

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/299410467>

Chapter 2: Physical Features Influencing Vegetation in Texas

Data · March 2016

CITATIONS

0

READS

14

2 authors, including:



David Bezanson

The Nature Conservancy

16 PUBLICATIONS 12 CITATIONS

SEE PROFILE

Some of the authors of this publication are also working on these related projects:



Publication Preview Source Natural vegetation types of Texas and their representation in conservation areas [View project](#)

Chapter 2: Physical Features Influencing Vegetation in Texas

Texas ranks among the most important states in biological diversity, and first among all states in the number of vascular plant species, with more than 4,300 (Hatch et al. 1990). The diversity of Texas is evident in its vegetation types which range from temperate and subtropical forests to grasslands, shrublands, deserts, and marshes.

Only a brief summary of the varied geology of Texas is possible in this chapter. The Balcones Escarpment roughly bisects the state from northeast to southwest, following the irregular lines of mountain ranges formed in the Precambrian and the Ouachita Mountains uplifted during the Pennsylvanian. East and south of the escarpment is the Gulf Coastal Plain, a flat or rolling plain consisting of sedimentary formations created during the Mesozoic by riverine and shallow marine deposition in the Gulf of Mexico. In uplands of eastern Texas, these formations have weathered into sandy clays and sands supporting pine-hardwood forests or, where drier, oak woodlands. Geologically recent (mostly Pleistocene) formations nearer the Gulf coast are covered by a belt of nutrient-rich, often poorly drained clays that support prairies and marshes. In south-central Texas along the edges of the coastal prairies are formations of harder sandstone supporting oak savannas and, on the drier South Texas Plains, brush species such as acacias and cacti. Weathering of upper Cretaceous limestones in north-central Texas formed the nutrient-rich calcareous clays of the Blackland Prairies. West of the Balcones Escarpment, the geology is much more varied, with outcrops of Paleozoic shale, limestone, sandstone, chert, and dolomite (largely of shallow marine origin) occurring throughout western Texas; Precambrian exposures are limited to the Llano Uplift in central Texas and a few isolated areas in the Trans-Pecos. Lower Cretaceous limestones make up the Edwards Plateau and limestones and sandstones underlie the Cross Timbers; both regions are characterized by shallower soils than are found east of the Escarpment. The High Plains or Llano Estacado of northwestern Texas is a vast sedimentary plain of

material from the Rocky Mountains deposited in the Pliocene; stream erosion during the Pleistocene cut away the eastern edge of the plains, exposing the Permian and Triassic shales which extend eastward through the Rolling Plains. Semi-arid grasslands cover deeper soils in these regions, with shallower and rocky soils support woodlands or brush. West Texas is the most geologically diverse region of the state, with every geologic period represented. Near Marathon, the Ouachita range is exposed; ancient flooded basins on either side of the Ouachitas accumulated limestone deposits that were later uplifted to form the Guadalupe and other mountain ranges. Several other ranges were formed during the Rocky Mountain uplift period, which also exposed older materials. Extensive volcanic activity in the Eocene and Oligocene produced the Davis, Chisos, and other mountains (Sellards et al. 1932). Today, igneous-derived soils generally hold more available moisture than limestone surfaces, and grasslands in West Texas tend to occur at lower elevations on igneous formations (Gehlbach 1967). Active floodplains hold significant volumes of water and support forests or woodlands throughout Texas, even in the driest parts of the state.

Most of Texas is located in a warm-temperate climate zone, with average temperatures and length of growing season decreasing gradually from south to north. Mountainous areas of the Trans-Pecos produce local "islands" of cool-temperate climate, and the northwestern Panhandle (the High Plains) has a dry, cool-temperate climate with hot summers. Areas adjacent to the Gulf of Mexico, including the Gulf Coastal Prairies and South Texas Plains, are subtropical and freezing temperatures are infrequent in the southernmost counties of Texas (the Lower Rio Grande Valley). The average length of growing season ranges from 178 days in the northern High Plains to 341 days at Brownsville (Dallas Morning News 1994). Climatic variation, and corresponding change in vegetation, across the state is significant but gradual, except in West Texas where temperatures are influenced by local elevation (Bray 1906, Hatch et al. 1990).

Average annual rainfall decreases somewhat uniformly across Texas from east to west, ranging from 55-60 inches in Newton and Orange counties on the

Louisiana state border to 8 inches at El Paso. Annual rainfall exceeds potential evapotranspiration in eastern Texas, but evapotranspiration exceeds rainfall throughout the western half of the state. In all parts of the state, 50 percent or more of average rainfall falls during the warmest six months of the year. In West Texas and the High Plains, the wettest months are in summer; elsewhere in the state, rainfall typically peaks in spring and fall, and summer droughts are frequent.

Rainfall is probably the most obvious factor influencing the structure and composition of vegetation in Texas, with soil characteristics also of importance. The easternmost one-fourth of Texas receives more than 40 inches of annual rainfall and is almost entirely forested except for the grasslands that occur on tight clay soils near the Gulf coast. In east-central Texas, which receives roughly 30 to 40 inches of annual rainfall, the natural vegetation prior to Anglo-European settlement was a mosaic of tallgrass prairie on clay soils (the Blackland, Fayette, Coastal and Grand Prairies) and oak woodlands on sandy or sandy loam soils (the Post Oak Savanna and Cross Timbers). West of the 30-inch line, grasslands become increasingly important except on shallow rocky surfaces, which are dominated by brushy woodlands of oaks and junipers. Mesquite is a common invader on deeper soils within this zone, which includes the Cross Timbers, Lampasas Cutplain, Rolling Plains, and Edwards Plateau. The South Texas Plains are also mostly in this rainfall zone and are characterized by a mosaic of grasslands and savannas of thorn-laden brush species (mesquite, acacias, and numerous others). The western one-fourth of Texas is demarcated by the 20-inch rainfall line, which runs slightly to the east of Amarillo, Lubbock, San Angelo, and Del Rio. West of that line, shortgrasses and desert shrubs are often dominant and trees and taller grasses are restricted to more hydric habitats such as riparian corridors, deep sands, and mountains.

The Trans-Pecos region contains areas of higher elevation than the rest of Texas (to 8,700 feet) and stratification of vegetation following elevational gradients is evident; bands of grasslands, shrublands, and isolated forested areas occur at higher elevations. Microclimatic effects of slope and landscape position are also

influential, with north and east slopes of mountains supporting more mesophytic vegetation than south or west facing slopes (Gehlbach 1967). Sites at higher elevations and north-facing slopes usually receive more precipitation than surrounding areas and evapotranspiration is lower, so these habitats are not exceptions to the rule that rainfall strongly influences vegetation.

The extent of pre-European influence on the structure of vegetation is uncertain. Spain controlled Texas from the late sixteenth century until the early nineteenth century, but Spanish colonization was minimal; large-scale conversion of land for agricultural uses began after Anglo-European settlement and annexation by the United States in 1845. The population of Texas grew explosively in the late nineteenth century with the rise of the cattle industry and the settlement and cultivation of the grasslands. By the mid-twentieth century, farming and ranching operations occupied more than 80 percent of the land in Texas. During the twentieth century Texas ranked first among the fifty states in production of cotton, cattle, goats and sheep, and was among the leading producers of wheat, grain sorghum, rice, dairy products, poultry, and truck crops (Dallas Morning News 1994). Agriculture profoundly influenced the landscapes of Texas in many ways. Livestock grazing affects the largest land area, as cattle production is important in almost every county in Texas. In areas where cattle ranching is an important economic activity, population density may be relatively low and populations of wildlife are often high; thus, cattle ranching has relatively less impact on the landscape than many other economic activities. However, overgrazing can have very deleterious effects on vegetation and range condition. Rotation of livestock is necessary to assure the persistence of preferred grasses and forbs; many palatable native grasses (e.g. Texas bluegrass) have become rare as a result of intensive grazing. Severe overgrazing was practiced during the first years of the cattle industry in western Texas (1880-1910) and resulted in long-term degradation of range soils and a permanent loss of grass cover over large areas (Warnock 1970). Livestock may also have been instrumental in propagating or encouraging the spread of brush species such as mesquite, prickly pear, and junipers in

rangelands. The most dramatically altered landscapes of Texas, however, are now-cultivated areas of former grassland in the Blackland and Coastal Prairies, South Texas, and parts of the High Plains, as these areas have been almost completely (90 percent or more) converted to cropland and pasture to grow cotton, corn, sorghum, wheat, hay, and other crops.

Private ownership of land is highly valued by Texans. Many private landowners in Texas are strongly interested in practicing good land stewardship and wildlife management, but most Texans are not very knowledgeable about the state's natural vegetation, which has been extensively modified for several generations.