kleberg, Kenedy, Nueces, and Brooks counties) and the 500,000 acre Kenedy properties (Kenedy County). Habitat fragmentation is relatively uncommon in the Coastal

Sand Plain and the central and northwestern South Texas Plains because of the presence of large, undeveloped ranches used primarily for cattle grazing and wildlife recreation.

Environments and Soils

Precipitation and Evaporation

The extraordinary diversity of plants, wildlife, and habitats is partly driven by an environment that is quite variable and diverse among years and across the South Texas landscape. The coefficient of variation^A in precipitation in South Texas is about 35%, which is comparable to that of tropical deserts⁶ (Fig. 2). Across the region, annual rainfall averages 24.5 inches (years 1900–1983; Fig. 3). The wettest year during 1900–1983 was 1919 when the regional average was 40.8 inches. The driest year was 1917, when the regional rainfall average was 9.5 inches. During the years 1900–1983, 36% were drought^B years and 34% were wet^C years. The mean annual precipitation deficiency (mean annual rainfall minus mean potential evapotranspiration) ranges from negative 12 inches in the northeast (Victoria, DeWitt, and Gonzales counties) to negative 36 inches in the southwest portion of the region (Zapata and Starr counties) (Fig. 4). By comparison, mean annual precipitation deficiency in Brewster and Hudspeth counties in the heart of the Chihuahuan Desert of western Texas is only negative 24 inches. The high precipitation deficiency creates desert-like conditions in much of western South Texas.

^A The coefficient of variation is the sum of the average difference between yearly rainfall and annual average rainfall divided by the annual average rainfall and is expressed as a percent.

^B Drought is defined as a year when the rainfall is less than 90% of the median rainfall.

^C A wet year occurs when the annual rainfall is greater than 110% of the median rainfall.



Figure 2. Effects of variable rainfall in South Texas shown by the lack of herbaceous vegetation during a drought in 1984 (top) and the lush grass at the same location 9 months later (bottom). Photographs by Timothy E. Fulbright.

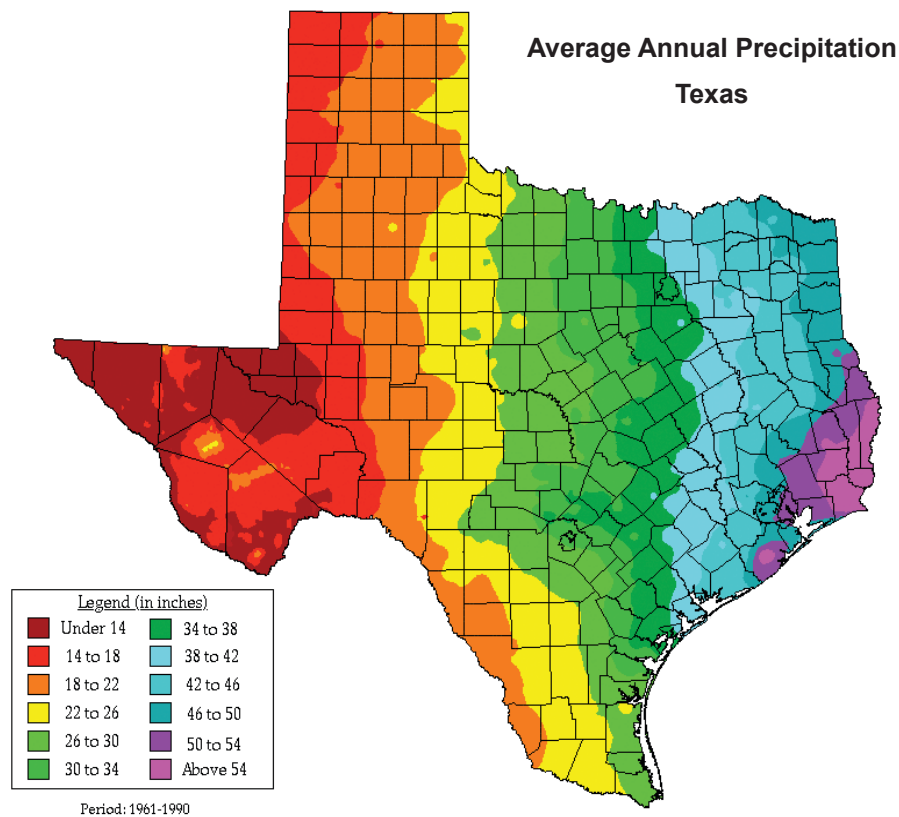


Figure 3. Average annual rainfall belts in Texas. Map courtesy of the Western Regional Climatic Data Center, PRISM Precipitation Maps 1961-90, www.wrcc.dri.edu/precip.html.

Temperature

South Texas has a subtropical subhumid-to-semiarid climate with high temperatures and infrequent killing frosts.⁶ The average annual air temperature in South Texas exceeds 70°F, which is comparable to southern Florida. In Webb County on the western side of South Texas, the average daily maximum temperature during July is 98.2°F and the average daily minimum in January is 55.2°F.⁷ Near the coast in Kleberg County, the average daily maximum temperature during July is slightly cooler (95.4°F) and the average daily minimum in January is slightly warmer (57.5°F).⁸ Only 12 severe^D freezes have been recorded at Brownsville, Texas, between 1878 and 2001 with the most recent episodes occurring in December 1983 and 1989.⁹ Severe freezes damage native woody plants, but are not sufficiently severe to kill most native species.^{9,10}

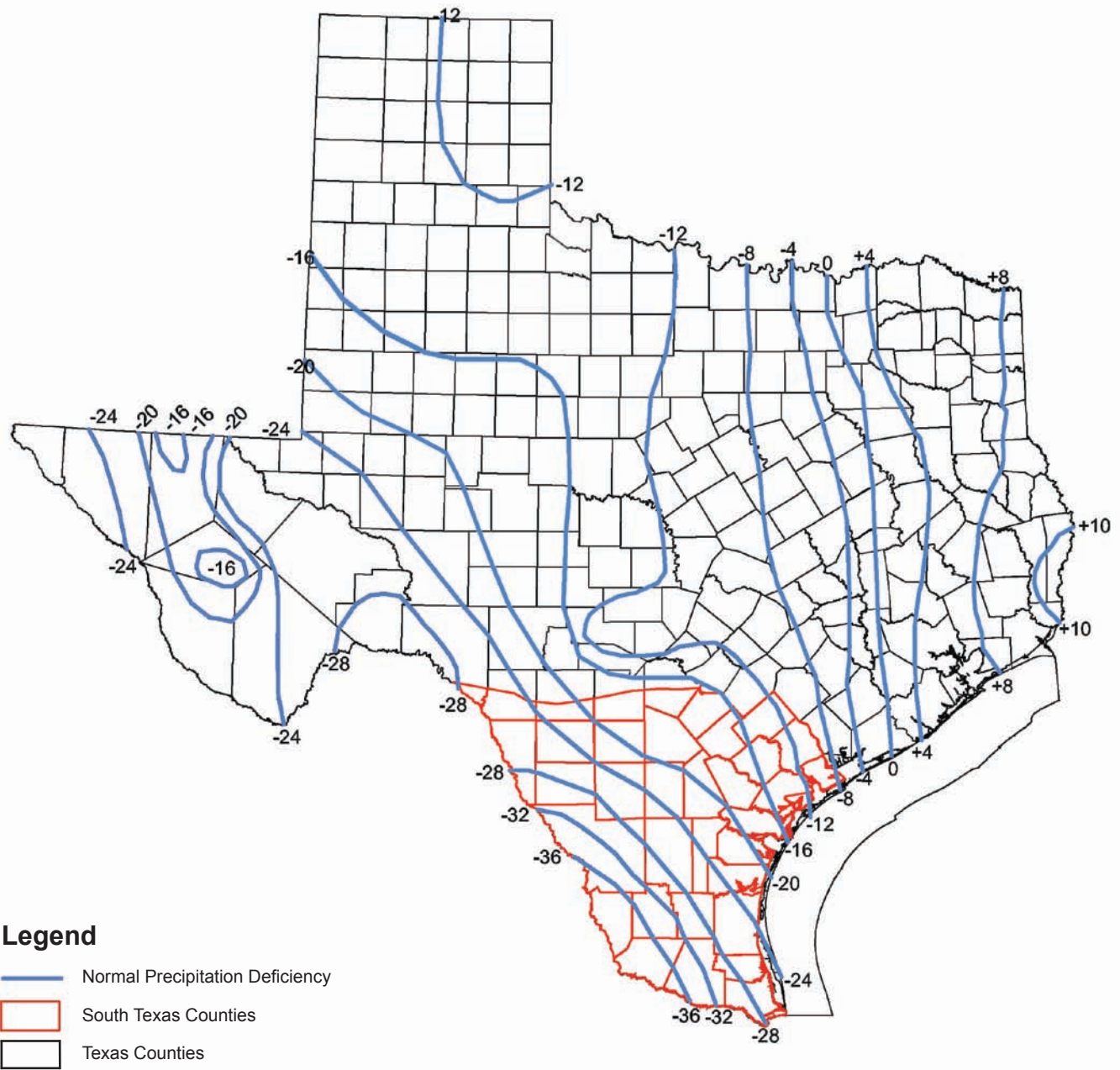
The extremely warm temperatures in South Texas have a profound impact on the ecology of plants and animals. Woody plants, which characterize the “Brush Country” of the western Rio Grande Plains, play a keystone role in the region’s ecology by moderating

the thermal environment beneath their canopies. The “microenvironment” beneath woody plant canopies is essential to the reproduction of many plant and animal species in the region.

The effect of temperature on the life cycle of granjeno, a common shrub that is a valuable food and cover plant for wildlife, is a classic example. Germination of granjeno seeds is inhibited by the extreme soil surface temperatures (greater than 140°F) that prevail during summer in areas unshaded by woody plants.¹¹ However, cooler temperatures (about 104°F) in the shade beneath mesquite canopies break dormancy of granjeno seeds, allowing germination when temperature and moisture conditions are favorable. Hence, granjeno commonly grows in clumps beneath mesquite trees, rather than in more open habitats between mesquite canopies.

The cooler environment beneath woody plant canopies enables the 2 most popular game species in South Texas to survive the long, hot summers. During summer, more than 52% of the habitat space available to northern bobwhite quail is unusable because surface temperatures are too warm.¹² Dense woody cover is extremely important for survival of quail because it provides shade and cooler temperatures for these birds.

^D Freeze episodes with temperatures below 17°F.



Legend

- Normal Precipitation Deficiency
- South Texas Counties
- Texas Counties

Figure 4. Normal precipitation deficiency (inches) in South Texas (1931-1955). Modified from Texas Agricultural Extension Service, Texas Agricultural Experiment Station. Not dated. Rainfall Belts in Texas. Publication L-232, 2 pp.

Dense woody cover is also critical for white-tailed deer. This species commonly feeds primarily at night during summer to avoid the excessive heat load generated during daytime by the intense South Texas sun.¹³ During daytime, white-tailed deer remain bedded in the relatively cool shade beneath the canopy of larger woody plants such as honey mesquites.

Soils

Soils in South Texas cover the entire spectrum of particle sizes, ranging from coarse sands of the Ingleside Prairie to fine montmorillonitic clays of the lower Coastal Prairie (Fig. 5). The Coastal Sand Plain (Fig. 6) is characterized by deep, white-colored, aeolian fine sands. Active, blowing dunes occupy about 5% of the Coastal Sand Plain (Fig. 7). These dunes migrate across the landscape in the direction of the prevailing winds from southeast to northwest (Fig. 8) and create unique, “mini-desert” microhabitats that add to the diversity of the surrounding landscape.

Sandy loam soils are common in the western South Texas Plains. Many of the upland sandy loam soils in western South Texas have a reddish hue. The “red sands” are renowned for supporting productive wildlife habitat.

Saline soils of the Maverick, Montell, and Monteola soil series cover thousands of acres in western part of South Texas.¹⁴ These soils support plants such as Texas varilla and armed saltbush, which are known as “halophytes.” Halophytes are plants possessing unique characteristics that enable them to survive in the harsh environment of saline soils. For example, some halophytes exude excess salt on the surface of their leaves to prevent too much salt from accumulating inside the leaves. Leaves of succulents such as Texas varilla swell because they absorb water to prevent salt from becoming too concentrated in their tissues.

The Bordas Escarpment (Fig. 6) consists of shallow soils underlain by a thick layer of caliche. Oriented along a generally north to south axis, the rolling hills of the escarpment bisect South Texas. The thin soils of the escarpment are high in calcium and support a diverse and unique assemblage of woody plant species. These soils are not amenable to cultivation, but support native plants that provide excellent wildlife habitat.

A great variety of soil types can exist in just one locale, as illustrated by a ranch in Dimmit County (Fig. 9). The variety of soils and the resulting variety of habitat types that are found in relatively small geographic areas within South Texas are major factors affecting the high species diversity of plants and animals in this region.

Habitat Diversity

Habitats—Where East Meets West

Driven by variability in soils, precipitation, and temperature, South Texas has a mixture of subtropical, eastern deciduous forest, and Chihuahuan desert plant and animal species. Different mixtures of plant species create an array of communities ranging from wetlands to sand dunes, and from grassland to oak woodland and semiarid shrubland. In fact, McLendon⁴ described 10 distinct vegetation associations and 29 different plant communities in South Texas exclusive of the Lower Rio Grande Valley and Coastal Wetlands (Fig. 10).

Laguna Madre—A Pristine Wetland

The Laguna Madre of South Texas and Laguna Madre del San Antonio in northern Mexico together form 1 of only 2 hypersaline lagoonal areas in the world of significant size.¹⁵ The biologically diverse Laguna Madre of South Texas is critical to saltwater fisheries and terrestrial vertebrates (Fig. 11). The Texas Laguna Madre System provides more than 50% of the total annual state catch of bay fishes.^{16,17} Laguna Madre supports 79% of the seagrasses along the Texas Coast.¹⁸ Seagrasses play a critical role in the reproductive cycles of many estuarine fish and invertebrates by providing refuge or habitat during at least part of their life cycle. The spectacular bird life of shorebirds, wading birds, and waterfowl is intrinsically linked to this rich saltwater ecosystem.

Based on estimates of seagrass distribution, recreational value, and commercial fishery harvests the economic value of the seagrass beds is at least \$12.6 million annually.¹⁸ This ecologically and economically valuable resource is sensitive to disturbance by human activities. Reduced water clarity caused by maintenance dredging is the suspected cause of loss of about 54 square miles of seagrass cover in the lower Laguna Madre between 1965 and 1988.¹⁹ Completion of the Gulf Intracoastal Waterway in 1949 improved water exchange with the Gulf of Mexico, resulting in moderation of salinity in Laguna Madre. The reduced salinity resulted in a 46 square mile increase in seagrass meadows in the upper Laguna Madre, but it also caused a change in composition of the seagrasses. For example, shoalgrass covered 82% of the lower Laguna Madre in 1965 compared to 33% in 1988.²⁰

Freshwater Wetlands—Rain-fed Oases

Spiny aster and longtom paspalum are common dominant plant species of periodically inundated areas in eastern South Texas.²¹ Coontail, water nymph, water stargrass, wigeongrass, sago pondweed, and muskgrass

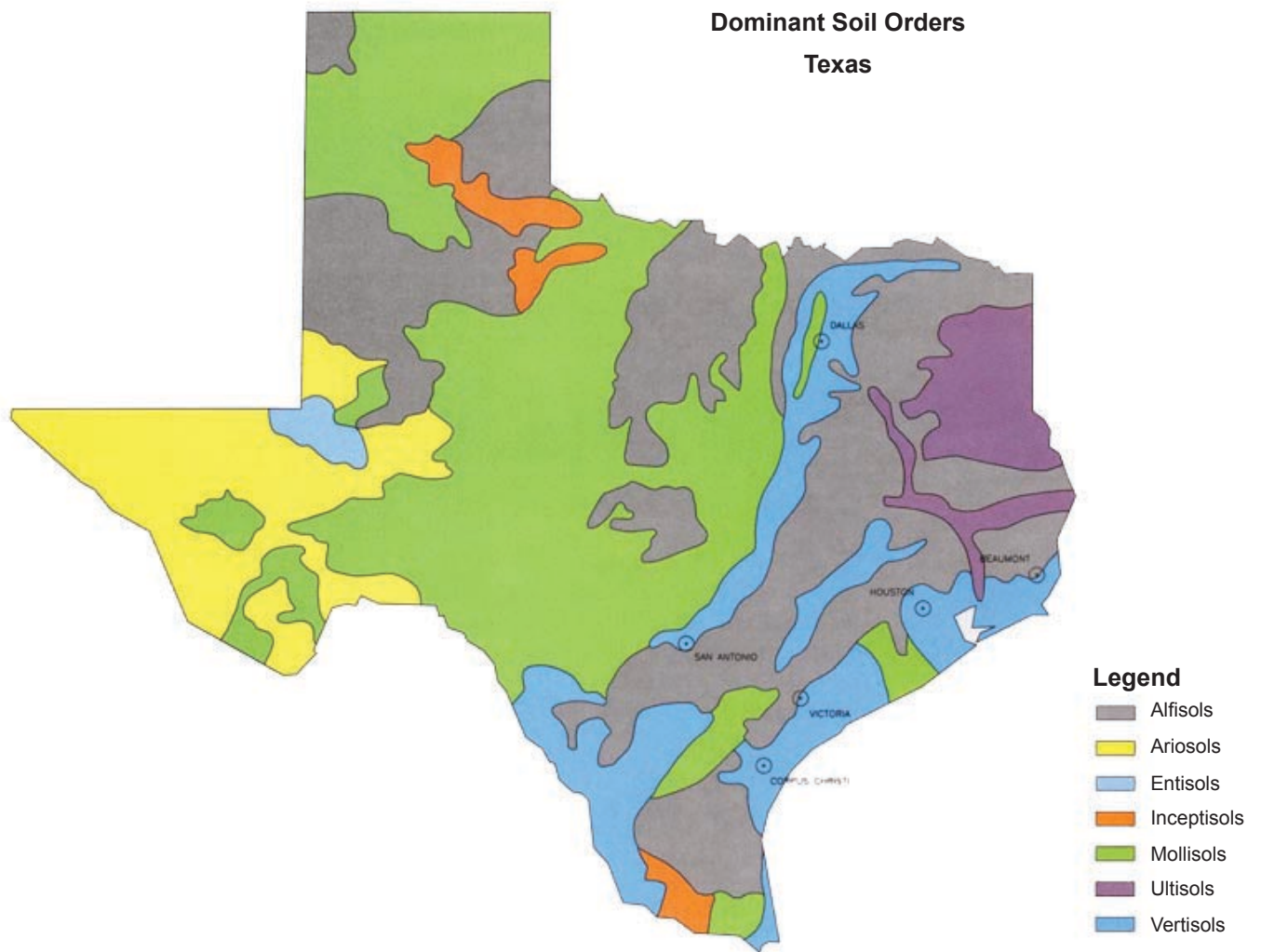


Figure 5. Dominant soil orders of Texas. Courtesy of Natural Resources Conservation Service, National Cartography and Geospatial Center, Fort Worth, Texas.

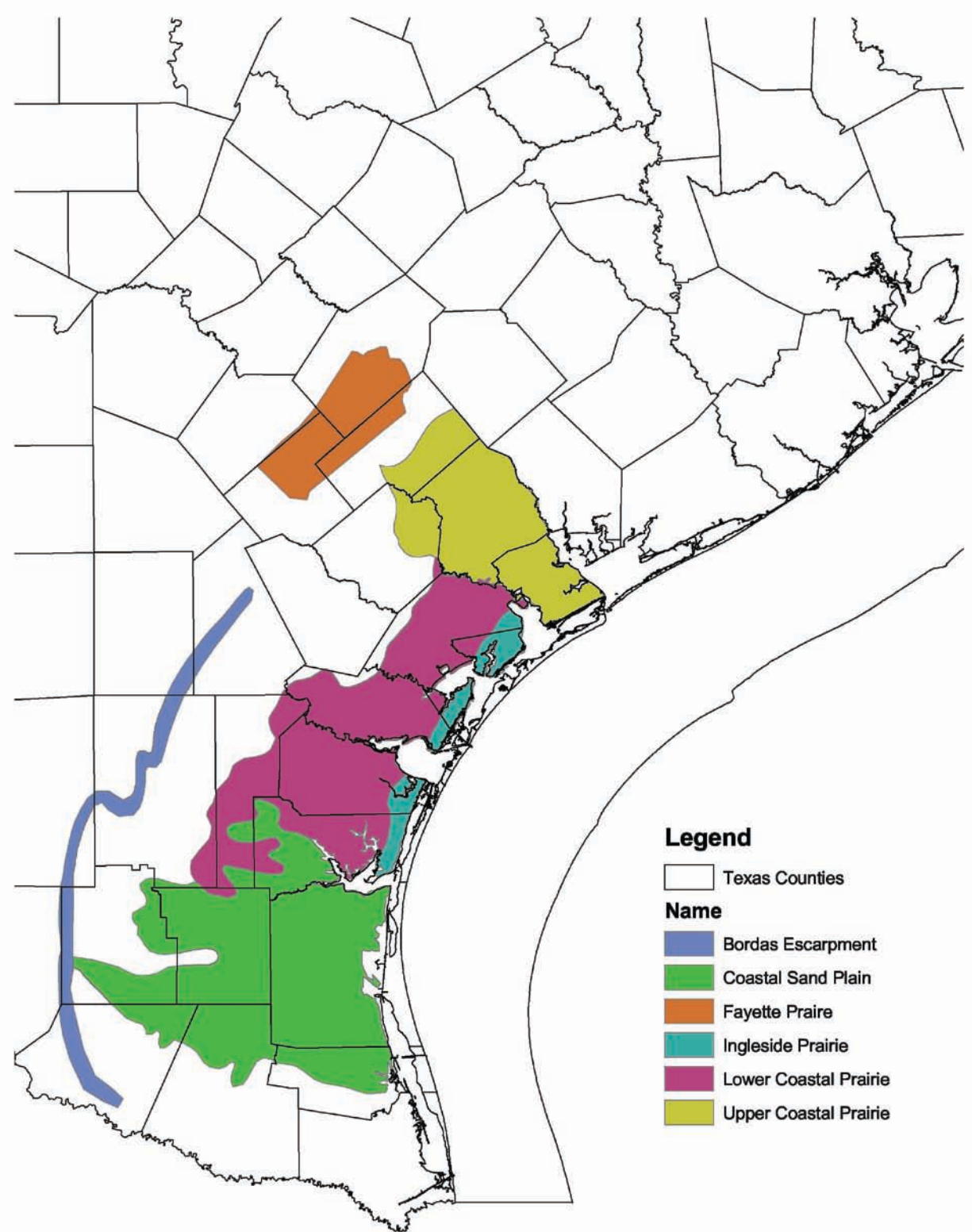


Figure 6. Coastal Sand Plain, Bordas Escarpment, and Prairies of South Texas. Adapted in part from www.texascenter.org/almanac/Land/4.2.MAPECOLOGY.HTML and F. E. Smeins, D. D. Diamond, and C. W. Hanselka, 1991, Coastal Prairie, Chapter 13 in *Natural Grasslands* (R. T. Coupland, editor), Elsevier, Amsterdam. County data courtesy of Texas Natural Resources Information System, Texas Water Development Board, Austin, Texas.



Figure 7. Active sand dunes create unique microhabitats in the Coastal Sand Plain. Photographs by Timothy E. Fulbright.

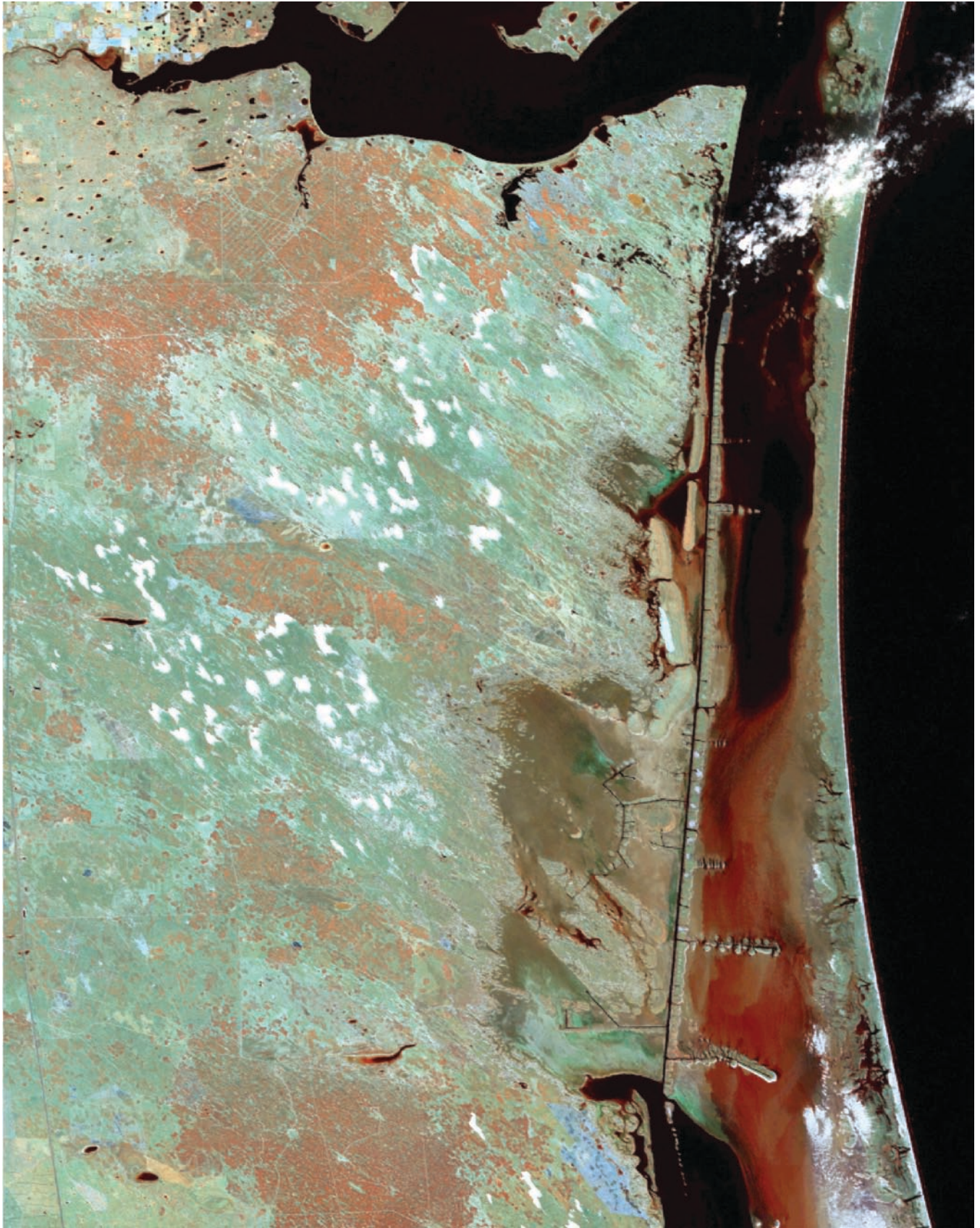


Figure 8. Sand dunes migrate across the Coastal Sand Plain from southeast to northwest. Landsat 7 enhanced thematic mapper pan-merged satellite image acquired December 18, 2000.

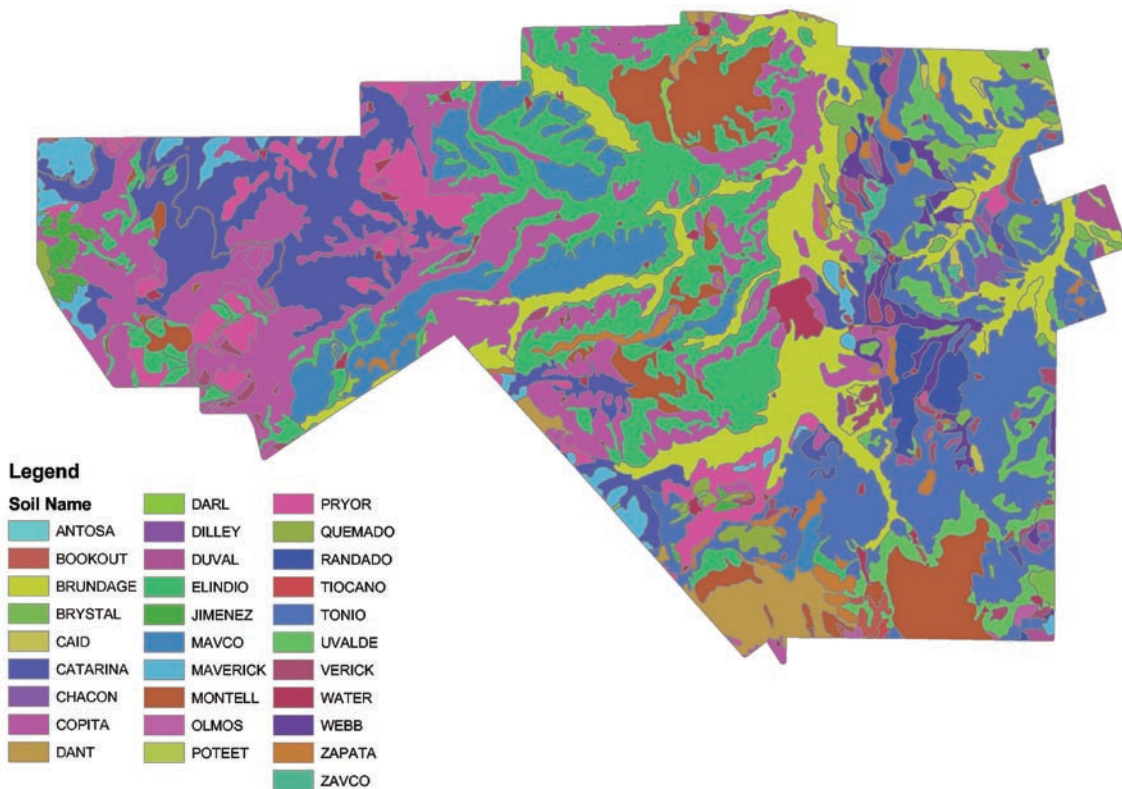


Figure 9. Soils of a ranch in Dimmit County, Texas. Modified from J. W. Stevens and D. Arriaga, 1985, Soil survey of Dimmit and Zavala counties, Texas, U.S. Department of Agriculture, Soil Conservation Service, U.S. Government Printing Office, Washington, D.C. 161 pp.

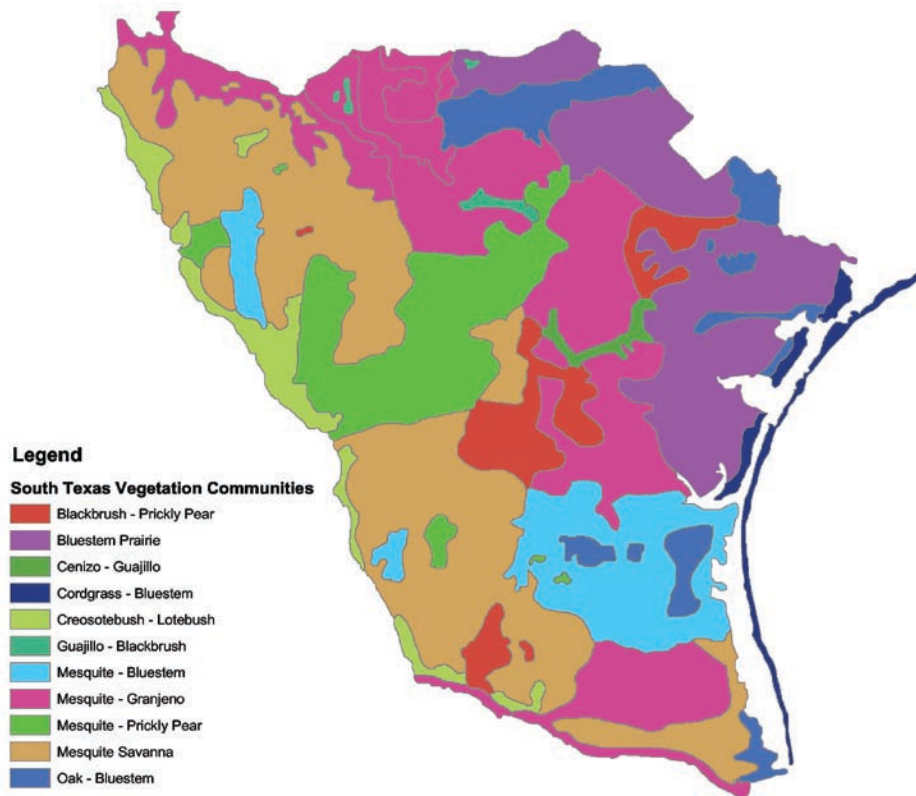


Figure 10. Map of broad-scale plant communities in South Texas. Modified from T. McLendon, 1977, Texas A&I University, Kingsville, Texas, unpublished.



Figure 11. Wading birds are attracted to South Texas wetlands. Photograph by Hugh Lieck.

are common aquatic plants in submerged freshwater communities of ponds and lakes. Floating-leaved plants include lotus and other species of Nymphaeaceae. Bulrushes, cattails, and sedges dominate marsh edges. Edges of lakes and ponds support stands of longtom and clubhead cutgrass.

Prairies— What the Spanish Conquistadores Saw

Prairies are a vanishing vegetation type in Texas. Much of the original Shortgrass Prairie in the Texas Panhandle has been converted to farmland. Natural vegetation of the Blackland Prairie, Coastal Prairie, and Fayette Prairie has been almost completely lost to cultivation and development.²² Less than 5% remains of the original Tallgrass Prairie that once extended from Oklahoma south through the eastern half of Texas to the Gulf Coast.

South Texas is rich in native prairies (Fig. 6) with at least 8 distinct native prairie types, including the Fayette Prairie, upper Coastal Prairie, lower Coastal Prairie, Ingleside Prairie (Fig. 12), Kenedy Sand Prairie (Fig. 13), Bluestem-Sacahuista Prairie, Sea Oats Prairie (Fig. 14), and Southern Cordgrass Prairie.^{4,23,24} The Fayette Prairie is similar to the Blackland Prairie, which is dominated by little bluestem.²³ The Fayette Prairie originally paralleled the Coastal Prairie extending southwest almost to the Frio River. The lower Coastal Prairie is dominated by

little bluestem and four-flowered trichloris and extends from Kleberg County northward to the San Antonio River where it merges with the upper Coastal Prairie.^{4,25} The Ingleside Prairie lies along the Laguna Madre from Refugio County to the mouth of Baffin Bay. The portion of the Ingleside Prairie between Corpus Christi and the mouth of Baffin Bay remains largely intact. Dominant grasses of Ingleside Prairie are seacoast bluestem, switchgrass, and fringeleaf paspalum.²³

The Kenedy Sand Prairie, found in the region extending from the mouth of Baffin Bay south to Willacy County and west to Jim Hogg County, is the largest remaining, intact prairie in Texas. Seacoast bluestem is the prevailing dominant plant species, with gulfdune paspalum dominating in swales and moderately drained flats in the eastern part of the region.²⁶

The Bluestem-Sacahuista Prairie occurs in a belt from 50–150 miles inland along the Gulf Coastal Plain.²⁴ Dominant species include little bluestem, seacoast bluestem, and gulf cordgrass (Fig. 15). The barrier islands off the southern coast of Texas support the Sea Oats Prairie, which is dominated by seacoast bluestem, sea oats, and gulfdune paspalum. The Southern Cordgrass Prairie is found in a narrow band adjacent to the Gulf Coast in both freshwater and brackish marshes. Dominant plant species include smooth cordgrass and marshhay cordgrass.



Figure 12. The Ingleside Prairie. Photograph by Timothy E. Fulbright.



Figure 13. The Kenedy Sand Prairie in the Coastal Sand Plain. Photograph by Timothy E. Fulbright.



Figure 14. The Sea Oats Prairie. Photograph by Timothy E. Fulbright.



Figure 15. Gulf cordgrass. Photograph by Timothy E. Fulbright.

Shrublands— Plant Diversity Par Excellence

There are 6 shrubland associations in South Texas.⁴ The mesquite-granjeno association is the major shrubland association in eastern and central South Texas. Poorly drained soils support an association dominated by huisache and pricklypear. An association of stunted mesquites and pricklypear characterizes saline or sodic soils. The caliche hills of the Bordas Escarpment, which extends from Starr County north and eastward to the Nueces River, are dominated on top by the guajillo-ceniza association and on the upper slopes by the blackbrush acacia-twisted acacia association (Fig. 16). The creosotebush-pricklypear association found in western South Texas is the driest vegetation association in the region. It contains numerous plant and animal species characteristic of the Chihuahuan Desert of western Texas and northern Mexico.

Woodlands— Forests Along Rivers and Streams

Woodlands found in riparian habitats in South Texas are dominated by sugar hackberry and huisache⁴ (Fig. 17). Other trees, which rise to dominant status depending on location, include eastern cottonwood, post oak, live oak, cedar elm, anaqua, mesquite, pecan, black hickory, shagbark hickory, Texas persimmon, Texas ebony, mustang grape, and muscadine.

Uplands are often veined with thin riparian areas known as ramaderos.²⁷ Ramaderos receive runoff water from adjacent uplands and support comparatively lush vegetation. These areas are critical nesting, feeding, and loafing areas for wildlife. Ramaderos also serve as corridors for animal movements providing a linking network with surrounding habitats. Thus, they are critical areas for maintaining biodiversity in the surrounding landscape. Sadly, more than 90% of the riparian habitat in South Texas has been cleared for agricultural or urban use. Conservation of remaining riparian areas is critical to prevent further loss of biodiversity.

Sandy soils in South Texas support live oak-post oak woodland.⁴ A post oak-live oak/little bluestem community is the major woodland community in a belt south of San Antonio in the northeastern portion of South Texas. A live oak-mesquite/seacoast community occupies parts of the Coastal Sand Plain interspersed within the Kenedy Sand Prairie.

Wildlife Diversity

Birds— The Spectacular Display

The Coastal Plain of South Texas lies along the safest migration route for many North American migratory bird species²⁸ (Fig. 18). More than 80% of 332 species of

long-distance North American migrants travel through the Texas Coastal Bend.²⁹ The Gulf of Mexico forms a barrier for many bird species, which migrate from forests and grasslands of northern and eastern North America and circumnavigate the Gulf of Mexico by funneling along the Coastal Plain between the arid South Texas Plains to the west and the Gulf of Mexico to the east.^{29,30} South Texas is frequently visited by migrants that cross the Gulf of Mexico in the fall, but use the land mass on their return in the spring.³¹

Woodlands of the Coastal Plain are critically important, serving as resting and gathering areas where forest birds rebuild fat reserves before continuing migratory flight. Preservation of these woodlands is a high priority because woodland reduction along the migratory route of birds that pass through South Texas will potentially reduce populations of these species in North America.³² Live oak mottes of the Coastal Sand Plain are also important staging habitat for species migrating along the Coastal Plain corridor. At least 39 species of migrants, including 18 warbler species, have been recorded in live oak mottes.²⁸

Large numbers of migrating hawks funnel through South Texas. More than 300,000 broad-winged hawks, the bulk of the North American population, annually migrate from breeding grounds in the eastern United States and Canada south, and converge along coastal South Texas in their trek to wintering areas in central and south Mexico.³³ Raptors on the Texas threatened species list that migrate through South Texas include the swallow-tailed kite, common black-hawk, zone-tailed hawk, and peregrine falcon. The endangered aplomado falcon also migrates through South Texas.

Laguna Madre is one of the most important wintering areas and migratory stopover points for waterfowl and shorebirds in the United States and is listed by the Center for Conservation Sciences as one of the Western Hemisphere Reserve Network Sites for the migration of shorebirds. About 80% of the North American redhead duck population winters in Laguna Madre.³⁴

During winter, redheads feed almost exclusively on shoalgrass rhizomes, even though other vegetation is available.³⁵ To demonstrate the importance of shoalgrass, when wild celery disappeared from Chesapeake Bay, redheads abandoned the area rather than switching to an alternative food source. This lack of flexibility in food choice during winter emphasizes the need to protect this vital food source in Laguna Madre. A substantial decline of shoalgrass in Laguna Madre has occurred during the past 4 decades. Up to 60% of the shoalgrass has been lost or replaced by other species of seagrass, such as



Figure 16. Ceniza is a dominant plant species on the caliche soils of the Bordas Escarpment. Photographs by Timothy E. Fulbright.



Figure 17. Riparian areas called ramaderos provide critical nesting, feeding, and loafing areas for wildlife. Photograph by Timothy E. Fulbright.

manateegrass, that have less value as waterfowl food.³⁶ All aquatic vegetation has disappeared from some areas where shoalgrass was once common. Increased turbidity from dredging, damage by boats, and decreased salinity in Laguna Madre are possible reasons for the decline.

Shoalgrass and other seagrasses in Laguna Madre are also important for wading birds. Availability of senescent seagrass that can be used for shelter and concealment may influence site use and ultimately survival of wintering piping and snowy plovers.³⁷ About 55% of the piping plover population winters on the Texas Coast. Piping plovers are listed as a threatened species both federally and by Texas. Other sensitive shorebirds found in South Texas include the “Interior” population of the least tern (endangered on federal and state lists) and sooty tern (threatened on Texas’ list).

Laguna Madre also is home to the State and federally endangered brown pelican. Three other waterbirds on the State threatened list use Laguna Madre and freshwater inland ponds—the reddish egret, white-faced ibis, and wood stork. The most famous of the waterbirds that migrates to South Texas is the endangered whooping crane.

South Texas is a critical breeding area for many bird species. The nation’s largest population of ferruginous

pygmy-owls (threatened on Texas’ list) occurs in Kenedy and Brooks counties.³⁸ South Texas is also home to the elf owl, screech owl, barn owl, and great-horned owl. The brown pelican, reddish egret, and white-faced ibis also breed in South Texas. Other birds on the Texas threatened species list that breed only in South Texas include the northern beardless-tyrannulet, rose-throated becard, Botteri’s sparrow, tropical parula, and white-tailed hawk.³⁹ Other unique birds of the South Texas brushland sought by birding enthusiasts include the green jay (Fig. 19) and groove-billed ani (Fig. 20).

South Texas is one of the last remaining strongholds for northern bobwhites. Populations of this popular gamebird have declined dramatically, particularly during the past 15 years (Fig. 21). In many southeastern states, scientists predict that native bobwhites will become rare. Habitat loss and land use changes that have made existing habitat unsuitable are probably major culprits in the decline of this species. In Texas, bobwhite populations have declined an average of 4.7% annually since 1981.⁴⁰ The decline in northern bobwhites has been smaller in South Texas than in the State as a whole, and much smaller than in the southeastern United States (Fig. 21). Maintaining good quality quail habitat in South Texas is essential to prevent loss of the species.



Figure 18. South Texas is the primary funnel for migratory birds in North America. Map ©WorldSat International, www.worldsat.ca, 2002—all rights reserved.



Figure 19. One of the more brilliantly colored bird species found in South Texas is the green jay. Photograph by Steve Bentsen.



Figure 20. South Texas brush communities are home to unique bird species such as the groove-billed ani. Photograph by Timothy E. Fulbright.

Trends in Northern Bobwhite Populations

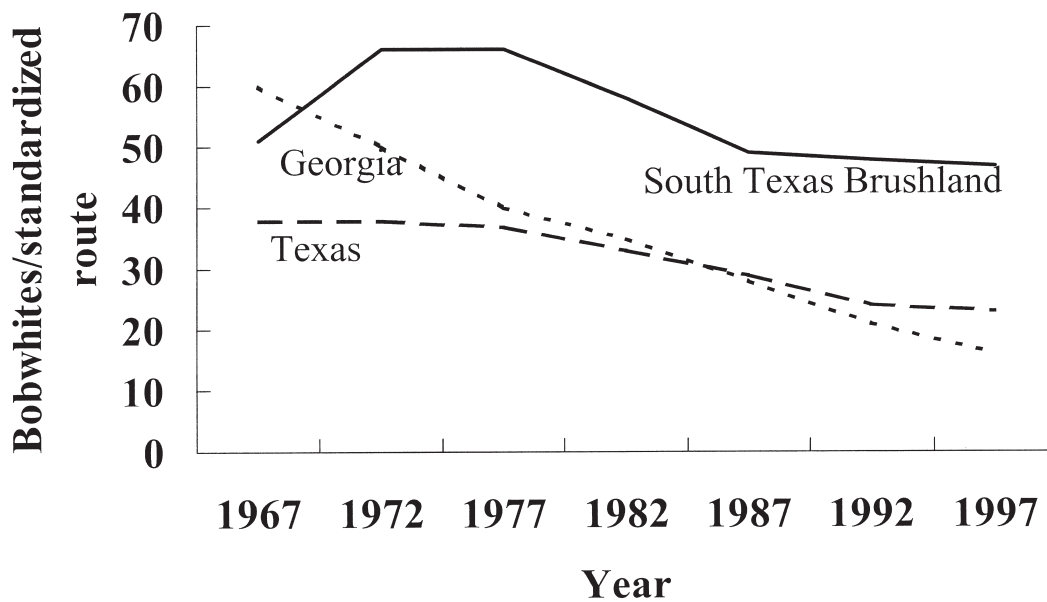


Figure 21. Northern bobwhite populations have declined less in South Texas than in the southeastern United States and Texas as a whole. Based on data from www.mbr.nbs.gov/bbs/htm/gf/tmp/02890.

Mammals—Revered Denizens of the Brasada (Brush)

South Texas is home to more than half the terrestrial mammal species found in Texas and is second only to the Trans-Pecos region in numbers of endangered vertebrates.¹ State listed threatened mammals in South Texas include the southern yellow bat, Coue’s rice rat, and white-nosed coati. Common carnivores include coyotes and bobcats, and mountain lions are scattered throughout the region. An occasional black bear, also on the State threatened species list, is seen in South Texas. South Texas is the nation’s last stronghold for the endangered ocelot, and perhaps for the jaguarundi, although no verified sightings have occurred since 1986. The pig-like javelina is common in the dense brush and cactus characteristic of much of South Texas (Fig. 22).

South Texas is renowned for producing trophy white-tailed deer (Fig. 23). Most deer hunting in the region is done on large private ranches. For example, 71% of the hunted deer range in Webb County is comprised of ranches larger than 5,000 acres.⁴¹ This land ownership pattern restricts hunter access and results in light hunting pressure and the ability to implement a very selective harvest of male white-tailed deer. Hunting is one of the primary driving forces that have encouraged landowners

to retain large tracts of habitat for white-tailed deer management rather than converting it to “improved pastures” for livestock. Certainly, “hunting equals habitat” in South Texas.

Reptiles and Amphibians—Delightful and Disdained

South Texas has 36 species of snakes and 19 species of lizards, 6 of which occur only in the region⁴² (Fig. 24), and is replete with threatened and endangered reptiles and amphibians. Six of 11 snakes and 2 of 4 lizards on the State threatened species list inhabit South Texas. Eight of 9 turtle species on the State threatened or endangered species list occur in South Texas. The threatened Texas tortoise occurs only in South Texas. The region has 19 species of toads and 3 species of salamanders. All frogs and toads and 2 salamanders on the State threatened list are found in South Texas.

Insects – The Most Diverse

According to information provided by the North American Butterfly Association, Texas has more butterfly species than any other state. The Lower Rio Grande Valley (Cameron, Hidalgo, Starr, and Willacy counties) alone has 293 butterfly species, which is more than the



Figure 22. The pig-like javelina with its tough hide and taste for eating pricklypear is well adapted to the thorny brush and cactus found in many areas of South Texas. Photograph by Timothy E. Fulbright.



Figure 23. The South Texas “Brush Country” is renowned for producing trophy white-tailed deer. Photograph by Timothy E. Fulbright.



Figure 24. Indigo snake. Photograph by Mike Stanfield.

4th ranked state, Colorado, with 266 species. Of the 293 butterfly species, 70 are found only in the Lower Rio Grande Valley.

Plant species diversity and butterfly diversity are intrinsically linked (Fig. 25). Caterpillars of native butterflies are highly host-specific. For example, lyside sulphur caterpillars subsist solely on guayacan and snout butterfly caterpillars feed specifically on granjeno. Reduction in diversity of native plants through extensive brush clearing, overgrazing, and other human impacts reduces diversity of butterflies.

Plant Diversity

There are 1,558 species of vascular plants in the Texas Coastal Bend region, within a mere 50–65 mile radius of Corpus Christi, Texas.⁴³ In the Lower Rio Grande Valley counties of Cameron, Hidalgo, Starr, and Willacy, there are at least 823 species and varieties of vascular plants excluding grasses.⁴⁴ The 281 species of woody plants and subshrubs found in South Texas include subtropical species such as anaqua, Texas ebony, and anacahuita; eastern deciduous forest species include red bay and yaupon; and Chihuahuan desert species include creosotebush, ceniza, and candelilla.⁴⁵ About 75% of endangered shrubs, 40% of endangered wildflowers, and half of the endangered cacti on the federal list for Texas are found in South Texas.

Vegetation in South Texas is extremely resilient. Periodic droughts may be of sufficient severity and duration that much of the land in the western Rio Grande Plains becomes barren of herbaceous vegetation (Fig. 2). When grasses disappear, ranchers turn to emergency feeds such as pricklypear. Cattle readily eat pricklypear when the spines are removed by burning (Fig. 26). Grasses and forbs quickly recover following adequate rainfall, bringing about a dramatic transformation from apparent “wasteland” to lush grassland (Fig. 2).

Value of Wildlife and Natural Landscapes

The Laguna Madre is of great economic value to South Texas. The “mother lake” supports \$225 million in annual revenue from sport fishing and recreational tourism.¹⁷ A large number of licensed fishing guides operate in the Laguna Madre, often charging daily fees of \$400–500 per boat (Fig. 27).

Wildlife-related recreation is extremely important to the economy of South Texas. In 1996, Texans spent \$1.18 billion on wildlife watching.⁴⁶ The Texas Coastal Bend is the richest birding area in the United States.³⁹ In 1996, the wildlife watching industry supported 29,071 jobs in Texas.⁴⁷ Creation of the World Birding Center at Mission is increasing public recognition of the economic importance of wildlife watching. The potential economic impact of preserving the unique habitats of South Texas



Figure 25. American snout butterfly. Photograph by Timothy E. Fulbright.



Figure 26. Cattle readily eat pricklypear when the spines are removed by burning. Photograph by Timothy E. Fulbright.



Figure 27. Sport fishing in Laguna Madre is of great importance to the economy of South Texas. Photograph by Timothy E. Fulbright.

is demonstrated by research at the 197-acre Audubon Sabal Palm Sanctuary at Brownsville. In 1990, visitors at the sanctuary spent an average of \$443 per person to travel to the sanctuary.⁴⁸ On the basis of total visits, the relatively small sanctuary generates \$1.28 million per year for the local economy.

Hunting is an extremely important source of income in South Texas. Texans spent \$1.4 billion on hunting in 1996, of which \$499 million were spent on trip-related expenditures and \$246 million on food and lodging.⁴⁷ The benefit to rural economies is significant. Lease fees charged by landowners for deer and quail hunting ranged from \$6–7/acre in Hidalgo County to \$18–25/acre in Zavala County in fall 1998.⁴⁹ In contrast to hunting, net income available for private landowners from rangeland livestock production was about \$2.63/acre.

Hunting and outdoor recreation potentially contribute more to land values than agriculture or urban development in many South Texas counties. The value of hunting and recreation as a percentage of the market value of land ranges from 1, 24, and 28% in the Lower Rio Grande Valley counties of Cameron, Willacy, and Starr, respectively, where most of the original brush has been lost to cultivated agriculture and urbanization, to 42, 56, and 63% in McMullen, Duval, and Dimmit counties in the “Brush Country,” respectively.⁵⁰ Based on traditional real estate appraisal definition, recreational use is the “highest and best use” of the land in Brooks, Dimmit, and Duval counties.

The value to humanity of unspoiled natural landscapes cannot be measured solely in economic terms. Natural landscapes unaltered by human hands have a soothing effect on many people. Millions who enjoy sightseeing, camping, and other activities seek the solitude and peace provided by natural landscapes. Natural views may block or reduce stressful thoughts.⁵³ Medical researchers have found that patients who are able to view natural landscapes require less medication than those confined to rooms with brick walls.⁵⁴ The benefits of open space are an intangible asset that is difficult to quantify on a monetary basis.

Human Population Trends

South Texas is bracketed on the north and on the south by regions of rapid human population growth (Fig. 28). The San Antonio Metroplex had a population of 1.6 million people in 1995 and experienced an increase in population greater than 16% from 1990 to 2000. The economy of the San Antonio region was healthy with a 4% jobless rate in 1997. In contrast, the Lower Rio Grande Valley is the poorest and most rapidly growing

border area in the United States (Figs. 28 and 29). The population south of a line from Webb County east to McMullen County, and eastward to Nueces County was 1.5 million in 1995. It is expected to increase to 2.6 million in 2020. Unemployment in the Lower Rio Grande Valley often exceeds 15%. In 1996, more than 50% of the population in Maverick, Dimmit, and Starr counties lived below the poverty line, compared to an average of only 18% statewide. Poverty, high unemployment, and a burgeoning human population in the South Texas border region will increasingly threaten habitat conservation.

Conclusion

Many Americans are greatly concerned about the loss of tropical rainforests and the resultant decline in biodiversity, yet on their doorstep lies a region that is equally deserving of attention and conservation with its incomparable diversity and countless unique and fascinating plant, animal, and insect species. Like the tropical rainforests, South Texas ecosystems remain relatively unstudied. For example, little was known about distributions, abundances, and basic ecology of bird species in the region of the Rio Grande Valley between International Falcon Reservoir and Del Rio (a distance of about 220 miles) until pilot studies began in 1997.³⁸ Furthermore, few detailed studies of plant communities have been conducted in South Texas. Future research may demonstrate that this region is even more diverse than we currently realize.

The drive for economic development and rapid human population growth presents profound challenges for conservation of the Last Great Habitat. Because virtually all land in South Texas is privately owned, incentives are needed that enable landowners to retain ownership and keep the habitat in an unfragmented condition. These incentives might include conservation easements and tax breaks for wildlife conservation or business ventures focused on outdoor recreation. Government programs should reward landowners for good stewardship of threatened and endangered species on their property and not penalize them as certain federal laws currently do. If we choose to “develop” the Last Great Habitat, we will lose a resource vital for our economy and essential for our health and well being. Our hope is that political and community leaders will recognize that the best strategy for economic improvement in South Texas is good stewardship of its diverse and valuable natural resources coupled with wise management of population growth.

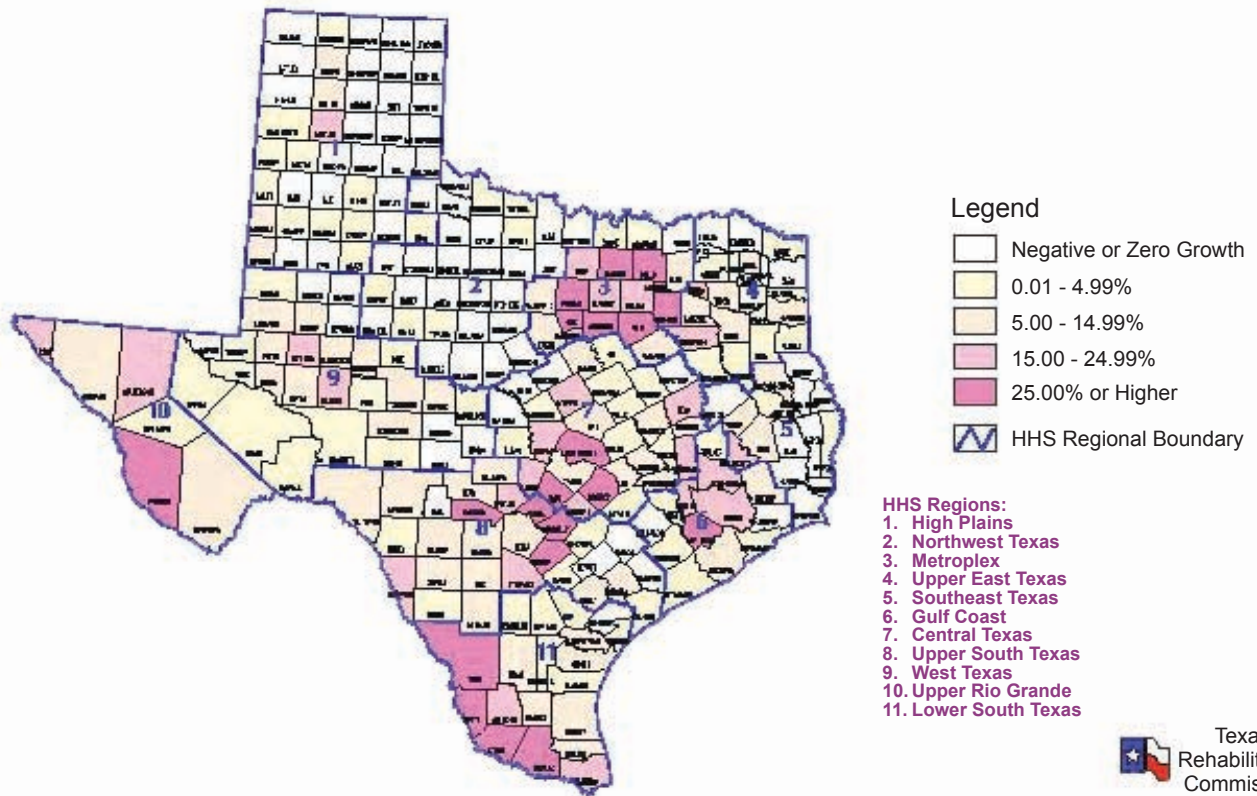


Figure 28. Projected rate of Texas population growth 2001-2010. Courtesy of Texas Health and Human Services Commission, www.hhsc.texas.gov/research/maps.html.



Figure 29. The popularity of game species such as northern bobwhites and wildlife watching provides impetus to conserve wildlife habitat in the face of human population growth. Photograph by Winnie Stanfield.

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Appendix 1. List of common and scientific names of plants mentioned in the text.

Common Name	Scientific Name
Anacahuita	<i>Cordia boissieri</i>
Anaqua	<i>Ehretia anacua</i>
Armed saltbush	<i>Atriplex acanthocarpa</i>
Black hickory	<i>Carya texana</i>
Blackbrush acacia	<i>Acacia rigidula</i>
Bulrush	<i>Scirpus</i> spp.
Candelilla	<i>Euphorbia antisiphilitica</i>
Cattail	<i>Typha</i> spp.
Cedar elm	<i>Ulmus crassifolia</i>
Ceniza	<i>Leucophyllum frutescens</i>
Clubhead cutgrass	<i>Leersia hexandra</i>
Coontail	<i>Ceratophyllum</i> spp.
Creosotebush	<i>Larrea tridentata</i>
Eastern cottonwood	<i>Populus deltoides</i>
Four-flowered trichloris	<i>Chloris pluriflora</i>
Fringeleaf paspalum	<i>Paspalum setaceum</i> var. <i>ciliatifolium</i>
Granjeno	<i>Celtis pallida</i>
Guajillo	<i>Acacia berlandieri</i>
Guayacan	<i>Porlieria angustifolia</i>
Gulf cordgrass	<i>Spartina spartinae</i>
Gulfdune paspalum	<i>Paspalum monostachyum</i>
Huisache	<i>Acacia smallii</i>
Little bluestem	<i>Schizachyrium scoparium</i>
Live oak	<i>Quercus virginiana</i>
Longtom paspalum	<i>Paspalum lividum</i>
Lotus	<i>Nelumbo lutea</i>
Marshhay cordgrass	<i>Spartina patens</i>
Mesquite	<i>Prosopis glandulosa</i>
Muscadine	<i>Vitis rotundifolia</i>
Muskgrass	<i>Chara</i> spp.
Mustang grape	<i>Vitis mustangensis</i>
Pecan	<i>Carya illinoensis</i>
Post oak	<i>Quercus stellata</i>
Pricklypear	<i>Opuntia lindheimeri</i>
Red bay	<i>Persea borbonia</i>
Sago pondweed	<i>Potamogeton pectinatus</i>
Seacoast bluestem	<i>Schizachyrium scoparium</i> var. <i>littoralis</i>
Seaoats	<i>Uniola paniculata</i>
Sedge	<i>Carex</i> spp.
Shagbark hickory	<i>Carya ovata</i>
Shoalgrass	<i>Halodule wrightii</i>
Smooth cordgrass	<i>Spartina alterniflora</i>
Spiny aster	<i>Leucosyris spinosa</i>
Sugar hackberry	<i>Celtis laevigata</i>
Switchgrass	<i>Panicum virgatum</i>
Texas ebony	<i>Pithecellobium flexicaule</i>
Texas persimmon	<i>Diospyros texana</i>
Texas varilla	<i>Varilla texana</i>
Twisted acacia	<i>Acacia schaffneri</i>
Water nymph	<i>Najas guadalupensis</i>
Water stargrass	<i>Heteranthera dubia</i>
Wigeongrass	<i>Ruppia maritima</i>
Wild celery	<i>Vallisneria americana</i>
Yaupon	<i>Ilex vomitoria</i>

Appendix 2. List of common and scientific names of mammals, birds, reptiles, and insects mentioned in the text.

Common Name	Scientific Name
American snout	<i>Libytheana carinenta</i>
Aplomado falcon	<i>Falco femoralis</i>
Barn owl	<i>Tyto alba</i>
Black bear	<i>Ursus americanus</i>
Bobcat	<i>Lynx rufus</i>
Botteri's sparrow	<i>Aimophila botterii</i>
Broad-winged hawk	<i>Buteo platypterus</i>
Brown pelican	<i>Pelecanus occidentalis</i>
Common black-hawk	<i>Buteogallus anthracinus</i>
Coue's rice rat	<i>Oryzomys couesi</i>
Coyote	<i>Canis latrans</i>
Elf owl	<i>Micrathene whitneyi</i>
Ferruginous pygmy-owl	<i>Glaucidium brasilianum</i>
Great-horned owl	<i>Bubo virginianus</i>
Green jay	<i>Cyanocorax yncas</i>
Groove-billed ani	<i>Crotophaga sulcirostris</i>
Indigo snake	<i>Drymarchon corais</i>
Interior least tern	<i>Sterna antillarum athalassos</i>
Jaguarundi	<i>Felis yagouaroundi</i>
Javelina	<i>Tayassu tajacu</i>
Lyside sulfur	<i>Kricogonia lyside</i>
Mountain lion	<i>Felis concolor</i>
Northern beardless tyrannulet	<i>Camptostoma imberbe</i>
Northern bobwhite	<i>Colinus virginianus</i>
Ocelot	<i>Felis pardalis</i>
Peregrine falcon	<i>Falco peregrinus</i>
Piping plover	<i>Charadrius melodus</i>
Reddish egret	<i>Egretta rufescens</i>
Redhead	<i>Aythya americana</i>
Rose-throated becard	<i>Pachyramphus aglaiae</i>
Screech owl	<i>Megascops asio</i>
Snout butterfly	<i>Libytheana carinenta larvata</i>
Snowy plover	<i>Charadrius alexandrinus</i>
Sooty tern	<i>Sterna fuscata</i>
Southern yellow bat	<i>Lasiurus ega</i>
Swallow-tailed kite	<i>Elanoides forficatus</i>
Texas tortoise	<i>Gopherus berlandieri</i>
Tropical parula	<i>Parula pitiayumi</i>
White-faced ibis	<i>Plegadis chihi</i>
White-nosed coati	<i>Nasua narica</i>
White-tailed deer	<i>Odocoileus virginianus</i>
White-tailed hawk	<i>Buteo albicaudatus</i>
Whooping crane	<i>Grus americana</i>
Wood stork	<i>Mycteria americana</i>
Zone-tailed hawk	<i>Buteo albonotatus</i>

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