

DISTRIBUTION OF THE MALVACEÆ IN SOUTHERN AND WESTERN TEXAS¹

HERBERT C. HANSON

(Received for publication December 6, 1920)

INTRODUCTION

In connection with the eradication of the pink bollworm of cotton the writer was assigned the project of studying the distribution and abundance of the malvaceous plants in various parts of Texas. This work was done under the direction of Dr. W. D. Hunter, in charge of the pink-bollworm eradication work of the Federal Horticultural Board. The reason for making this survey was to determine if the malvaceous plants other than cotton were of importance in relation to the eradication of the pink bollworm (*Pectinophora gossypiella* Saunders). Throughout the entire survey no indication of the insect was found on any of the malvaceous plants other than cotton.

From June to December, 1918, and in June and November, 1919, the extreme southeastern section of the state, embracing Hardin, Jefferson, Liberty, Chambers, Galveston, and parts of Harris, Fort Bend, and Brazoria counties, were thoroughly scouted. In June, 1919, the vicinity of Hearne, 100 miles northwest of Houston, was examined. In June and July, 1919, the areas in the vicinity of Corpus Christi, San Antonio, and Pecos were studied. From January to June, 1919, and in August, 1919, a strip 20 to 80 miles wide on the Texas side of the Rio Grande from the Gulf of Mexico to New Mexico was scouted.

The species of Malvaceae found in the areas studied are discussed under the following life zones: 1. Semi-tropical Gulf Strip of the Lower Austral Zone; 2. Austroriparian Division of the Lower Austral Zone; 3. Lower Sonoran Division of the Lower Austral Zone; and 4. Upper Sonoran Division of the Upper Austral Zone.

I. SEMI-TROPICAL GULF STRIP OF THE LOWER AUSTRAL

The Semi-tropical Gulf Strip includes that part of Texas along the coast below the 100-foot contour line. This strip, involving approximately the Coast Prairie, is about 60 miles wide. It is divided into the Humid Section, the area east of the 97th meridian; and the Xerophytic Section, the area west of the 97th meridian.

¹ Published with the permission of the Secretary of Agriculture.

A. Humid Section

Topography: Usually low and flat with occasional low hills. Drainage is poor, so there is much marshy land. Adjacent to the coast is a strip of salt marsh, often several miles wide. *Soil:* Black clay chiefly. *Elevation:* Most of the area is below 100 feet; Beaumont 29 feet, Galveston 9 feet. *Rainfall:* The annual mean in the eastern part is over 50 inches and in

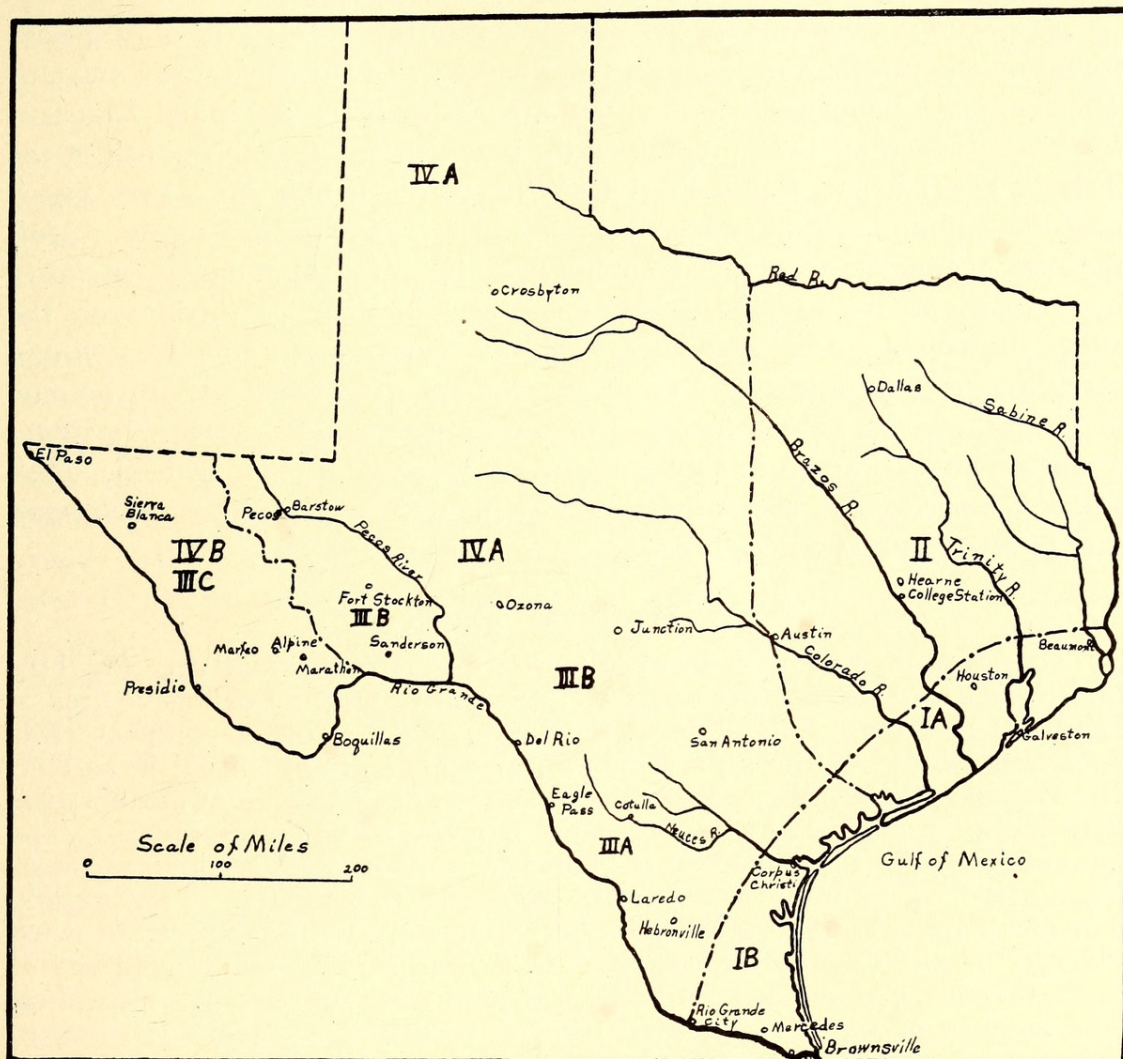


FIG. 1. Map of Texas, showing life-zones. I. Semi-tropical Gulf Strip: A. Humid Section, B. Xerophytic Section. II. Austroriparian. III. Lower Sonoran: A. Rio Grande Plain, B. Great Plains, C. Plateaus and mountains below 4000 feet. IV. Upper Sonoran: A. Great Plains, B. Plateaus and mountains above 4000 feet.

the western part about 35 inches; at Beaumont, 45.1 inches; at Galveston, 47.6 inches. *Temperature:* The mean annual temperature at Beaumont is 68° F., at Galveston 69.4° F. *Clear Days:* The percentage of clear days in 1918 at Beaumont was 38.8, at Galveston 28.8. *Humidity:* Very high, as is indicated by the abundance of Spanish moss (*Tillandsia* spp.) on trees.

Most of this section is open prairie characterized by such genera as *Rudbeckia*, *Oenothera*, *Sabbatia*, *Panicum*, *Baptisia*, *Eragrostis*, *Andropogon*, and others. From the east the Atlantic type of woodland is invading.

The most common and abundant species is *Pinus taeda*. Other common species are: *Quercus stellata*, *Q. michauxii*, *Pinus palustris*, *Taxodium distichum*, *Hicoria* spp., *Ulmus* spp., *Magnolia* spp., *Liquidambar styraciflua*, *Nyssa* spp., *Ilex* spp. From the southwest, *Parkinsonia aculeata*, *Prosopis glandulosa*, and *Vachellia Farnesiana* are invading. Characteristic of the salt marshes are species of *Spartina* and *Sporobolus*.

Nine wild malvaceous species were found in this area. The only species found on the prairie was *Callirrhoe involucrata*. In the fresh water swamps *Hibiscus lasiocarpus* was common and abundant, *H. militaris* and *Kosteletzkya althaeifolia* were infrequent. In the brackish marsh at the mouth of the Trinity River in Galveston Bay, *Kosteletzkya althaeifolia* grew very vigorously and abundantly, *Hibiscus militaris* and *H. lasiocarpus* rarely. *Malvaviscus drummondii* occurred commonly and often abundantly in fairly open woods along streams, lakes, bays, and in shrubby thickets on the edges of woods. *Sida spinosa* and *Malvastrum americanum* were found rarely in very open woods. No malvaceous plants were found in the pine or swamp forests. Four malvaceous weeds were found: *Sida rhombifolia* abundant and common in waste places, *S. spinosa* frequent in fields, *Malvastrum americanum* frequent in waste places, and *Modiola caroliniana* rare in low, moist, waste places.

B. Xerophytic Section

Topography: Low and flat, broken only by streams and very low hills and ridges. In the northern part of Cameron County an extensive area of sand dunes extends inland from the Gulf. *Soil*: Chiefly compact clay. *Elevation*: Most of the area is below 100 feet; Corpus Christi is 20 feet, Brownsville 38 feet, Mercedes 68 feet. *Rainfall*: The annual mean at the 97th meridian is about 35 inches, at the Rio Grande about 20 inches. The annual mean at Corpus Christi is 27 inches, at Brownsville 27 inches (maximum 60 inches, minimum 9 inches), at Mercedes 19.8 inches. *Temperature*: The mean annual temperature from Laredo to the Gulf is 73° F., at Brownsville 73° F., at Corpus Christi 70.0° F. *Clear Days*: The percentage of clear days in 1918 in Corpus Christi was 36, in Mercedes 12.1. *Humidity*: The amount of water evaporated from a free-water surface, according to Hill (9), is less than 60 inches annually.

Most of the Xerophytic Section is covered with chaparral vegetation. Woody species of the Leguminosae; mesquite (*Prosopis glandulosa*), huisache (*Vachellia Farnesiana*), mimosas, acacias, *Parkinsonia aculeata*, prickly pear (*Opuntia* spp.), *Leucophyllum texanum*, and others characterize this vegetation. Along streams and lakes, *Ehretia elliptica*, *Celtis pallida*, *Siderocarpus flexicaulis*, and large mesquites and huisaches are common. Dense clumps of the Mexican palm, *Sabal mexicana*, occur along the Rio Grande in the vicinity of Brownsville. A greater abundance of tropical vegetation is prevented from developing by the periodic freezes caused by "northers" in winter and by the aridity of the region.

Several of the malvaceous species found in this area were very rare, and

some had not been previously collected in the United States. *Abutilon incanum* was found commonly in the taller chaparral, in open woods, and as a weed in fields throughout the region. *A. berlandieri* occurred in the same habitats as *A. incanum*, but it was less abundant. *A. jacquini* was found only in small clumps, or scattered singly, in openings in the palm woods between Brownsville and the Gulf. Only one clump, composed of about 20 plants, of *A. pedunculare* was found, in a small opening in the palm woods below Brownsville. *A. triquetrum* formed large clumps in openings in the palm woods and was found rarely in mesquite and huisache woods within a few miles of Brownsville. A few plants of *A. wrightii* were found on the shell point extending into the bay between Portland and Corpus Christi. *Bastardia viscosa* was found in very limited numbers in only one locality, in prickly pear and mesquite on the shore of a lake east of Brownsville. *Callirrhoe digitata* occurred abundantly in low thickets in the vicinity of Corpus Christi. *Cienfuegosia sulphurea* was found commonly on low, moist, black clay soil in the vicinity of Corpus Christi, Taft, and Gregory. It appears to have spread considerably since Heller (8) found it at Corpus Christi in 1894, and Lewton (11) found it at Taft in 1910 after considerable searching. The thick, woody tap root of the plant makes it a persistent weed in low parts of cotton fields. *Hibiscus cardiophyllus* was found rarely in mesquite woods near Brownsville, rarely on the dry clay banks of the Arroyo Colorado near Harlingen, and rather frequently in the chaparral west of Harlingen. In places it is cultivated for its pretty red flower. *Malachra capitata* was found only in the Brownsville region, occurring rarely in openings in the palm woods, on the borders of the willow woods along the Rio Grande, and as a weed in fields. *Malva parvifolia* occurred very commonly and abundantly as a weed in towns of this section. *Malvastrum americanum* was found commonly in woods and as a weed in fields and yards. *M. spicatum* was found frequently in open woods, on the edges of woods, and as a weed from Brownsville to Mission. In very open woods of mesquite, huisache, and Texas ebony along a lake near Brownsville, *M. americanum* and *M. spicatum* were the dominant plants under and between the trees. *M. wrightii* was common and abundant in open mesquite and as a weed along fences and roads in the vicinity of Corpus Christi. *Malvaviscus drummondii* was very abundant and common in the palm woods and in thickets along the Rio Grande and in the woods near Corpus Christi. It is often cultivated for its odd red flower and red berry-like fruit. *Modiola caroliniana* was found very rarely in low, moist, open places near Brownsville. *Sida angustifolia* and *S. spinosa* were found infrequently as weeds in fields and in open woods. *S. ciliaris* was found in open woods and as a weed in fields and lawns from Riviera to Gregory. *S. filiformis* and *S. diffusa* were found frequently in open mesquite woods and in openings from Brownsville westward. *S. hastata* occurred commonly as a weed in towns and in open chaparral from Brownsville westward. *S. cuneifolia* was found abun-

dantly in this region on sandy ridges near Point Isabel. One plant of a form of *Sphaeralcea lobata* was found in a vacant yard near Brownsville. No other specimens of this western species were found east of the Pecos River. *Wissadula lozani* was common in open woods and as a weed along roads in the vicinity of Corpus Christi and from Brownsville westward. *W. periplocifolia* was found abundantly in openings and along the edges of palm woods, and frequently in other woods in the vicinity of Brownsville only.

II. AUSTRORIPARIAN DIVISION OF THE LOWER AUSTRAL

Area: The part of Texas east of the 98th meridian and north of the Semi-tropical Gulf Strip. *Topography:* Chiefly prairie, low rolling hills in places. *Soil:* The soil varies considerably from sand to clay. There are large areas composed of heavy, black clay soil. *Elevation:* From about 100 feet in the southern part to about 1000 feet in the northwestern part; at College Station 308 feet, at Dallas 512 feet. *Rainfall:* The annual mean in the eastern part is over 50 inches, in the western part about 35 inches; the annual mean at College Station is 37.5 inches, at Dallas 38.0 inches. *Temperature:* The mean annual temperature at College Station is 67.9° F., at Dallas 66.4° F. *Clear Days:* The percentage of clear days in 1918 at College Station was 34.3, at Dallas 44.7. *Humidity:* The evaporation from a free-water surface, according to Hill, is less than 50 inches annually for the division.

As only one locality, the vicinity of Hearne in the southern part of this section, was scouted, no attempt is made at listing all the malvaceous species that occur in the entire section. The low, red, sandy clay hills in the vicinity of Hearne are covered with oak forest, and the wide river bottom of the Little Brazos River, consisting of black clay loam, supports a forest of hickories, oaks, magnolias, elms, sycamores, and others.

Malvaviscus drummondii was found commonly, but not abundantly, in the bottom-land forest and in thickets on the borders of this forest. *Callirhoe involucrata* occurred abundantly and commonly in woods, in waste places, along roads, and in clearings in this locality. *Sida diffusa* was very rare as a weed in waste places. *Modiola caroliniana* occurred very commonly and abundantly as a weed in low, moist waste places. The largest and best developed *Modiola* plants found in Texas were in Hearne.

III. LOWER SONORAN DIVISION OF THE LOWER AUSTRAL

A. The Rio Grande Plain

Area: The Rio Grande Plain comprises the area bounded by the Gulf Coast Strip, by the Rio Grande, and by a line drawn from Del Rio to San Antonio to the Gulf Coast Strip near Corpus Christi. It is separated from the Great Plains to the north, between San Antonio and Del Rio, by the Balcones Fault Escarpment. The rocks north of this escarpment were lifted up relatively to those south of it. *Topography:* Marked by flat silt plains, sandy plains, low sandy hills, arid clay hills, and ridges of coarse gravel. The surface is more hilly and broken in the western and northern

parts than near the Gulf. The Rio Grande flows through a broad, sometimes terraced, valley from Del Rio to the Gulf. *Elevation*: From about 100 feet where the area borders the Gulf Coast Plain to about 1,000 feet at the Balcones Escarpment; at Del Rio 952 feet, at San Antonio 701 feet, at Eagle Pass 800 feet. *Rainfall*: The annual mean ranges from 20 to 25 inches over most of the area; Del Rio 21.0 inches, San Antonio 26.8 inches, Eagle Pass 20.9 inches. *Temperature*: The mean annual temperature at Del Rio is 69.6° F., at San Antonio 70.3° F., at Eagle Pass 71.1° F. and from Laredo to the Gulf 73.0° F. *Clear Days*: The percentage of clear days in 1918 at Del Rio was 57.0, at San Antonio 50.9, at Eagle Pass 50.9. *Humidity*: According to Hill, the mean annual evaporation from Rio Grande City to Eagle Pass is 50–60 inches, from Eagle Pass to Del Rio 60–65 inches.

On the level plains mesquite is dominant. Other important species associated with it are *Condalia obovata*, huisache in the moister areas, *Quercus virginiana*, and others. Grasses and many herbs of tropical affinities characterize the sandy plains in the southeastern part. Great Plains grasses and herbaceous species are common in the northwestern part. On the dry hills and ridges, prominent chaparral plants are *Covillea tridentata*, *Acacia* spp., *Parkinsonia texana*, and *Leucophyllum texanum*. The great variety of cacti and yuccas in the western part of the region indicates a greater degree of xerophytism. Along the Rio Grande hackberries, hickories, elms, sycamores, and huisaches are conspicuous.

Abutilon incanum was found frequently in this region in the woods along the Rio Grande, in mesquite chaparral on the plains, on rocky and gravelly hills, and as a weed along roads. *A. berlandieri* was rare in the woods along the Rio Grande and in mesquite woods along creeks. *A. wrightii* was frequent on rocky hillsides. *Callirrhoe digitata* was abundant in mesquite chaparral in the vicinity of Del Rio and San Antonio. *C. involucrata* occurred frequently in grassy valleys and plains from Laredo west and north. *C. lineariloba* was found only on the sandy, grassy plains in the vicinity of Hebronville. *Gayoides crispum* grew abundantly on exposed rocky slopes, mesquite-covered clay slopes, and stream banks in the vicinity of Laredo and westward. *Hibiscus cardiophyllus* was frequently found in mesquite chaparral on clay hills, on sand and gravel hills, and on rocky cliffs along the Rio Grande as far west as the vicinity of Del Rio. *H. coulteri* was found frequently on rocky hillsides along the Rio Grande in the vicinity of Del Rio. The region about Del Rio appears to be the eastern limit of *H. cardiophyllus*. *Malvastrum americanum* occurred frequently as a weed in towns and fields and in woods in valleys. *Malvaviscus drummondii* was very abundant in the mesquite woods along streams in the vicinity of San Antonio, but rare in the Rio Grande Valley. *Modiola caroliniana* was found infrequently as a weed in low, moist places in the vicinity of San Antonio. *Malva parviflora* was a very common and abundant weed in waste places throughout the region. *Sida cuneifolia* was found commonly in the sandy plain and on sandy hills from Hebronville to

Laredo. *S. angustifolia* occurred frequently in valleys and as a weed in fields from the Gulf Coast Strip to Laredo and Cotulla. *S. diffusa* and *S. filiformis* were common on rocky and gravelly hills, on dry clay hills, on plains, and in valleys throughout the region. *S. hastata* occurred commonly in valleys, on plains, and on rocky and sandy slopes, and as a weed along streets. *Sphaeralcea cuspidata* was found abundantly in sandy, loamy, and clay soil in valleys and as a weed along irrigation ditches and in fields from Eagle Pass westward. *S. hastulata* was abundant on the sandy plain and in gravelly places south of Hebronsville. *S. pedatifida* was frequent on sandy and gravelly slopes from Laredo to Cotulla and Eagle Pass.

B. The Great Plains

Area: The Great Plains includes the area from the Balcones Fault Escarpment between Del Rio and San Antonio west to the mountains in Trans-Pecos Texas and northwest throughout Texas. The portions of this area below 4,000 feet belong to the Lower Sonoran; the areas above 4,000 feet belong to the Upper Sonoran. *Topography:* The southern part is dissected into rugged hills and deeply eroded ravines and canyons. The area west of the Pecos River is more elevated and rougher than the area east of it. The northern part is generally quite flat. *Elevation:* 1,000 to over 4,000 feet; at Junction 2,180 feet, at Barstow 2,573 feet, at Fort Stockton 3,050 feet, at Plainview, near Crosbyton, 3,370 feet. *Rainfall:* For most of the area the mean annual precipitation is from 15 to 20 inches. At Junction it is 25.1 inches, at Barstow 11.1 inches, at Fort Stockton 15.1 inches, at Crosbyton 21.0 inches. *Temperature:* The mean annual temperature at Junction was 65.4° for 1918, at Barstow 64.5°, at Fort Stockton 64.0°, at Crosbyton 59.7°. *Clear Days:* The percentage of clear days at Junction in 1918 was 59.0, at Barstow 64.4, at Fort Stockton 44.2, at Crosbyton 59.7. *Humidity:* The mean annual evaporation, according to Hill, ranges from 60 to 80 inches per year throughout the region.

The southern part of this region is a sparsely wooded area, the northern part a short-grass area. Characteristic plants of the southern part are mesquite, *Acacia* spp., *Mimosa* spp., hackberries, pecan, oaks, piñon pine, mountain cedar, *Covillea*, cacti, yucca, and agaves. The bald cypress (*Taxodium distichum*) finds its western limit in this region.

Abutilon incanum was found frequently in wooded valleys, in rocky ravines, and on rocky slopes from Ozona to Fort Stockton and southward through the area. *Abutilon wrightii* was found frequently on rocky slopes and cliffs in the southern part of the region. *A. texense* was rare in open mesquite in valleys from Ozona to the Pecos River, and in the shade of mesquites in the depressions on the plains near Barstow. *Callirrhoe digitata* was abundant in thickets along the lower part of the Devils River. *C. involucrata* was common and abundant in woods and in openings in valleys from Del Rio to Ozona and Sheffield. *Disella lepidota* was abundant in slight depressions in the plains in the vicinity of Pecos. *Gayoides crispum* was found frequently in rocky situations in the southern part. *Hibiscus cardiophyllus* was rare on rocky banks of the Rio Grande near Del Rio.

H. coulteri occurred frequently on rocky hillsides and cliffs along the Rio Grande. *Malva parviflora* was a common weed in waste places in towns. *Pavonia lasiopetala* was found in only one place, in a dry, rocky ravine near New Braunfels. *Sida diffusa* and *S. filiformis* occurred commonly in sandy and rocky places, in chaparral, and on the open plains from the Rio Grande to Pecos. *S. hastata* was frequent in woods, open plains, in rocky places, and as a weed in waste places throughout the region. *Sphaeralcea cuspidata* was frequent in sandy to clay soil in valleys and on low plains and as a weed in fields from the Rio Grande to Pecos. *S. lobata* was found commonly as a weed along irrigation ditches at Pecos and at Barstow. *S. subhastata* was a common weed adjoining fields near Pecos.

C. Trans-Pecos Plateau and Mountains below 4000 feet

Area: Extends from the Great Plains on the east to New Mexico on the west and from the Rio Grande to New Mexico on the north. This area belongs to three climatic zones: the Lower Sonoran below 4,000 feet, the Upper Sonoran above 4,000 feet, and the Transition on the highest peaks of the Davis and Guadalupe mountains. *Topography:* This is an area of low mountains separated by plains and basins that have been formed mostly from the *débris* derived from the erosion of the mountains and by lava flows. Most of the mountains are broad and somewhat flat. *Soil:* In many arid and semi-arid localities "caliche" is a characteristic formation. "Caliche" is a deposit of lime formed by the evaporation of waters carrying calcium carbonate. This forms the "cap rock" of the high plains. *Elevation:* In the Rio Grande Valley near Boquillas the elevation is about 1,500 feet. The highest elevation is 8,690 feet, on El Capitan in the Guadalupe Mountains near the New Mexican line. At Fort Davis the elevation is 5,000 feet, at El Paso 3,762 feet. *Rainfall:* The annual mean for most of the region is from 9 to 20 inches; at Fort Davis it is 17.4 inches, at El Paso 9.8 inches. *Temperature:* The annual mean temperature at El Paso is 62.9°. *Clear Days:* The percentage of clear days at El Paso in 1918 was 56.4. *Humidity:* The mean annual evaporation for this region, according to Hill, is 70-90 inches.

In the Rio Grande Valley, willows, cottonwoods, mesquite, and screw-bean (*Strombocarpa pubescens*) are important species. On dry plains and slopes, yuccas, agaves, numerous cacti, *Dasyllirion* spp., *Nolina* spp., *Fouquieria splendens*, *Covillea tridentata*, low mesquites, shrubby acacias, and mimosas are abundant. Open short-grass plains separate the mountains in the vicinity of Alpine and Marfa. On higher slopes, in the Upper Sonoran Zone, *Pinus edulis*, *Juniperus* spp., and *Quercus* spp. compose the chief elements of the vegetation.

Abutilon incanum and *A. parvulum* were found rarely, *A. wrightii* frequently, on rocky slopes in this area. *A. malacum* was abundant on rocky hillsides and mountain sides along the Rio Grande from Boquillas to El Paso and in the vicinity of Balmorhea. *Hibiscus denudatus* var. *involutellatus* was frequent from Boquillas and Marathon throughout the Big Bend to El Paso on rocky slopes. *H. coulteri* was found in similar

situations, but ranged east to the Great Plains. *Malva parviflora* occurred rarely as a weed in towns. *Disella lepidota* was common along the Rio Grande in the Big Bend. *Disella hederacea* was common in somewhat alkaline soil along the Rio Grande at El Paso and at Indio in the Big Bend. *Sida hastata* occurred generally but not abundantly in valleys throughout the region. *S. diffusa* and *S. filiformis* were common in their usual wide range of habitats. *Gayoides crispum* was found frequently on rocky slopes in the Big Bend and in the Davis Mountains. *Sphaeralcea cuspidata* was found abundantly in the Rio Grande Valley from Boquillas to El Paso, and infrequently in the valleys to the north. *S. lobata* was abundant in rocky and sandy soil near El Paso, and rare at Ruidosa in the Big Bend. *S. incana* was rare below 4,000 feet, but it was seen in sandy soil near the Rio Grande at El Paso. *S. subhastata* was rare at the base of mountain slopes in sandy clay soil at Shafter and Sierra Blanca. *S. tenuipes* was found in abundance on rocky mountain sides at El Paso and Sierra Blanca. *Sida longipes* was rare on rocky mountain sides near Sanderson. *S. tragiaefolia* was common in rocky valleys at Boquillas.

IV. THE UPPER SONORAN

The higher portions of the Great Plains, already discussed under the Lower Sonoran, are included in the Upper Sonoran. As very little of the Upper Sonoran plains were scouted, this area is not treated in detail. The Trans-Pecos Plateau and Mountains above 4,000 feet are included in the Upper Sonoran. The physiography, climate, and vegetation of this area were described in the preceding section.

Hibiscus denudatus var. *involutellatus*, *H. coulteri*, *Abutilon incanum*, *A. malacum*, *A. wrightii*, *A. parvulum*, *Gayoides crispum*, *Sphaeralcea cuspidata*, *S. lobata*, *S. incana*, *Sida hastata*, *S. diffusa*, and *S. filiformis* were found in this zone in locations as described in the preceding section. *Wissadula holosericea* was frequent on rocky slopes near Balmorhea, in the Davis Mountains, and near Alpine. *Sphaeralcea tenuipes* was abundant on the mountain sides near El Paso. *S. pumila* was frequent in sandy soil on lower mountain slopes near the lower limit of this zone at El Paso. *Malvastrum elatum* occurred frequently in sandy and rocky soil from Alpine and the Davis Mountains to El Paso. *M. coccineum* was rare on the sandy plain near Alpine. A few plants of *Disella sagittaeifolia* were found as weeds in a yard at Alpine. *Sida tragiaefolia* was rare on rocky slopes near Alpine. *S. longipes* was rare on rocky slopes from Sanderson to Marathon. *S. neomexicana* was frequent on rocky slopes near Limpia Canyon in the Davis Mountains.

TABLE I. *List of Malvaceous Species, Native and Introduced, Collected in Texas, with Notes on Habitat, Occurrence, and Zones*

Species	Habitat	Occurrence	Zones
<i>Abutilon berlandieri</i> Gray	Woods, open chaparral, weed in fields. Somewhat xerophytic. Native.	Corpus Christi, Brownsville, Laredo, Uvalde.	Semi-tropical, L. Sonoran.
<i>A. incanum</i> (Link) Sweet	Woods, open chaparral, rocky hillsides, mountain sides, weed in fields. Fairly xerophytic. Native.	Corpus Christi, San Antonio, Austin, Brownsville, El Paso.	Semi-tropical, L. Sonoran, U. Sonoran.
<i>A. jacquini</i> Don.	Palm woods. Mesophytic. Native.	Brownsville.	Semi-tropical.
<i>A. malacum</i> S. Wats.	Rocky hillsides and mountain sides. Very xerophytic. Native.	Boquillas, Balmorhea, El Paso.	L. Sonoran, U. Sonoran.
<i>A. pedunculare</i> H. B. K.	Palm woods. Mesophytic. Native.	Brownsville.	Semi-tropical.
<i>A. texense</i> T. & G.	Valleys and plains. Xerophytic. Native.	Ozona, Barstow.	L. Sonoran, U. Sonoran.
<i>A. triquetrum</i> (L.) Presl.	Palm woods, very rare in mesquite and huisache. Mesophytic. Native.	Brownsville.	Semi-tropical.
<i>A. wrightii</i> Gray	Rocky hillsides and mountain sides. Rare in valleys. Xerophytic. Native.	Corpus Christi, San Antonio, Laredo, Marfa, Balmorhea.	Semi-tropical, L. Sonoran, U. Sonoran.
<i>A. parvulum</i> Gray	Rocky hillsides and mountain sides. Xerophytic. Native.	Western Texas.	U. Sonoran.
<i>Althaea rosea</i> Cav.	Introduced as a decorative plant.	Throughout Texas.	Semi-tropical, Austroriparian, L. Sonoran, U. Sonoran.
<i>Bastardia viscosa</i> (L.) H.B.K.	Among mesquite and prickly pear. Mesophytic. Native.	Brownsville.	Semi-tropical.
<i>Callirrhoe digitata</i> Nutt.	Woods and thickets. Mesophytic. Native.	Corpus Christi, San Antonio, Del Rio.	Semi-tropical, L. Sonoran.
<i>C. involucrata</i> (Nutt.) Gray	Prairies and woods. Mesophytic. Native.	Hearne, Galveston, Laredo, Sheffield.	Semi-tropical, L. Sonoran, U. Sonoran, Austroriparian.
<i>C. lineariloba</i> (T. & G.) Gray	Sandy soil. Mesophytic. Native.	Hebronville.	L. Sonoran.
<i>Cienfuegosia sulphurea</i> (St. Hil.) Garcke	Moist black soil. Mesophytic. Native.	Corpus Christi, Taft.	Semi-tropical.
<i>Disella hederacea</i> (Dougl.) Greene	Alkaline soil. Xerophytic. Native.	Along Rio Grande from El Paso to Presidio.	L. Sonoran.
<i>D. lepidota</i> (Gray) Greene	Plains and along streams. Xerophytic. Native.	Along the Rio Grande in the Big Bend, Pecos.	L. Sonoran.
<i>D. sagittaeifolia</i> (Gray) Greene	Weed along streets. Xerophytic. Native.	Alpine.	U. Sonoran.

TABLE I (Continued)

Species	Habitat	Occurrence	Zones
<i>Gayoides crispum</i> (L.) Small	Rocky hillsides and mountain sides, in woods along creeks. Xerophytic. Native.	Laredo, Davis Mts., Big Bend.	L. Sonoran, U. Sonoran, Semi-tropical.
<i>Hibiscus cardiophyllus</i> Gray	Mesquite woods, clay banks, sandy and gravelly hills, rocky cliffs, rarely cultivated. Somewhat xerophytic. Native.	Brownsville to Laredo to Uvalde.	Semi-tropical, L. Sonoran.
<i>H. coccineus</i> Walt.	Cultivated. Introduced.	Southeastern Texas.	Semi-tropical.
<i>H. coulteri</i> Gray	Rocky hillsides and mountain sides. Xerophytic. Native.	Del Rio throughout Big Bend to El Paso.	L. Sonoran, U. Sonoran.
<i>H. denudatus</i> var. <i>involutellatus</i> Gray	Rocky hillsides and mountain sides. Xerophytic. Native.	From Boquillas and Marathon throughout Big Bend to El Paso.	L. Sonoran, U. Sonoran.
<i>H. esculentus</i> L.	Cultivated.	Throughout Texas.	Semi-tropical, Austroriparian, L. Sonoran, U. Sonoran.
<i>H. lasiocarpus</i> Cav.	Fresh water swamps, cultivated. Swamp plant. Native.	Chambers, Liberty, Jefferson counties.	Semi-tropical, Austroriparian.
<i>H. manihot</i> L.	Cultivated. Introduced.	Austin.	L. Sonoran.
<i>H. militaris</i> Cav.	Fresh water swamps, cultivated. Swamp plant. Native.	Chambers and Jefferson counties, Hearne.	Semi-tropical, Austroriparian.
<i>H. rosa-sinensis</i> L.	Cultivated. Introduced.	Southeastern Texas, San Antonio, Brownsville, El Paso.	Semi-tropical, L. Sonoran.
<i>H. sabdariffa</i> L.	Cultivated. Introduced.	Alvin, Brownsville to Mission.	Semi-tropical.
<i>H. syriacus</i> L.	Cultivated. Introduced.	Throughout Texas.	Semi-tropical, Austroriparian, L. Sonoran, U. Sonoran.
<i>H. trionum</i> L.	Cultivated. Introduced.	Throughout Texas.	Semi-tropical, Austroriparian, L. Sonoran, U. Sonoran.
<i>Kosteletzkya althaeifolia</i> (Chapm.) Gray	Salt water marshes and fresh water swamps near the coast. Swamp plant. Native.	Jefferson, Chambers, and Galveston counties.	Semi-tropical.
<i>Malachra capitata</i> L.	Borders of woods, weed in fields. Mesophytic. Native.	Brownsville.	Semi-tropical.
<i>Malva parviflora</i> L.	Common weed. Introduced.	Brownsville to El Paso.	Semi-tropical, L. Sonoran, U. Sonoran.

TABLE I (Continued)

Species	Habitat	Occurrence	Zones
<i>M. sylvestris</i> L.	Cultivated. Introduced.	Throughout Texas.	Semi-tropical, Austro-riparian, L. Sonoran, U. Sonoran.
<i>Malvastrum americanum</i> (L.) Torr.	Woods in valleys, common weed. Native. Mesophytic.	Southeastern Texas, Corpus Christi, Brownsville, San Antonio to Del Rio.	Semi-tropical, L. Sonoran.
<i>M. coccineum</i> (Pursh) Gray	Plains. Xerophytic. Native.	Alpine, Great Plains generally.	U. Sonoran.
<i>M. elatum</i> (Baker) Nels.	Sandy and rocky soil. Xerophytic. Native.	Alpine, Davis Mts. to El Paso.	U. Sonoran.
<i>M. spicatum</i> (L.) Gray	Open woods and chaparral, weed in fields. Mesophytic. Native.	Brownsville to Mis- sion.	Semi-tropical.
<i>M. wrightii</i> Gray	Mesquite woods, weed along fences and roads. Mesophytic. Native.	Corpus Christi.	Semi-tropical.
<i>Malvaviscus arboreus</i> Cav.	Cultivated. Introduced.	Brownsville.	Semi-tropical.
<i>M. drummondii</i> T. & G.	Woods and thickets, cultivated. Meso- phytic. Native.	Southeastern Texas, Hearne, San An- tonio, Corpus Christi, Browns- ville, Laredo.	Semi-tropical, Aus- tro-riparian, L. Sonoran.
<i>Modiola caroliniana</i> (L.) G. Don.	Rather moist, low places, weed. Meso- phytic. Native.	Southeastern Texas, Hearne, San An- tonio, Brownsville.	Semi-tropical, Austro-riparian, L. Sonoran.
<i>Pavonia lasiopetala</i> Scheele	Dry, rocky banks of ravines. Meso- phytic. Native.	New Braunfels.	L. Sonoran.
<i>Sida angustifolia</i> Lam.	Open woods, weed in fields. Mesophytic. Native.	Brownsville to Laredo and Cotulla.	Semi-tropical, L. Sonoran.
<i>S. ciliaris</i> L.	Open mesquite woods, weed in fields and lawns. Mesophytic. Native.	Riviera, Corpus Christi, Gregory.	Semi-tropical.
<i>S. cuneifolia</i> Gray	Sandy soil. Xerophy- tic. Native.	Brownsville to Laredo.	Semi-tropical, L. Sonoran.
<i>S. diffusa</i> H.B.K.	Dry mesquite woods, plains, sandy and rocky hillsides, mountains and valleys. Xerophy- tic. Native.	San Antonio, Hearne, Brownsville to El Paso.	Semi-tropical, Austro-riparian, L. Sonoran, U. Sonoran.
<i>S. filiformis</i> Moric.	Usually associated with <i>S. diffusa</i> . Xerophytic. Native.	San Antonio and Brownsville to El Paso.	Semi-tropical, L. Sonoran, U. Sonoran.
<i>Sida hastata</i> St. Hil.	Woods, plains, rocky and sandy slopes, weed along streets. Somewhat xerophy- tic. Native.	San Antonio, Browns- ville, El Paso, Davis Mts., Pecos.	Semi-tropical, L. Sonoran, U. Sonoran.
<i>S. longipes</i> Gray	Rocky hillsides and mountain sides. Xerophytic. Native.	Sanderson to Mara- thon.	L. Sonoran, U. Sonoran.

TABLE I (Continued)

Species	Habitat	Occurrence	Zones
<i>S. neomexicana</i> Gray	Mountain slopes. Xerophytic. Native.	Limpia Canyon in Davis Mountains.	U. Sonoran.
<i>S. rhombifolia</i> L.	Common weed in waste places. Mesophytic. Native.	Southeastern Texas.	Semi-tropical.
<i>S. spinosa</i> L.	Rare in woods, common weed in fields. Mesophytic. Native.	Southeastern Texas, Gregory, Brownsville	Semi-tropical.
<i>S. tragiaefolia</i> Gray	Rocky valleys and mountain sides. Xerophytic. Native.	Alpine. Boquillas.	L. Sonoran, U. Sonoran.
<i>Sphaeralcea cuspidata</i> Gray	Valleys, sandy or clay soil. Weed in fields. Xerophytic. Native.	Eagle Pass to El Paso, Pecos.	L. Sonoran, U. Sonoran.
<i>S. hastulata</i> Gray	Sandy and gravelly valleys and plains. Xerophytic. Native.	Roma to Del Rio.	L. Sonoran.
<i>S. incana</i> Torr.	Rocky mountain slopes, common weed in waste places. Xerophytic. Native.	Davis mountains, Alpine, El Paso.	L. Sonoran, U. Sonoran.
<i>S. lobata</i> Wooton	Sandy loam valleys, rocky slopes, weed in waste places. Xerophytic. Native.	One plant in Brownsville. Pecos, Ruidosa, Alpine, El Paso.	Semi-tropical, L. Sonoran, U. Sonoran.
<i>S. pedatifida</i> Gray	Sandy and gravelly slopes and plains. Xerophytic. Native.	Laredo, Cotulla, Eagle Pass.	L. Sonoran, U. Sonoran.
<i>S. pumila</i> Woot. & Standl.	Sandy mountain slopes. Xerophytic. Native.	El Paso.	U. Sonoran.
<i>S. subhastata</i> Coult.	Valleys and plains, base of mountain slopes. Xerophytic. Native.	Pecos, Sierra Blanca, Shafter.	L. Sonoran.
<i>S. tenuipes</i> Woot. & Standl.	Rocky mountain sides. Xerophytic. Native.	Sierra Blanca, El Paso.	U. Sonoran, L. Sonoran.
<i>Wissadula holosericea</i> (Scheele) Garcke	Rocky hills and mountain slopes. Xerophytic. Native.	Davis Mountains, Balmorhea, Alpine, San Antonio.	L. Sonoran, U. Sonoran.
<i>W. lozani</i> (Rose) Fries	Open woods, weed in fields and along roads. Somewhat xerophytic. Native.	Corpus Christi and Brownsville to Laredo.	Semi-tropical, L. Sonoran.
<i>W. periplocifolia</i> (L.) Griseb.	Open woods, borders of woods, weed in fields and along roads. Mesophytic. Native.	Brownsville.	Semi-tropical.

SUMMARY

1. In this paper several counties in the extreme southeastern part of Texas and the southwestern part of the state from Corpus Christi and San Antonio west to New Mexico were studied.

2. A total of 66 species of Malvaceae were found; 55 of these are native, 9 introduced and found only in cultivation, 1 introduced and found both in cultivation and as a weed, and 1 as an introduced weed. These species are listed in Table 1.

3. In the Semi-tropical Gulf Strip 32 native species were found, in a very small area of the Austroriparian 4, in the large area of the Lower Sonoran 35, and in the Upper Sonoran 22.

4. Classifying these species according to habitat: in open woods in the southeastern part of the state 3 species were found, in southeastern swamps 3, in southeastern prairies 2, in plains 16, in southwestern woods along streams and lakes 21, in southwestern chaparral 19, in palm woods in vicinity of Brownsville only 9, on rocky slopes in west and southwest 22, in alkaline soil in west 2.

5. Semi-tropical species of limited distribution are: *Bastardia viscosa*, *Malachra capitata*, *Abutilon pedunculare*, *A. jacquini*, *A. triquetrum*, *Wisadula periplocifolia*, and *Cienfuegosia sulphurea*.

6. Western species of decidedly xerophytic type are: *Disella* spp., *Sphaeralcea* spp., *Sida* spp., *Abutilon malacum*, *Hibiscus denudatus* var. *involucellatus*, *H. coulteri*, *Malvastrum coccineum*, and *M. elatum*.

7. Eastern mesophytic species are *Hibiscus lasiocarpus*, *H. militaris*, and *Kosteletzkya althaeifolia*.

8. Species of very wide distribution are: *Callirrhoe involucrata*, *Malvastrum americanum*, *Malva parviflora*, *Sida diffusa*, *S. spinosa*, *S. hastata*, *Abutilon incanum*, and *Malva viscus drummondii*.

UNIVERSITY OF COLORADO,
BOULDER, COLORADO

BIBLIOGRAPHY

1. Bailey, V. Biological survey of Texas. Fauna 25, U. S. Biol. Surv. 1905.
2. Bray, W. L. The ecological relations of the vegetation of western Texas. Bot. Gaz. 32: 99. 1901.
3. ——. The vegetation of the Sotol country in Texas. Univ. Texas Bull. 60. 1905.
4. ——. Distribution and adaptation of the vegetation of Texas. Univ. Texas Bull. 82. 1906.
5. Cook, O. F. Change of vegetation on the South Texas prairies. Bur. Plant Ind. Circ. 14. 1908.
6. Coulter, J. M. Botany of western Texas. Contrib. U. S. Nat. Herb. 2. 1891-1894.
7. Havard, V. Report on the flora of southern and western Texas. Proc. U. S. Nat. Mus. 8: 449-533. 1885.
8. Heller, A. A. Contrib. Herb. Franklin and Marshall Coll. 1: 67. 1895.
9. Hill, R. T. Physical geography of the Texas region. U. S. Geol. Surv. Topograph. Atlas U. S. 1900.
10. Lewis, I. M. The trees of Texas. Univ. Texas Bull. 22: 1915.

11. **Lewton, F. L.** *Cienfuegosia drummondii*, a rare Texas plant. Bull. Torrey Bot. Club. 37: 473-475. 1910.
12. **Merriam, C. H.** Life zones and crop zones of the United States. U. S. Biol. Surv. Bull. 10: 1898.
13. **Palmer, E. J.** The canyon flora of the Edwards plateau of Texas. Jour. Arnold Arboretum 1: 233-239. 1920.
14. **Small, J. K.** Flora of Southeastern United States. 2nd ed. New York, 1913.
15. **Stearnes, F.** Flora de la region norte de Chihuahua. Estac. Agric. Exper. Ciudad Juarez Bull. 38. 1912.
16. **Udden, J. C., Baker, C. L., and Bose, E.** Review of the geology of Texas. Univ. Texas Bull. 44. 1916.
17. **Wootton, E. O., and Standley, P.** Flora of New Mexico. Contrib. U. S. Nat. Herb. 19. 1915.



Hanson, Herbert C. 1921. "Distribution of the Malvaceae in southern and western Texas." *American journal of botany* 8(4), 192–206.

<https://doi.org/10.1002/j.1537-2197.1921.tb05616.x>.

View This Item Online: <https://www.biodiversitylibrary.org/item/181550>

DOI: <https://doi.org/10.1002/j.1537-2197.1921.tb05616.x>

Permalink: <https://www.biodiversitylibrary.org/partpdf/314418>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: Not in copyright. The BHL knows of no copyright restrictions on this item.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.