

Oct. 3

Vol. VIII, No. 29. Washington, D. C. Sept. 23, 1885.**REPORT ON THE FLORA OF WESTERN AND SOUTHERN TEXAS.****By Dr. V. HAVARD, U. S. A.**

The observations and collections on which the following report is based were made at the several posts where I have been stationed since August, 1880, also, and chiefly, while on duty with the expeditions for the exploration of Western Texas, under the command of Maj. William K. Livermore, chief engineer officer, Department of Texas, in the summer and fall of 1881 and 1883. The specimens themselves will be presented to the National Museum.

The first part describes in a general way the vegetation of Western and Southern Texas. The various topographical features of the land are considered separately and their botanical physiognomy sketched as accurately as possible. It includes such meteorological notes as were deemed useful for the better understanding of the subject.

The second part is made up of economic notes on the plants known to have useful or baneful properties or to be of value to agriculture or industry.

My grateful acknowledgments are particularly due to Mr. Sereno Watson, of Cambridge, and Dr. George Vasey, of the Department of Agriculture, for their valuable assistance in the determination of species.

PART I.**GENERAL VIEW.**

Austin, the capital of Texas, lies within the timbered agricultural section of the State. South and west of it, the mean annual temperature increases while the rainfall decreases so that a change of vegetation soon becomes perceptible. San Marcos and New Braunfels are still centers of prosperous farming districts; farther south the success of crops is not so assured. After crossing the Guadalupe the change of climate is marked and becomes more and more striking. The timber grows thinner on the prairies, seldom extending far from valleys or water-courses; broad plains are covered with Mezquit, so characteristic of a serene, rainless sky. West of the Colorado and San Antonio Rivers, and south of the latter, farming is only remunerative on bottom-lands of valleys; it ceases, practically, west of the headwaters of the San Saba, Llano, and Nueces, and south of the Frio, or is only possible in rare valleys with irrigation.

Dallas and Fort Worth stand in the midst of a fine agricultural

region. Thence, going westward on the Texas Pacific Railroad, no material change is noticed until the Brazos is passed when the arboreal vegetation becomes less luxuriant. The Cottonwood and American Elm, common hitherto, are now sparse, while the Mezquit begins to show itself. Groves of Live Oak, Red Oak and Juniper continue as far as Baird. Beyond this town, we pass out of the timbered and farming region of North-Central Texas and gradually enter what has been called the great Texano-Mexican Desert, a vast expanse of plains and prairies, scarred by arroyos, where streams are few and very far apart, and timber, if there be any, confined to water-courses and mountains. The epithet of desert has only reference to the scarcity of timber and water, which imparts a bald, barren aspect to the face of nature; shrubby and herbaceous vegetation fairly covers this immense zone which in many districts is admirably adapted to the raising of live stock. Even sandy, alkaline soils are seldom entirely destitute of grass or chaparral.

If we draw a line from the southeast corner of the Pan Handle, or from Fort Elliot, to the harbor of Corpus Christi, we shall divide Texas in two unequal parts. The eastern, comprising about two-fifths of the State, with rich alluvial soil, warm climate, and good rainfall, is an excellent agricultural and pastoral land. The larger western part, of cretaceous formation, consists mostly, as already mentioned, of treeless plains of various degrees of fertility and barrenness, from the best pastures to bare sand flats. Near the extreme west, from the New Mexican border to the Great Bend of the Rio Grande, are several large mountain systems where good timber and perennial waters are found.

I roughly estimate that, of the western plains beginning at the imaginary line drawn above, one-third is worthless owing to sterility of soil and absence of water. One-third, with good loamy land watered by living springs and running creeks, always affords excellent grazing. The capability of the other third to subsist herds and flocks depends entirely upon the rainfall, and, therefore, varies from year to year; thus the district which an explorer in a dry season finds a barren waste, may, the next year, with an increased and better distributed precipitation, be covered with good grass through which flow many ephemeral streamlets; hence the discrepancy of accounts as to the pastoral worth of Western Texas.

RAINFALL.

The rainfall of Western Texas is small and exceedingly variable as to time and quantity. It ranges from 10 to 33 inches. At San Antonio, the mean is 32.75; it decreases irregularly but steadily as we proceed westward to El Paso and the Colorado of the West, then increases slightly to the ocean. Although the rainfall is small in Western Texas, it is not as scant and hopeless as in the desert districts of Arizona and California.

All this is shown in the following table computed from the data of

five or more years, obtained, for the most part, from the office of the Chief Signal Officer, United States Army:

Locality.	Inches.
San Antonio	32.75
Fort Clark	29.37
Eagle Pass	26.06
McKavett	21.71
Stockton	15.91
El Paso	13.06
Tucson	10.83
Yuma	3.28
San Diego	9.97

It is in the western counties of Texas where the rain is least, viz., Tom Green, Crockett, Pecos, Presidio, El Paso, each larger than the State of Vermont, that are found the worst lands of the State. In these counties there are, outside of mountains, but two or three creeks permanently running, and only for 3 or 4 miles.

There is no well-defined rainy season in Western Texas; rain falls in fitful "spells" at any, and often the most inopportune, time, with long intervals of drought. Two or three months receive one-half of the yearly precipitation. It is the season of sudden rises and floods which, in a few hours, cause irreparable damages and again as promptly subside, drained away by timberless arroyos, so that but a comparatively small amount of moisture is retained in the earth and penetrates to the sub-soil.

Three or four, or more, months of the year are entirely without rain, or only receive an insignificant amount. It is the season of dust storms and prairie fires; then springs dry up, streams stagnate or sink out of sight. Even the Rio Grande, above its main Mexican tributary, the Conchas, ceases to run, and in many places its bed becomes a sinuous avenue of glaring sand.

Generally speaking, there are two yearly waves of rainfall; the smaller from April to June, the larger from August to November. They shift more or less from year to year and vary also according to locality. At San Antonio, a large proportion of the rain falls during the winter and early spring.

TEMPERATURE.

Excluding the tropical southern half of Florida, the mean annual temperature of the Lower Rio Grande is the highest in the United States. Next to Key West (mean 77.5), Fort Ringgold has the unenviable distinction of being the hottest military post in the Union. Its mean annual temperature (data from the office of the Chief Signal Officer) is 73.4, about a degree higher than that of Fort Yuma (72.3), the hottest post west of the Rocky Mountains. Next to Ringgold, come in order:

Laredo, 72.6; Brownsville, 72.42 (U. S. Hospital observations); Eagle Pass, 70.57; all of which places are on the Rio Grande.

West and north of a line passing through Eagle Pass and San Antonio, the annual mean falls below 70; it is sensibly lower than that of military posts lying at higher latitudes in Arizona and Southern California. It decreases slightly going west, as in the following table, in which no correction is made for latitude.

Locality.	Temperature.
Galveston	69.92
San Antonio.....	69.24
Fort Clark.....	69.07
McKavett.....	65.56
Stockton.....	64.97
El Paso.....	63.67

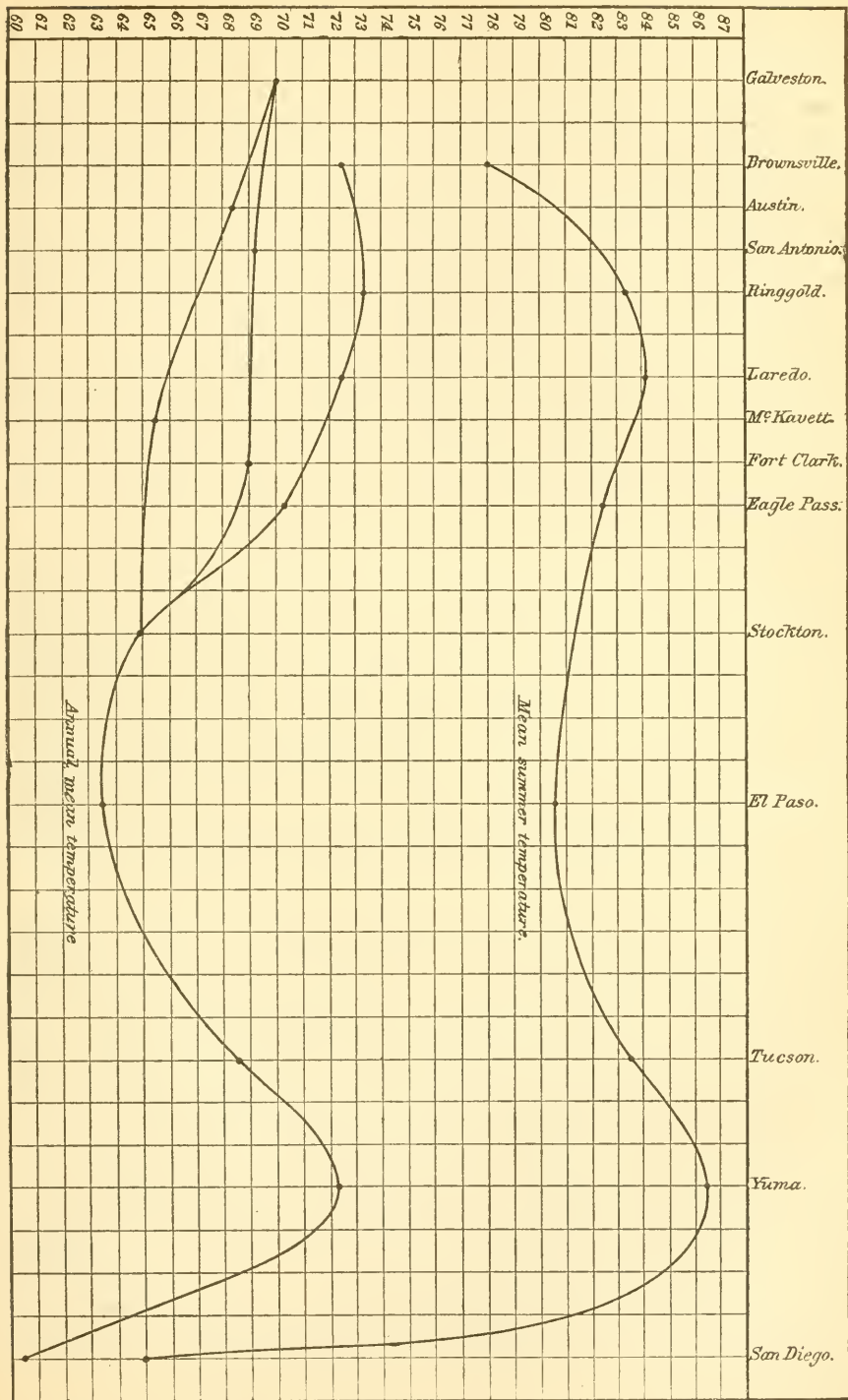
Fort Davis, lying in a mountain region, has a lower mean (61.84) as well as a higher rainfall (23.48) than would be expected from its comparative longitude.

The summer means (from May to September inclusive) of the several places noticed above do not always correspond with their annual means, a fact of considerable importance in the appreciation of local temperature. Ranked in the order of their summer means, Fort Yuma stands first (86°.26); Laredo, second (84.10); Fort Ringgold, third (83.64); Key West, fourth (82.86); Eagle Pass, fifth (82.46). The summer mean of El Paso is 80.76, showing that the estival temperature, on going westward towards the continental divide, does not decrease in the same ratio as the annual mean, and, therefore, that the greater fall of the latter is due to the colder winter.

A thermal line, drawn so as to represent by its altitude the varying mean annual temperature of the Mexican Boundary, would describe the following curves: From Brownsville, a rise to Ringgold, its highest apex; thence a gradual, slow fall to El Paso; a second and less rise to Fort Yuma, and another and much more abrupt depression to San Diego, Cal., its lowest point. It is interesting to notice that the peaks of this line, Ringgold and Yuma, are at about the same distance from the ocean, and that the great inland depression at El Paso is near its center.

The line of summer temperature, as already seen, would not be quite parallel with the above. From Brownsville it would rise and reach the summit of its first convexity at Laredo, thence descend by an almost imperceptible incline to El Paso, rise to its apex at Fort Yuma and fall to its lowest point at San Diego, Cal.

In both of these lines, the great and sudden depression from Yuma to the shore of the Pacific at San Diego, a distance of less than 200 miles, is very remarkable.



Thermal lines showing the mean summer temperature of the Mexican boundary; also the mean annual temperature of the same and other places. No allowance made for latitude or altitude.

VALLEYS.

In all valleys, where there is any arboreal vegetation at all, are found Mezquit and Hackberry of various dimensions. The other timber of valleys and the peculiarities of their flora will be noticed under the heading of their respective streams. In this place I shall only consider those general features which belong to all or most of them.

In the water of many creeks float the leaves of *Nuphar advena* (Yellow Pond-Lily); *Hydrocotyle interrupta*, *umbellata* and *prolifera* (Water Pennyworts); *Cabomba Caroliniana*; several species of *Potamogeton*; *Jussiaea repens*, from San Antonio eastward and northward.

Commonly growing in water, but more or less erect, are: *Nasturtium officinale* (Water-Cress), widely introduced; *Sagittaria variabilis* and *lanceifolia* (Arrow-heads); *Samolus Valerandi* and *ebracteatus* (Water Pimpernels); *Cicuta maculata* (Water Hen-lock); *Berula angustifolia* (Water Parsnip); *Mimulus luteus* and *Jamesii* (Monkey-flowers); *Herpestis Monniera*; *Dianthera Americana*; *Ludwigia palustris* and *natans*; *Lythrum alatum*.

On the immediate shore, near the water's edge, are frequently seen: *Lobelia cardinalis* and *splendens* (Cardinal-flowers), *Erythraea calycosa*, *Eustoma Russellianum*, *Epilobium coloratum*, *Oenothera biennis* and *Jamesii* (Evening Primroses), *Polygonum acre* and *hydropiperoides* (Knotweeds), *Marsilia vestita* and *macropoda*, *Ammania auriculata*, *Valerianella stenocarpa*, *Erigeron Philadelphicus*, the last three hardly extending west of San Antonio, and the following grasses: *Arundo Donax* (Cane-Grass), *Phragmites communis* (Wild Broom-Corn), *Panicum virgatum* and *crus-galli*, *Zizania miliacea* (Indian Rice), *Uniola latifolia* (Spike-Grass), *Andropogon macrurus*, *Agrostis verticillata*, *Brizopyrum spicatum*.

Of shrubs we find—

On river shores or the dry bed of water-courses, commonly: *Cephalanthus occidentalis* (Button-bush), one of the most widespread of shrubs; *Baccharis angustifolia* and *cærulescens* (Groundsel-shrubs), *Pluchea borealis* (Arrow-wood), *Hymenoclea monogyra*, *Aster spinosus*; less frequently: *Ilex decidua* (Holly), east of Devil's River; *Cercis reniformis* (Western Red-bud), *Cornus Drummondii* (Texas Dogwood), east of Devil's River; *Rhamnus Carolinianus* (Alder-Buckthorn), east of Devil's River; *Karwinskia Humboldtiana*, west of Devil's River; *Amorpha fruticosa* (False Indigo), *Rubus trivialis* (Low Blackberry).

In dry mountain arroyos: *Unguadia speciosa* (Mexican Buckeye), *Leucana retusa*, *Chilopsis saligna* (Desert Willow), *Juglans rupestris* (Nogal), the latter often of arboreal size.

In the shade of rocks along water-courses, west of Devil's River, are frequently seen two handsome shrubs, *Fallugia paradoxa* with feathery fruit, and *Tecoma stans* with golden, bell-shaped flowers.

Valleys are generally well covered with shrubbery, sometimes thin and scattered, as on the Upper Pecos, or dense, as on the Lower Rio Grande where it forms an impenetrable chaparral. This shrubby vegetation consists of:

- Prosopis juliflora* (Mezquit) and *pubescens* (Screw-Bean).
Zizyphus obtusifolius (Lote-bush).
Condalia obovata (Capul or Blue-Wood), *Mexicana* and *spathulata*.
Koerberlinia spinosa (Junco).
Acacia Farnesiana (Huisache), *flexicaulis* (Ebony), *jilicina*,
Wrightii, *Rœmeriana*, *Emoryana*.
Mimosa biuncifera (Uña de Gato), *borealis*, *Lindheimeri*.
Bumelia lycioides, *lanuginosa*, *spinosa*.
Parkinsonia aculeata (Retama).
Ptelea trifoliata (Shrubby Trefoil).
Lantana macropoda and *Camara*.
Lippia lycioides.
Lycium Berlandieri, *puberulum*, *Carolinianum*.
Sophora secundiflora (Frijolillo) and *affinis* (east of the Nueces).
Portiera angustifolia (Guayacan).
Celtis pallida (Granjeño).
Colubrina Texensis.

Many vines climb over trees and shrubs:

- Rhus Toxicodendron* (Poison Ivy).
Smilax tamnoides (Fiddle-shaped Greenbrier).
Cocculus Carolinus and *diversifolius*.
Maximowiczia Lindheimeri, with handsome, pendent, scarlet berries.
Philibertia cynanchoides, blossoming profusely all summer.
Roulinia unifaria.
Vitis candicans, *riparia*, *rupestris*, *æstivalis*, all edible Grapes growing thriftily and bearing excellent fruit.
Vitis incisa, *indivisa*, *bipinnata*, wild Grapes with pretty foliage but unpalatable berries.
Ipomœa sagittata, *pandurata*, *coccinea* (var. *hederifolia*), *Mexicana*, *sinuata*, *trifida* (Morning Glories).
Clematis Pitcheri and *Drummondii* (Virgin's Bower).
Passiflora fetida, *tenuiloba*, *affinis*, *incarnata* (Passion Flowers).
Ampelopsis quinquefolia (Virginian Creeper).
Mekania scandens (Climbing Hemp-Weed).
Anredera scandens (Texas Madeira Vine).

Of the many herbs growing on valley bottoms, the most common and conspicuous are:

- Callirrhœ involucrata*, *digitata*, *pedata* (Purple Mallows).
Sida hederacea, *lepidota*, *physocalyx*.
Sphæralcea angustifolia.
Hoffmanseggia stricta.

- Allionia incarnata.*
Nyctaginia capitata.
Solanum elaeagnifolium, nigrum, triquetrum, heterodoxum, rostratum, Torreyi.
Datura meteloides.
Petunia parviflora.
Chamaesaracha Coronopus.
Physalis lobata, hederæfolia (and var. puberula), mollis (var. cinerascens).
Salvia farinacea, lanceolata, Texana.
Monarda citriodora and punctata.
Tetraclea Coulteri.
Teucrium Canadense and Cubense.
Lippia nodiflora.
Verbena bipinnatifida, ciliata, bracteosa.
Lepidium intermedium and alyssoides.
Arabis Ludoviciana.
Draba cuneifolia.
Nasturtium obtusum.
Vesicaria Gordonii.
Cucurbita perennis.
Martynia proboscidea, fragrans, althææfolia.
Euphorbia albomarginata, serpens, petaloidea, hypericifolia, dentata, heterophylla, marginata, maculata, glyptosperma.
Tragia nepetæfolia.
Acalypha hederacea.
Polygonum camporum, amphibium, Pennsylvanicum, incarnatum, aviculare.
Rumex hymenosepalus and Berlandieri.
Heliotropium Curassavicum.
Portulaca oleracea, retusa, lanceolata.
Sesuvium Portulacastrum.
Oenothera speciosa, pinnatifida, sinuata.
Gaura parviflora and Drummondii.
Asclepiodora decumbens.
Convolvulus incanus.
Phacelia Popei.
Nama hispidum.
Nemophila phacelioides.
Ruellia tuberosa.
Antirrhinum maurandiioides.
Tribulus maximus and grandiflorus.
Corydalis aurea, var. occidentalis.
Argemone hispida.

And also the following Composites :

Helianthus lenticularis, petiolaris, ciliaris.

Gaillardia pulchella.
Lepachys columnaris, var. *pulcherrima.*
Gutierrezia Texana.
Helenium amphibolum.
Stephanomeria minor.
Verbesina encelioides.
Parthenium hysterophorus.
Heliomeris tenuifolia.

Characteristic of alkali flats or arid sandy bottoms, are :

Atriplex canescens (under several forms), *acanthocarpa*, *expansa.*
Suaeda fruticosa and *depressa.*
Spirostachys occidentalis.
Acanthochiton Wrightii.
Cladotrix lanuginosa.
Varilla Texana.

SAN ANTONIO.

The flora of the valley of the San Antonio River, near its head where stands the town of San Antonio, being typical of that of the many valleys which drain the surrounding country, I shall, at the risk of repetition, describe it with some detail.

Many trees and shrubs leaf in March and, during the same month, many native flowers can be collected. In April the vegetation is in its prime; masses of luxuriant timber spread over the valley, thick shrubbery of various shades of green covers the uplands, and a sward of thin but nutritious grass carpets the ground. The pale green of the Mezquit-clad hills, contrasting with the somber foliage of the valley, is particularly striking. In May, plants begin to suffer from the hot and dry atmosphere. Before August, when summer rains usually begin, the scant grass has become parched, the shrubbery temporarily withered and the timber dimmed with dust. The first showers, however, quicken everything back to life. The winter temperature seldom falling below 20°, many ornamental shrubs prosper in gardens, and hardy rosebushes blossom all winter.

The homely but useful Mezquit (*Prosopis juliflora*), here as everywhere in South and Western Texas, is predominant; it is mostly a shrub, sometimes a stunted tree, and covers the slopes and many of the tablelands. Mixed with it are the hardly less common Lote-bush (*Zizyphus obtusifolius*) and Brasil or Blue Wood (*Condalia obovata*), two Rhamnaceous shrubs growing together and similar in appearance. To the same order belong also *Rhamnus Carolinianus*, a tall shrub in shady places, and *Colubrinia Texensis*, a low bush on higher ground near the head of the river.

Perhaps the tree most characteristic of San Antonio, and the pride of its inhabitants, is the Huisache (*Acacia Farnesiana*) which thrives everywhere in the valley, filling the air, in March and April, with the

delicate perfume of its capitate, yellow flowers. Pretty also are the shrubby *Acacia amentacea* and *Ræmeriana*, growing on gravelly hills.

The other ligneous Leguminosæ deserving mention are: The Frijolillo (*Sophora secundiflora*), a dark green shrub, on rocky grounds, with thick bunches of rank violet flowers early in the spring, and poisonous scarlet beans in summer; *Sophora affinis*, a small tree with green bark, loosely-clustered flowers (in March) and beaded pod; the Retama (*Parkinsonia aculeata*), an elegant ornamental tree more common on the Lower Rio Grande; *Cæsalpinia pulcherrima*, a bush with gorgeous orange flowers, common in gardens, introduced from Mexico; the Honey Locust (*Gleditschia triacanthos*), mostly cultivated.

Largest and most conspicuous of trees along the river is the lordly Pecan (*Carya olivæformis*), attaining here an enormous size, and the Cottonwood (*Populus monilifera*). Less common are Black Walnut (*Juglans nigra*), Bald Cypress (*Taxodium distichum*), Black Willow (*Salix nigra*), Green Ash (*Fraxinus viridis*, var., *Berlandieriana*).

Of the Urticaceæ there are several members: The common Hackberry (*Celtis occidentalis*), a rather handsome tree 1 to 2 feet in diameter, affecting several forms; the Thorny Hackberry or Granjeno of the Mexicans (*Celtis pallida* of Torrey), a stiff shrub bearing insipid yellow berries; the Red Mulberry (*Morus rubra*), growing everywhere and yielding luscious fruit; the Wild Mulberry (*Morus microphylla*), along the river; the Paper Mulberry (*Broussonetia papyrifera*), common in yards; the Water Elm (*Ulmus crassifolia*), a middle-sized tree along streams, and the only Elm seen about San Antonio; the Osage Orange (*Maclura aurantiaca*).

The Live Oak (*Quercus virens*), a large tree, forms the main feature of the arboreal vegetation on the higher grounds of the valley. Another Oak, smaller and less common, a form of Red Oak, is *Quercus rubra*, var. *Texana*. Post Oak (*Quercus stellata*) is also found on surrounding hills.

Of the Maple Family, the Box-Elder (*Negundo aceroides*), a small tree near the water, is the only representative. To a closely allied order belongs the Wild China-tree or Soapberry (*Sapindus marginatus*). The naturalized China-tree (*Melia azedarach*), on account of its hardiness and rapid growth, is a favorite shade tree.

Of the Rose Family, the only notable arborescent members are a species of Hawthorn (*Cratægus subvillosa*) and a Plum (*Prunus Americana*, var. *mollis*). Of the Rutaceæ, two shrubs are common: the Hop-tree (*Ptelea trifoliata*) along the river, and the Prickly Ash (*Xanthoxylum Clava-Herculis*) on hill-sides.

Other shrubs deserving mention are: The Trefoil Barberry (*Berberis trifoliata*), low, evergreen bush with glaucous, spiny leaves, yellow blossoms, and red, palatable berries; the well known Texas Persimmon (*Diospyros Texana*); the thorny *Bumelia lanuginosa*; a small Holly (*Ilex decidua*); a Dogwood (*Cornus Drummondii*); the pretty *Lippia lycioides*

bearing many slender racemes of exquisitely fragrant white flowers; *Forestiera pubescens*, *Vitis bipinnata*, *Sambucus Canadensis*.

Of vines, we have the Poison Ivy (*Rhus Toxicodendron*) very common and of luxuriant growth; the Texas Virgin's Bower (*Clematis Drummondii*), a pretty climber with long-feathered fruit; the Virginian Creeper (*Ampelopsis quinquefolia*) and several Grapes, viz.: *Vitis candicans* and *æstivalis* which yield scant but good fruit; *Vitis incisa* and *indivisa*, neat, hardy climbers but with useless berries.

Of the herbs of San Antonio, only the most characteristic can find place here.

The earliest, blossoming in February, are:

- Allium striatum*.
- Anemone Caroliniana*.
- Arabis Ludoviciana*.
- Draba cuneifolia*.
- Linaria Canadensis*.
- Verbena bipinnatifida* and *ciliata*.
- Oxalis stricta*.

In March, blossom the following:

- Scutellaria Drummondii*.
- Vesicaria Gordoni*.
- Nemophila phacelioides*.
- Astragalus leptocarpus*.
- Gaura Drummondii*.
- Corydalis aurea*, var. *occidentalis*.
- Pinaropappus roseus*.
- Gaillardia simplex*.
- Lindheimeria Texana*.
- Veronica peregrina*.
- Oenothera triloba* and *speciosa*.
- Sisyrinchium Bermudiana*.
- Cooperia pedunculata*.
- Nemastylis geminiflora*, slopes of reservoir, very showy.
- Lupinus subcarnosus* (Texas Lupine), covering fertile slopes with a carpet of purple blue.
- Delphinium azureum* (Azure Larkspur), here anomalously white-flowered.
- Phlox Ræmeriana*, small but showy, mixing abundantly its pink flowers with the two preceding.
- Callirrhœe pedata* (Purple Mallow), elegant and showy.
- Gilia incisa*.

Later in the season we find:

- Gelasine Texana*?
- Desmanthus acuminatus* and *depressus*, grassy plots.
- Neptunia pubescens*, grassy plots.
- Schrankia angustata*, gardens.

- Psoralea rhombifolia*, Mezquit woods.
Vicia Ludoviciana, valley.
Medicago maculata, valley.
Indigofera leptosepala, sandy hillsides.
Sesbania macrocarpa, rare.
Cassia Lindheimeriana and *occidentalis*.
Malvaviscus Drummondii (Wild Fuchsia), common.
Malvastrum Wrightii and *tricuspidatum*.
Abutilon Wrightii and *Texense*.
Sida diffusa and *physocalyx*, yards.
Pentstemon Cobæa, elegant and showy, rare.
Castilleia indivisa, low Mezquit woods.
Maurandia Wislizeni, high Mezquit woods.
Teucrium Canadense.
Hedeoma acinoides and *Drummondii* (Pennyroyal), the former common in the valley, the latter abundant on hills.
Stachys agraria, valley.
Salvia farinacea, *ballotaeflora*, *Texana*, *coccinea* (Sages), common.
Scutellaria versicolor, woods.
Monarda citriodora (Horsemint), abundant.
Brazoria scutellarioides, very pretty, in low places.
Bifora Americana.
Chærophyllum procumbens.
Daucus pusillus, var. *scaber*.
Polytænia Nuttallii.
Eryngium Wrightii?, very showy late in summer.
Vesicaria argyrea, about the reservoir.
Streptanthus platycarpus?
Stellaria media and *prostrata*, valley.
Silene antirrhina, Government Hill.
Menodora heterophylla, common.
Specularia perfoliata, *biflora*, *leptocarpa*, *Lindheimeri*.
Asclepias longicornu.
Asclepiodora viridis.
Gonolobus reticulatus and *biflorus*.
Œnothera tetraptera and *serrulata* (Evening Primroses).
Linum multicaule and *Berlandieri*, both showy Flaxes.
Siphonoglossa Pilosella, common.
Ruellia tuberosa, very common late in summer.
Dianthera parviflora.
Orybaphus nyctagineus.
Tradescantia Virginica.
Tinantia anomala, shady woods.
Sisyrinchium geniculatum and *anceps*.
Passiflora incarnata and *affinis* (Passion-Flowers).
Lithospermum Matamorensense, shady woods.

- Onosmodium Bejariense*, shady woods.
Echinosperrnum Redowskii, var. *cupulatum*.
Evolvulus sericeus, very common throughout summer.
Convolvulus hermannioides.
Dichondra repens, roadsides.
Ipomœa trifida.
Nana Jamaicense, shade of fences.
Geranium Carolinianum, valley.
Euphorbia marginata, common and showy.
Geum album, river shore.
Yucca rupicola, very elegant; in rocky woods.
Nicotiana repanda (Wild Tobacco), common.
Solanum nigrum, *triquetrum*, *elaagnifolium*, *rostratum*, abundant.
Mirabilis longiflora, rare.
Bowlesia lobata, shade of fences.
Bouchetia erecta, Mezquit woods.
Spigelia Lindheimeri, Mezquit woods.

Humble but very elegant are two members of the Amaryllis Family, new crops of which appear after every summer shower, the white-flowered *Cooperia Drummondii* and the golden-petaled *Habranthus Texanus*.

The most common Composites, mostly homely weeds, are:

- Verbesina encelioides* and *Virginica*.
Ambrosia trifida.
Franseria tenuifolia, var. *tripinnatifida*.
Xanthium Strumarium.
Hymenopappus artemisiæfolius.
Gaillardia pulchella.
Helianthus lenticularis.
Parthenium Hysterophorus.
Lepachys columnaris, var. *pulcherrima*.

The last two, particularly, choke the lanes and vacant grounds of the town.

Of grasses we find—

In pastures:

- Buchloe dactyloides* (Buffalo or Mezquit Grass).
Bouteloua oligostachya, *hirsuta*, *Texana* (Gramas).
Aristida purpurea, var. ? *longisetu* (Triple-awned Grass).
Stipa Neesiana.
Andropogon saccharoides and *scoparius* (Beard-Grasses).

Along the river:

- Panicum Crus-Galli*, var. *longisetum* (Panic-Grass).
Uniola latifolia (Spike-Grass).
Arundo Donax (Cane-Grass).
Zizania miliacea (Wild Rice).

In yards and gardens:

Cynodon dactylon (Bermuda Grass), introduced.

Panicum fuscum and *Texanum* (Panic-Grasses).

Hordeum pusillum (Wild Barley).

Leptochloa mucronata.

Paspalum distichum.

Eriochloa sericea.

Melica diffusa.

Digitaria sanguinalis (Finger-Grass).

Eragrostis oxylepis.

Setaria glauca (Bristly Fox-tail).

Festuca tenella.

Lepturus paniculatus.

Cenchrus tribuloides (Bur-Grass).

Bromus unioloides (Johnson-Grass).

VALLEYS EAST OF THE PECOS.

Most of the trees noticed on the San Antonio River reappear in other valleys east of the Pecos.

The Medina is well timbered with Pecan and Water Elm (*Ulmus crassifolia*); more sparsely with Cottonwood, Sycamore (*Platanus occidentalis*) and Bald Cypress, all large, useful trees. On higher grounds are groves of fine Live Oak whose short trunk measures from 2 to 4 feet in diameter.

The Hondo, Seco, and Sabinal (Cypress Creek) are poorly wooded; the Frio, only fairly so in scattered clumps.

The Nueces River, although dry in many places, is well timbered from the heads of its forks to its mouth. On its forks thrive the Chestnut Oak (*Quercus Muhlenbergii*), 3 to 4 feet in diameter, a smaller Oak with pale foliage (*Q. Durandii*), the Texas Red Oak (*Q. rubra*, var. *Texana*), the Soapberry (*Sapindus marginatus*), the Wild Mulberry (*Morus microphylla*) and the Black Willow. On its lower part are groves of Cottonwood and Texas Green Ash (*Fraxinus viridis*, var. *Berlandieriana*).

The country between Uvalde and Eagle Pass is drained by several creeks, viz.: Turkey, Chuparosa, Live Oak, Comanche, and Penitencia, all converging into Lake Espantosa. They are mostly dry, but their courses are well marked by fringes of Live Oak and Water Elm, together with Hackberry, Green Ash, Retama (*Parkinsonia aculeata*) and Black Willow.

Las Moras Creek takes its name from the scattered Mulberry trees (*Morus microphylla*) growing on its banks. Groves of Pecan, Live Oak, and Water Elm, with the usual Hackberry and Soapberry, are found near its head at Fort Clark.

The Pinto and Sycamore are thinly wooded all along their immediate margins. The San Felipe is fairly timbered near its mouth, but much of its course is bare.

The San Pedro, or Devil's River, is a large stream draining a hilly, grassy district, interesting alike to botanist, sportsman, and stockman. More or less timber is found all along its course, consisting of Pecan, Sycamore, Mulberry, Hackberry, Soapberry, and Willow, with shrubbery of Persimmon, Granjeno, Mezquit, and Frijolillo. In the vicinity of old Fort Hudson are groves of Live Oak. Between the bridge of the Southern Pacific Railroad and the old crossing, a distance of 3 miles, I observed four species of Grapes: *Vitis æstivalis*, *riparia*, *rupestris* and *candicans*, with intermediate forms, all growing luxuriantly.

Below Eagle Pass, the Rio Grande receives no tributary on the Texas side. Many arroyos drain the vast plains stretching from the Nueces and the Olmos Rivers to the boundary line, and several retain more or less rainwater, but there is no permanent running stream emptying into the Rio Grande from Eagle Pass to Brownsville.

Many streams, some becoming important rivers, take their origin along the eastern edge of the Staked Plains. I shall review them briefly as they appear within our limits.

THE CONCHO.

The Concho and its tributaries run through undulating, grassy plains. From Fort Concho we can trace their course for several miles by Pecan trees of luxuriant growth; they are also fringed in places with Live Oak, American Elm (*Ulmus Americana*), more sparsely with Cottonwood and everywhere with Hackberry. On the Main Concho the timber, thick below, becomes scant a few miles above Fort Concho, but scattered clumps extend as far as Camp Charlotte. On the North Concho there is good timber, restricted to the banks, as far as Sterling Creek. A small wild Plum (*Prunus rivularis*) with red, palatable fruit, is common on the Concho and Colorado. Dense thickets of Mezquit cover many of the surrounding high table-lands.

The most common Grasses in the Concho Basin and northward are, *Buchloe dactyloides* (Buffalo-Grass), *Aristida purpurea*, *Bouteloua oligostachya* (Common Grama), and *Hilaria mutica*, all, but specially the first and third, of excellent quality. The first two are commonly called Mezquit-Grass.

Decking the prairie on all sides, are the cherry-red *Callirrhœ pedata*, the Prairie Lily (*Cooperia Drummondii*), and the ubiquitous *Verbena bipinnatifida*, *Monarda citriodora*, *Salvia farinacea*.

THE COLORADO.

At Austin, the capital of Texas, the picturesque banks of the Colorado are well timbered with Pecan, Cottonwood, Sycamore, Cypress, several species of Elm and of Oak. The latter are: *Quercus virens* (Live Oak), *Q. rubra* (Red Oak), *Q. nigra* (Black Jack), *Q. macrocarpa* (Bur Oak), *Q. stellata* (Post Oak), *Q. palustris*. The White-heart Hickory

(*Carya tomentosa*) is also found in the vicinity, and Hackberry, Soapberry and Red Cedar are common.

Immediately above Austin the timber remains good. Beyond the San Saba it gradually decreases, and, after passing the mouth of the Concho, one sees only the American Elm and, in less quantity, Hackberry, Soapberry, and Willow. Still further up, at Colorado City, where the Texas Pacific Railroad crosses it, no timber is visible on the naked banks and the river has dwindled to a salt brook, often dry.

Two of the upper tributaries of the Colorado have permanent water, some wood, and run through good grazing districts: Tobacco Creek, fringed with Hackberry and Willow, and Champlin Creek. On the latter I noted two or three Cottonwood; Black Willow (*Salix nigra*) attaining a foot in diameter and the dominant tree; Hackberry and Soapberry; a small Plum (*Prunus vicularis*) and two shrubby Oaks, *Quercus grisea*, and var. *brevifolia* of *Q. undulata*, the latter 10 to 12 feet high. Large Mezquit woods cover many of the surrounding plains and afford excellent fuel and fence rails, but no building timber.

The San Saba and Llano Rivers, large western affluents of the Colorado, are fairly well timbered, and flow through fertile valleys, while good grass covers the surrounding plains. The prevalent trees along these streams are: Pecan, Cottonwood, Willow, Chestnut Oak (*Quercus Muhlenbergii*), Live Oak (*Q. virens*), a small Post Oak (*Q. Durandii*), American Elm and Mulberry (*Morus microphylla*). On the uplands the Red Cedar (*Juniperus occidentalis* var. *conjungens*) and the ordinary Post Oak (*Quercus stellata*) are conspicuous in places.

THE BRAZOS.

The Clear Fork of the Brazos runs through a good farming region. Its banks are covered with Pecan, Cottonwood, Live Oak, American Elm, Hackberry, Willow, and Mesquite. The last four trees or shrubs, with a few stray Pecan, extend into the southern branches of the Fork as far as Abilene and the range of high hills forming the watershed between the waters of the Brazos and those of the Colorado.

Above the mouth of the Clear Fork, the Brazos dries up in many places; the timber grows scarce and often disappears. Its several branches, shallow, sluggish and salt creeks, stretch westward through broken, naked plains and gypsiferous bluffs. Despite the barren aspect of the country the grass is very good in many districts, where thrive large herds of cattle.

On approaching the Staked Plains, water is purer, more plentiful, and the grass more nutritious and abundant. Small groves of Cottonwood are seen in sheltered cañons, notably in Cañon Blanco.

THE RED RIVER.

The many heads of the Red River, within the Pan Handle, afford an ample supply of excellent and permanent water, and meander through

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a very fine grazing region. Several of them are shaded with Cottonwood. Farther down the Red River is often dry, the timber scant or absent, and the grass very poor on the sandy plains.

Pease River and the Big Wichita run through arid, treeless plains; occasional clumps of Hackberry and Willow, and stray Cottonwood, are found in side cañons. Near its mouth the Big Wichita is well timbered.

THE PECOS.

The Pecos is not a wooded stream. Near its mouth, where its swift, muddy, and saline waters run through a deep, rocky valley, are clumps of Texas Green Ash (*Fraxinus viridis*, var. *Berlandieriana*), Willows (*Salix nigra* and *longifolia*) and Hackberry. Common here are the beautifully penninerved shrub, *Karwinskia Humboldtiana*, and the ever-green Guayacan (*Portiera angustifolia*) reaching an altitude of 15 feet. In a side cañon I noted other arborescent shrubs, *Quercus undulata*, var. *pungens*, *Fraxinus Greggii*, *Forestiera reticulata*. I failed to see the *Pistacia Mexicana*, a small tree found hereabout by Bigelow. In this vicinity were collected the following handsome and remarkable plants: *Pentstemon baccharifolius*, *Amoreuxia Wrightii*, and *Hibiscus cardiophyllus*.

On ascending the river the timber becomes very sparse; it increases slightly near the mouth of Independence and Live Oak Creeks and then disappears. Both of these creeks are good running streams, the former watering a grazing district noted for its excellence, the latter fringed with Live Oak and Cedar.

Above Live Oak Creek, the Pecos, a full-brimmed, muddy river, from 8 to 15 yards wide, meanders for several hundred miles through sandy, naked, broken plains, whereon neither topography nor vegetation betoken its course. The shrubbery on its banks consists of low Mezquit, Lote-bush (*Zizyphus*), Capul (*Condalia obovata*), Creosote-bush (*Larrea Mexicana*), Junco (*Kaerberlinia spinosa*), Cenizo (*Atriplex canescens*) and *Lycium Carolinianum*. The Long-leaved Willow (*Salix longifolia*) grows in small clumps on the banks, often in company with a Grounsel-bush (*Baccharis angustifolia*) which spreads in many places its showy white panicles. Close to the water grow commonly: *Statice Limonium*, *Samolus ebracteatus*, *Eustoma Russellianum* and a giant form of *Aster divaricatus*.

The prevalent grass of the Pecos flats, and often the only kind, is *Sporobolus airoides*, with erect culm, 1 to 3 feet high, and loose, open panicle; it is distinctly salt to the taste and caused severe colic in most of the mules and horses of our party. Cattle readily eat it, and with

apparent immunity, which probably is obtained by all animals feeding on it long enough.

On bottoms, the most common Composites are *Conyza Coulteri* and *Bigelovia Wrightii*. Common also are *Helianthus lenticularis*, *Verbesina encelioides*, *Perezia Wrightii*, *Grindelia squarrosa*, and *Clappia suadaefolia*; and on alkali soils, the fleshy chenopods: *Suaeda fruticosa* and *depressa*, *Spirostachys occidentalis*.

No peculiar vegetation distinguishes the Fall of the Pecos. The stream, rushing through a jungle of Cane-Grass (*Arundo Donax*), is parted by a rocky island and then tumbles about 20 feet over limestone boulders, its muddy waters breaking into various shades of red and brown.

At Pope's Crossing, the Pecos is about 25 yards wide and from 1 to 3 feet deep, with hard, gravelly bottom. Its banks are still bare of timber, but in places shaded with Cane-Grass. The Cañagre (*Rumex hymenosepalus*) is quite abundant here, as at many other points along the river.

That part of the Pecos Basin from old Fort Lancaster up to Pope's Crossing, made up largely of barren flats, is about the worst; the grazing is fair enough on many of the adjoining slopes and hills, but nowhere sufficient for profitable cattle raising. Near the latter place the grass improves very much; on the plains north of it large herds of cattle roam and thrive, and settlements are forming.

It is worthy of notice that cattle, when accustomed to drink the saline water of the Pecos, prefer it to pure rain water.

On the fine rolling prairie near the mouth of Delaware Creek, the excellent grass consists of *Bouteloua oligostachya*, *hirsuta*, *racemosa*, *eripoda*; *Aristida dispersa*; *Setaria caudata*; *Triodia acuminata*; *Pappophorum Wrightii*.

Two of the principal tributaries of the Pecos, Delaware Creek and Black River, are treeless except on their headwaters in the foothills of the Guadalupe Mountains; here are small groves of Cottonwood, Chestnut Oak (*Quercus Muhlenbergii*), a small Ash (*Fraxinus pistaciifolia*), Hackberry, Soapberry, and Willow. They both run through an excellent grazing district. On the bluffs of Delaware Creek were collected a very large and remarkable form of *Boerhavia leiosolena*, a new species of *Greggia* (*G. linearifolia*, Watson) and a *Nama* (*N. stenophyllum*, Gray) not before observed north of the Rio Grande.

VALLEYS WEST OF THE PECOS.

West of the Pecos the few running streams found outside of mountain districts are naked; they are: Comanche, Leon, Toyah Creeks, the Alamos, San Francisco, and Maravillas. On the forks of the last two may be seen a few clumps of Hackberry, Soapberry, and Willow; scattered Cottonwood occur near the head of the Maravillas.

COMANCHE CREEK.

Comanche Creek springs from the foot of the limestone bank on which stands Fort Stockton. It is a large, clear, rapid stream, strongly impregnated with alkaline salts; it runs 3 or 4 miles and then sinks. The country roundabout, a vast expanse of gravelly sand, is dreary in the extreme. There is not even a bush on the banks of the creek. Near the water's edge I noticed a handsome form of *Aspicarpa hyssopifolia*; also *Ludwigia palustris*, *Ipomœa sagittata*, *Samolus ebracteatus*, and such sea-shore plants as *Statice Limonium* and *Brizopyrum spicatum*.

On the gravelly mesa around the post are some of the usual herbs of the region—*Verbena bipinnatifida*, *Baileya multiradiata*, *Riddellia tagetina*, *Heliotropium Greggii*, *Melampodium cinereum*.

MOUNTAIN STREAMS.

The water-courses which drain the mountains are generally well timbered. On the Limpio, the most important stream between the Pecos and El Paso, stand groves of Cottonwood, scattered clumps of Red Oak and Emory's Oak, Hackberry, and Willow. Near its heads are forests of Pine. In the picturesque Wild Rose Pass the *Rosa Arkansana* is common; still more so are the feathery *Fallugia paradoxa* and the economic Cañagre.

The Cibolo, running on the east side of the Chenate Mountains, is densely wooded. Cottonwood (*Populus Fremonti*) 4 and 5 feet in diameter, and Texas Green Ash, 40 and 50 feet high with trunk 1 to 2 feet in diameter, are characteristically prominent. The other trees are Hackberry, Soapberry, Nogal (*Juglans rupestris*), Wild Mulberry (*Morus microphylla*), and Willows (*Salix longifolia* and *nigra*). Over these trees the Arroyo Grape (*Vitis riparia*) climbs luxuriantly, forming dense walls and bowers which yield, in the fall, small but very palatable bunches of fruit. South of the mountains and long before reaching the Rio Grande, the Cibolo is dry and timberless.

West of the Chenate Mountains runs Capote Creek, a small stream shaded from the fall to its mouth with Cottonwood, Texas Green Ash, and Willows. The neighboring bluffs are covered with excellent grass, principally *Bouteloua* and *Cathestechum*. I collected, at the fall, a new shrub, *Sageretia Wrightii*, Watson; and, thereabout, the following rare and interesting plants: *Elytraria tridentata*, *Sedum Wrightii*, *Desmodium spirale*, *Hibiscus Coulteri*, *Boerhaavia scandens*, *Pentstemon acuminatus*, *Aristalochia brevipes*.

The Chisos Mountains are drained by the Tornillo on the east and the Tarlinga on the west. The former, mostly dry, bears on its upper part a few small scattered Cottonwood, stunted Hackberry, Willows, and copses of shrubby Tornillo or Screw Bean (*Prosopis pubescens*). Its lower part is entirely naked. The Tarlinga contains more water and better timber; clumps of Cottonwood, beginning at Agua Fria, dot its

course through the cañon; the last 15 miles are naked except near a large spring, 2 miles from its mouth, where more Cottonwood are found.

The Bofecillos Mountains are drained by the Ternero on the west and the Grapevine on the east. The former is a dry arroyo for about 5 miles above its mouth, then becomes a running creek for 5 or 6 miles, with sparse Cottonwood, Texas Green Ash, Hackberry and Willow; this timber extends into several side cañons. In gravelly ravines near its head, the handsome shrub *Cassia Wislizeni* is common.

The Grapevine, one of the prettiest tributary cañons of the Rio Grande, contains a small stream which sinks and reappears in many places, and many clumps of Cottonwood, Green Ash and Willow. The *Vitis astivalis?* grows thriftily over the trees, while the Maiden-hair Fern (*Adiantum Capillus-Veneris*) and Poison Ivy line the damp rocks. Here were collected two rare and showy grasses, *Cottea pappophoroides* and *Imperata arundinacea*.

Between the upper part of the Ternero and the Grapevine, including the northern portion of the Bofecillos Mountains, lies a vast grassy plateau which would be of great value as a grazing range were water more plentiful.

THE RIO GRANDE.

FROM EL PASO TO ITS MOUTH.

The valley, as it issues from the pass near which stands the town of El Paso, widens out into a broad plain covered with a forest of Cottonwood whose dense foliage contrasts strongly with the tawny gray of the bare slopes, the dark blue of the sharply outlined mountains and the pale azure of the sky.

The timber is confined to the river bottom and consists of Cottonwood* (*Populus Fremonti*, var. *Wislizeni?*), Willows and Sparse Ash (*Fraxinus pistaciæfolia*, forma *tomentosa* of Torrey). The Willows are two or three forms of *Salix nigra*, and *Salix amygdaloides* the larger and prevalent species.

The valley, below El Paso, varies in width from one to several miles and, wherever irrigated, produces fine crops of corn, Mexican wheat, onions, sweet potatoes, melons, cabbages, beans, alfalfa (*Medicago sativa*) and red pepper. It also produces excellent fruits, such as grapes, pear, and apricot. The Irish potato has not yet been successfully cultivated on the Rio Grande.

The Mezquit, as a low spreading shrub, remains prominent on high ground. Its congener, the Screw-Bean (*Prosopis pubescens*), or Tornillo of the Mexicans, growing in clusters 10 to 20 feet high, the separate stems 8 to 10 inches thick, now becomes very abundant on the bottom.

* Owing to the variable forms they affect, there is still some uncertainty in the differentiation of the Poplars of the Southwest.

The Ash already seen at El Paso is occasionally met with; it is planted in the streets of Isleta and San Elizario, its quick growth and spreading limbs making it a valuable shade tree. The Mexican Elder (*Sambucus Mexicana*) also found in these towns may have been imported.

Below San Elizario, the valley remains broadly open down to old Fort Quitman. The water, however, is not always abundant or of good quality and, during dry seasons, disappears in places; the soil is also more barren. Large groves of Cottonwood, often continuous, cover the alluvial bottom.

Atriplex canescens, under several marked forms, grows thickly on sandy and gravelly banks; common also are the other Chenopods, *Atriplex acanthocarpa* and *expansa*, often in the company of the weedy *Acanthochiton Wrightii*. *Ephedra antisiphilitica* and *trifurca* (Cañatilla) are never rare on the foot-hills with the Creosote-bush and cylindrical *Opuntia*. Nearer the edge of the river are thickets of *Baccharis carulescens*, *Pluchea borealis*, and that most common of bushy weeds *Aster spinosus*.

At Quitman, the prevalent grasses are *Hilaria mutica* and *Bouteloua oligostachya* (Common Grama).

Below this point the valley becomes contracted and does not admit of farming as far down as Ruidoso. The Cottonwood continues to be abundant, although now with increasing distances between the groves. From the summit of Eagle Mountain it can be traced along the valley from Ojo Caliente into Vieja Cañon; it is dense at the mouth of Capote Creek; thence, with few interruptions, extends to Presidio del Norte, forming large woods a few miles above this town.

The valley is more or less settled between Ruidoso and Presidio, and under irrigation yields good wheat, corn, and vegetables. Fifteen miles from the latter place is the village of Polvo, at the foot of the Bofecillos; thence to Del Rio there is no other agricultural settlement.

Below Presidio, the Cottonwood is much less frequent; small clumps are seen at long intervals. It disappears in the Great Cañon, where no arborescent vegetation of any kind is possible, but reappears below it, forming large groves a few miles from the mouth of the Tarlinga, southwest of the Chisos Mountains. At this point, the broad valley, abundant water and rich alluvial soil offer great inducements to settlers. Thence the Cottonwood is more sparse, but still occurs in scattered clumps as far as the Sierra Carmel, below the abandoned Presidio de San Vicente. Here the river enters another series of cañons, a hundred miles long, and as it issues from the highlands, near the mouth of the Pecos, it is bare of Cottonwood and remains so to its mouth.

At Presidio del Norte (953 miles from the mouth of the Rio Grande, altitude 2,780 feet) the broad valley and adjoining terraced table-lands are encompassed by steep hills and craggy mountains bare of all visible arborescent growth, the whole forming a vast landscape of utter dreariness and desolation.

The vegetation is that peculiar to the great Texano-Mexican Desert. The sparse trees are confined to the alluvial bottom and dependent ravines; they are Cottonwood, Hackberry, Mesquite, Screw Bean and Willow (*Salix longifolia* and *nigra*). Shrubs and bushes are common enough, but in scattered thickets nowhere forming a dense chaparral; those preponderating on mesas and hills are:

Acacia Greggii and *constricta*.

Mimosa borealis and *biuncifera*.

Dalea formosa.

Condalia obovata and *spathulata*.

Zizyphus obtusifolius.

Kæberlinia spinosa.

Celtis pallida.

Lycium Carolinianum, *Berlandieri*, *puberulum*.

Mozinna spathulata.

Ephedra antisiphilitica and *trifurca*.

Larrea Mexicana.

Flourensia cernua.

Yucca angustifolia.

The Palmo (*Yucca baccata*, var. *australis*), with tall caudex, 10 to 20 feet high and 1 to 2 feet in diameter, covers the broad graded incline extending from the valley to the Chenate Mountains. The obnoxious Lechuguilla (*Agave heteracantha*) is everywhere but too common. The Bear-Grass or Sotol (*Dasylirion Texanum*) is also conspicuous. Of the abundant Cacti the most remarkable species are: *Anhelonia fissurata* (Pellote) bearing a beautiful flower and used medicinally by Mexicans; *Anhelonia Williamsii* not before observed on this side of the Rio Grande; *Cereus Greggii*, one of the most ornamental of its class; *Cereus stramineus* (Strawberry Cactus) with large, red, delicious fruit.

The bottom is covered with such weeds as—

Nama hispidum.

Solanum nigrum and *eleagnifolium*.

Portulaca oleracea, *retusa*, *lanceolata*.

Petunia parviflora.

Sida hederacea.

Cucurbita perennis.

Lippia nodiflora.

Tribulus maximus.

Rumex Berlandieri.

And also the following Composites:

Helianthus lenticularis and *ciliaris*.

Verbesina encelioides.

Aster spinosus, *tanacetifolius* and *canescens*.

Coreopsis cardaminefolia.

Aplopappus spinulosus.

Gutierrezia Texana.

Helenium amphibolum.

More conspicuous and interesting herbs are—

On the bottom :

- Collomia longiflora.*
Tribulus grandiflorus.
Martynia altheæfolia.
Oenothera triloba and *pinnatifida.*
Argemone hispida.
Hoffmanseggia stricta.
Sphæralcea angustifolia.
Tetradlea Coulteri.
Lepidium alyssoides.
Philibertia cymachoides and *linearis.*

On the mesas :

- Talinum aurantiacum.*
Læselia Havardi, Gray.
Cassia bauhinoides.
Mentzelia multiflora.
Talinopsis frutescens.
Baileya multiradiata.
Riddellia tagetina.

The coarse "Maton" grass (*Sporobolus Wrightii*), on which many of the native ponies feed in winter, occupies large portions of the open bottom. The grazing is very poor in the valley and on the low mesas; it is only in the foothills that we find nutritive Grasses, principally *Bouteloua oligostachya* and *polystachya*, *Cathestechum erectum*, *Aristida purpurea*.

Here the Rio Grande receives its largest affluent, the Rio Conchas, having its source nearly due south in the Sierra Madre of Chihuahua. The valley of this fine river is very fertile, and, under irrigation, produces abundant cereals, vegetables, and fruits, on which subsist many towns and villages from Presidio del Norte to Chihuahua.

An excursion of about 40 miles through and beyond the Cañon of the Conchas did not reveal any notable change. The country, outside of the river bottom, is a hopeless desert extending to the very mountains surrounding the City of Chihuahua. In this desert we found a flourishing Sotol-mescal factory, the favorite alcoholic beverage of frontier Mexicans, made from the Sotol or Bear-Grass.

On February 14, 1881, I was surprised to see the Cottonwood on the Conchas already quite green, while those of the Rio del Norte, on the other side of the dividing ridge were still a bare, blackish mass. I subsequently ascertained that the difference in the advance of vegetation between the two valleys is three or four weeks, and found an easy explanation for it by taking the temperature of their respective streams. Thus, on February 21, between 9 and 10 o'clock a. m., the temperature of the Rio del Norte, just above the junction, was 49°, while that of the Conchas was 58°, and that of the conjoined rivers (now Rio Grande) 55°.

These observations testify to the remarkable influence of a few degrees of heat in the moisture of the subsoil upon early vernal vegetation.

From Presidio one sees a lofty mountain to the southeast, Sierra Rica, 9,000 feet or more in altitude, probably the highest in the State of Chihuahua. Its summit is covered with Nut Pine of large size (or its Mexican kin, *Pinus cembroides*), and its slopes with *Quercus grisea* (Gray Oak) and *Arbutus Xalapensis*.

Below Presidio the river enters a series of deep cañons not yet thoroughly explored. Vegetation within them is scant, sometimes entirely absent. Two rare and pretty shrubs, *Cowania ericifolia* (rediscovered by me on Tornillo Creek) and *Emorya suaveolens*, were found hereabout by the botanist of the Boundary Survey. Below the Bofecillos Mountains, on gravelly mesas, the *Eriogonum Havardi*, Watson, is conspicuous with its semi-globular masses of leaves from which spring many slender, diverging stems. With it, but much rarer, was found a new species, *E. suffruticosum*, Watson. In the cañon leading to the San Carlos Crossing I rediscovered the *Acacia Schottii*, apparently at the identical place where first seen by Dr. Parry. In the same cañon were collected a new species of *Boerhaavia* (*B. bracteosa*, Watson), the pretty *Bouchea linifolia*, the rare *Mimosa fragrans*, and, nearer the river, a giant form of *Acacia filicina*, 6 to 8 feet high, forming a dense thicket.

Opposite the mouth of the Tarlinga, the Rio Grande issues from the Great Cañon through a narrow chasm into which one may advance, creeping under the overhauling walls, nearly half a mile. Here *Salvia Henryi* and *Nama undulatum* are common.

Near the mouth of the Tarlinga, on low sand banks, was found, with ripe and excellent fruit, the Watermelon (*Citrullus vulgaris*), which has become extensively naturalized in Western Texas.

Growing on the immediate shore, and first observed as a native plant north of the Rio Grande, is the beautiful Tobacco-Shrub (*Nicotiana glauca*), and on neighboring gypseous hills that rare and curious shrub *Salazaria Mexicana*. Farther down, in foot-hills nearly opposite San Vicente, was collected a new species of a Mexican genus, *Brongniartia minutifolia*, Watson.

Del Rio is a promising agricultural village, where, among other fruits, delicious peaches are raised. From this point almost down to Eagle Pass the fertile and wide valley seems well adapted to farming. Settlements occupy the several creeks watering it.

At Eagle Pass, distant 495 miles from the mouth of the river, altitude 1,460 feet, the general aspect of the vegetation remains the same but a close examination reveals changes. The Bear-Grass has disappeared, and the giant *Yucca baccata* is dwarfed to a mere tuft of leaves. *Acacia Greggii* and *constricta* of the gravelly mesas of Presidio are here replaced by *Acacia amentacea*, *Berlandieri*, *Coulteri*, and *Wrightii*. The Mezquit is as common as ever, shading the parade ground of old Fort Duncan, its gnarled branches often loaded with thrifty bunches of Mistletoe

(*Phoradendrum flavescens*). The Screw Bean is no longer seen. Here begin the Retama (*Parkinsonia aculeata*) and Huisache (*Acacia Farnesiana*), elegant trees becoming more frequent and of larger size below. Common and conspicuous are the thorny, yellow-flowered *Parkinsonia Texana*; the white-leaved, purple-flowered *Caulophyllum Texanum*; the fragrant *Lippia lycioides* and *graveolens*; the Majorano (*Salvia ballotæflora*), and the Guayacan (*Porlieria angustifolia*). The other shrubs are:

Calliandra conferta.

Castela Nicholsoni (Goat-bush).

Shæfferia cuneifolia.

Bumelia lanuginosa and *spinosa*.

Lantana macrocarpa and *Camara*.

Diospyros Texana (Persimmon).

Mozzina spathulata (Sangre de dragon).

Larrea Mexicana (Creosote-bush).

Flourensia cernua.

Lycium Carolinianum.

Celtis pallida (Granjeño).

Forestiera angustifolia.

Kæberlinia spinosa (Junco).

Condalia Mexicana, *obovata*, *spathulata*.

Colubrina Texensis.

Zizyphus obtusifolius.

The following climbers are characteristic :

Ipomœa sinuata.

Clematis Drummondii.

Philibertia cynanchoides.

Maximowiczia Lindheimeri.

Passiflora tenuiloba and *fœtida*.

Roulinia unifaria.

Cuscuta decora.

In the early summer the bottom is covered with the flowers of *Callirhoë involuerata*, *Oenothera speciosa*, *tetraptera* and *sinuata*, *Anemone hispida* (with purplish flowers), *Phacelia Popei*, *Monarda citriodora* and *punctata*, *Gaillardia pulchella*, *Dichetophora campestris*, *Helenium amphibolum* and *oclinium*.

Other herbs, growing in various situations, are :

Neptunia pubescens.

Dalea lasiathera.

Psoralea rhombifolia.

Malvastrum leptophyllum, *tricuspidatum*, *pedatifidum*.

Sphæralcea hastulata.

Melochia pyramidata.

Hermannia Texana.

Galphimia linifolia.

Asclepias longicornu.
Jatropha Berlandieri.
Talinum sarmentosum.
Oxalis dichondraefolia.
Ionidium lineare.
Siphonoglossa Pilosella.
Aristolochia longiflora.

And also the following Composites :

Conoclinium dissectum.
Varilla Texana.
Aphauostephus ramossissimus.
Gymnosperma corymbosa.
Chætopappa modesta.
Encelia subaristata.
Gutierrezia eriocarpa.
Palafoxia Texana.
Bigelovia coronopifolia.
Verbesina encelioides.

The prevalent Grasses are :

Buchloe dactyloides (Buffalo-Grass).
Bouteloua oligostachya, *Texana*, *polystachya*, *Humboldtiana*.
Chloris cucullata.
Panicum lachnanthum, *autumnale*, *virgatum*, *crus-galli*.
Hilaria cenchroides and *mutica*.
Eragrostis megastachya and *reptans* var. *capitata*.
Triodia mutica.
Andropogon scoparius and *contortus*.
Pappophorum vaginatum.
Paspalum læve.
Cenchrus myosuroides.
Spartina gracilis.
Arundo Donax.
Sporobolus Wrightii.

Three miles below Eagle Pass, the Rio Escondido, on the Mexican side, empties into the Rio Grande. It is a clear, swift stream shaded with Pecan, Hackberry, and Wild Mulberry (*Morus microphylla*), over which climb luxuriantly the Mustang Grape (*Vitis candicans*) and a quinquefoliate form of Poison Ivy. On the bluffs above are groves of fine Live Oak extending thence, along the hill tops, into the interior of the State of Coahuila.

The general features of the vegetation do not change much down to Laredo. The narrow valley, sparsely fringed with timber, is contained within lines of broken bluffs, or cuts its course through high, gravelly mesas. It expands at rare intervals, affording farming land to a few ranches. The shrubbery becomes denser, larger, and extends farther

from the river; it now forms a tolerably well defined wooded belt which runs parallel with the river to its mouth and spreads north of it from 20 to 40 miles.

Laredo stands on a broad and level sandy plain over which it has been projected to convey the waters of the Rio Grande. Mezquit continues to be the prevalent shrub; the Huisache (*Acacia Farnesiana*) and Retama (*Parkinsonia aculeata*) are much more common; the Colima (*Xanthoxylum Pterota*) begins to appear. In gardens and yards are noticed the elegant Tobacco-Shrub (*Nicotiana glauca*) of arborescent size, and the Mexican Maguey (*Agave Americana*). The river shore is mostly bare; at intervals are clumps of Black Willow, Hackberry, Water Elm (*Ulmus crassifolia*), and Texas Green Ash (*Fraxinus viridis*, var. *Berlandieriana*). Along the water's edge was collected a genus of Grass (*Hemarthria*) new to the United States.

Proceeding on the narrow-gauged railroad toward Corpus Christi, one crosses the undulating, hilly wooded belt, the shrubs being: Mezquit, Huisache, Granjeno, Hackberry, Texas Persimmon, *Parkinsonia aculeata* and *Texana*, *Condalia obovata* and *Mexicana*, *Acacia amentacea* and *Wrightii*, *Karwinskia*. Here also begin to be seen, in the wild state, rare patches of Maguey (*Agave Americana*), which, as a native plant, grows very sparsely on the Texas side of the Lower Rio Grande. The Nopal (mostly *Opuntia Engelmanni*), of very thrifty growth, is every where abundant in the woods which it sometimes renders impassable.

Opposite Belleville, the Salado, one of the largest rivers of Northern Mexico, flows into the Rio Grande. At the time of the Boundary Survey, Cypress (*Taxodium distichum*) was rather common on its shores and extended down the Rio Grande to Roma. It is quite sparse now but is occasionally noticed as far down as Edinburg. At Havana Ranch I saw a fine specimen of this tree 2 feet in diameter.

Below Belleville, bluffs and high mesas gradually recede while the valley widens; much of it now is susceptible of cultivation. Roma is the head of high-water navigation, while Rio Grande City is generally reached by steamers at all stages of water.

At Rio Grande City (Ringgold), the woody vegetation on the neighboring bluffs and throughout the river belt, 30 miles or more wide, is dense, and in low places reaches the magnitude of scrub timber. The nature of it has changed; one now commonly sees: Nacahuite (*Cordia Boissieri*), a small tree with large, mulberry-like leaves and excellent fruit; Barretta (*Helietta parvifolia*), which, although a common shrub here, had not before been observed in the United States; Ebony (*Acacia flexicaulis*), an evergreen shrub or small round-headed tree 1 foot in diameter; Colima (*Xanthoxylum Pterota*), spiny shrub with pungent leaves; more rarely *Ptelea angustifolia*. The other shrubs also growing in this locality have already been noticed. They are Mezquit, Texas Persimmon (Chapote of the Mexicans), Granjeno, Guayacan, Junco, of arbor-

escent size; Coyotillo (*Karwinskia*), Amargoso (*Castela Nicholsoni*), *Zizyphus*, *Acacia Berlandieri* and *amentacea*, only shrubby.

In the woods below Ringgold the *Agave variegata* was found. Much cultivated about yards are the Mexican Maguey (*Agave Americana*) and several forms of *Agave rigida*.

The valley of the Rio Grande, from 3 to 4 miles wide at Rio Grande City, becomes a broad alluvial plain below Edinburg. It is thinly but almost continuously settled from Roma to Brownsville. It produces, with little or no rain, excellent crops of Sugar Cane, Cotton, Corn, and all kinds of vegetables except Potato.

The timber of the alluvial bottom is now quite thick in places, completely and most pleasantly shading roads for miles. At Rio Grande City, and downward to Brownsville, it consists of: Black Willow (*Salix nigra*), often 2 and 3 feet in diameter and from 50 to 70 feet high, bearing some resemblance to the Cottonwood of the middle and upper river; Long-leaved Willow (*Salix longifolia*), much smaller than the preceding; Water Elm (*Ulmus crassifolia*), of good size; Green Ash (*Fraxinus viridis*, var. *Berlandieriana*), 2 and 3 feet in diameter and 50 feet high; Huisache and Retama, middle-sized trees; Anaqua (*Ehretia elliptica*), 1 to 2 feet in diameter, with deep green, scabrous foliage and edible berries; Coma (*Bumelia lycioides*), becoming a tree 1 foot in diameter and 30 feet high; Uña de Gato (*Acacia Greggii*), 8 to 10 inches in diameter and 30 feet high; Brasil or Blue-wood (*Condalia obovata*), shrub or small tree; Huajillo (*Pithecolobium brevifolium*), spiny shrub whose foliage is eaten by goat and sheep; Granjeno (*Celtis pallida*), arborescent shrub whose twisted branches are much sought after for canes; *Sesbania Cavanillesii*, very graceful shrub or small tree with bunches of yellow flowers in August and winged legume; Pecan, a large tree, only at a few places, and probably introduced.

Common and pretty vines are *Ipomœa sinuata* and *trifida*, *Cocculus diversifolius*, *Vitis incisa*, *Anredera scandens*, and *Vigna luteola*.

At Havana Ranch (below Ringgold), late in August, I noted the following plants in bloom :

Talinum sarmentosum.

Iva ciliata.

Acleisanthes Berlandieri, reclining over low bushes.

Lippia geminata, erect, 3 to 4 feet high.

Salvia coccinea.

Mimosa strigillosa.

Teucrium Cubense.

Solanum tectum?

Sesbania Cavanillesii.

Vigna luteola.

Martynia fragrans.

Below Edinburg one is surprised at the unexpected appearance, in small, sparse clumps, of a Palmetto (*Sabal Palmetto*?) with the habit

and proportions of the South Carolina tree. The Long Moss (*Tillandsia usneoides*), found as far west as San Antonio, becomes a marked feature of the vegetation near the coast.

At and about Brownsville the most common trees are, as above, Retama, Huisache, Hackberry, Willow, and Mezquit, the latter extending down the river nearly to its mouth.

HILLS, BLUFFS, AND MESAS.

The most widespread and common tree on hills and bluffs, from the Canadian River to the Rio Grande, is the Red Cedar (*Juniperus occidentalis* and var. *conjungens*), generally of small size and gnarled growth. Next in frequency is the low round-headed Gray Oak (*Quercus grisea*), particularly conspicuous on the grassy bluffs southwest of Marfa. The Post Oak (*Q. stellata*) is found on ridges near the Gulf Coast and, in thin groves, on high ground farther inland, north of the Nueces River. It is a good-sized tree in the Buffalo Gap Mountains, south of Abilene, its extreme western limit in Texas. The Red Oak (*Q. rubra*) often extends from valleys to the base of hills and mountains but is nowhere large or abundant. The shrubby *Q. undulata* begins at the Pecos River and occurs occasionally in clefts of rocky bluffs along the Rio Grande.

On some of the high ridges and peaks of the mountainous region north of the Chisos Basin, from the Santiago Range to Peña Colorado, and thence nearly to Fort Davis, are seen small scattered Nut Pine (*Pinus edulis*), and, at a lower altitude, clumps of shrubby Ash (*Fraxinus cuspidata* and *Greggii*) and Mulberry (*Morus microphylla*). Nut Pine is also sparingly found on the bluffs of the forks of Nueces River and further north along the edge of the escarpment of the Staked Plains.

Very prominent on foot-hills and bluffs are: the Bear-Grass or Sotol (*Dasyllirion Texanum*), the pestilent Lechuguilla (*Agave heteracantha*), the handsome Jacob's Staff or Ucotillo (*Fouquieria splendens*) whose thorny shoots are tipped with racemes of scarlet flowers, the forbidding Spanish Bayonet or Palmo (*Yucca baccata*) in all stages of growth, the smaller *Yucca angustifolia*, the tufty *Nolina Texana* and *erumpens*.

On low slopes and banks of ravines abounds the Texas Persimmon (*Diospyros Texana*), and common are several species of Sumach (*Rhus microphylla*, *trilobata* and *virens*).

On the craggy, limestone hill-sides of the west, we find habitually the Sangre de Dragon (*Mozinna spathulata*), the leafless *Euphorbia antisiphilitica*, the bushy *Mortonia scabrella*, the long-tubed *Macrosiphonia Berlandieri*, the curious moss-like Siempre Vive (*Selaginella lepidophylla*) and its congener *S. rupestris*, several Ferns (*Notholaena* and *Pellaea*).

In the Great Bend of the Rio Grande, the bluffs are often covered with decayed argillaceous schist, giving them a repulsive blackish and cindery appearance. Even then they are seldom entirely bare but mostly

dotted with white bunches of Common Grama interspersed among thick patches of Lechuguilla. About their bases are thickets of *Atriplex acanthocarpa* and *canescens*; *Scelinocarpus diffusus*, *Ephedra*, *Larrea*, *Flourensia*; more rarely *Clappia suwdefolia*, and always more or less *Cactaceae*. Somewhat special to the gravelly hills of the Great Bend are: *Agenia Microphylla*, *Cladothrix suffruticosa*, *Bouchea spathulata*, *Cowania ericifolia*, *Boerhaavia eriosolena*, *Hibiscus Coulteri*, *H. denudatus* (var. *involucellata*), *Lycium pallidum*, *Prunus minutiflora*. On the bluffs of the Rio Grande, south of the Chisos Mountains, mixed with Lechuguilla and nearly as forbidding, was collected a new species of a genus not before observed in the United States—*Hechtia Texensis*, Watson.

Mesas are covered with:

- Prosopis juliflora*.
- Zizyphus obtusifolius*.
- Condalia obovata* and *spathulata*.
- Larrea Mexicana*.
- Ephedra antisiphylitica* and *trifurca*.
- Flourensia cernua*.
- Kœberlinia spinosa*.

The *Leucophyllum Texanum*, so strikingly beautiful with its purple flowers and white foliage, is very abundant on high plains west of Uvalde; in the Great Bend it is often mixed or replaced by its still handsomer kin *Leucophyllum minus*. Likewise highly ornamental is the spinose *Parkinsonia Texana* on the Lower Rio Grande, and the scented *Buddleia marrubifolia* farther west.

Other shrubs likewise common, and characteristic of bluffs and high mesas, are:

- Acacia Berlandieri*, *Greggii*, *constricta*, *amentacea*.
- Cassia Wislizeni* (west of the Pecos).
- Mimosa biuncifera*, *borealis*, *Lindheimeri*, *dysocarpa*, *monanctris*.
- Eysenhardtia amorphoides*.
- Dalea formosa*.
- Forestiera augustifolia*, *Neo-Mexicana*, *pubescens* (east of the Pecos).
- Salvia ballotiflora*.
- Coldenia Greggii*, *canescens*, *hispidissima*.
- Lippia lycioides*, *Wrightii*, *graveolens*.
- Cercocarpus parvifolius*.
- Talinopsis frutescens*.
- Castela Nicholsoni*.
- Microrhamnus ericoides*.
- Krameria canescens*, *parvifolia*, *lanceolata*.
- Berberis trifoliata*.
- Parthenium incanum*.
- Yucca rupicola* (east of Devil's River).

Of herbaceous plants, the most conspicuous belong to the genera

Mentzelia, *Ænothera*, *Boerhaavia*, *Acleisanthes*, *Dalea*, *Cassia*, *Greggia*, *Vesicaria*, *Abutilon*, *Menodora*, *Eriogonum*, *Croton*, *Euphorbia*, *Riddellia*, *Baileya*, *Zinnia*, *Liatris*, *Aplopappus*, *Pectis*.

In ravines and cañons are commonly seen several pretty trailers like *Janusia gracilis*, *Rhynchosia Texana*, *Phaseolus angustissimus* and *atropurpureus*; the Scarlet Sage (*Salvia Greggii*), the showy *Tecoma stans*, and *Eucnide bartonioides*.

Cactaceæ are never wanting on broken uplands; the most common species are: *Mamillaria macromeris*, *meiacantha*, *tuberculosa*, *Heyderi*; *Cereus stramineus*, the noted Strawberry Cactus, under several forms; *C. chloranthus*, *paucispinus*, *enneacanthus*; *Echinocactus longehamatus* (Turk's Head), often a foot in diameter, yielding delicious fruit hardly inferior in size or quality to that of *Cereus stramineus*; *E. horizonthaloniensis*, *intertextus*; *Opuntia frutescens*, *arborescens*, *Grahami*, and several flat-jointed species.

Nutritious Grasses, often sparse or absent in valleys, generally cover bluffs and hills. The Common Grama (*Bouteloua oligostachya*) is by far the most abundant. Other common species are *Bouteloua hirsuta*, *polystachya* and *Havardi*; *Cathestechum erectum* (first time collected north of the boundary line); *Andropogon scoparius* and *saccharoides*; *Aristida purpurea* and *dispersa*; *Elionorus ciliaris*; *Muhlenbergia distichophylla*.

STAKED PLAINS.

Under the name of Staked Plains is comprised the vast, rather ill-defined plateau south of the Canadian River Basin and east of the Pecos; this river, bending eastward, also forms its southwest boundary. It ends abruptly, by a sudden fall of several hundred feet, on the north where drained by the Canadian, and on the east where drained by the many heads of the Brazos and Red River. Judging from the general direction of the water-courses, this plateau slopes down insensibly towards the south and east. There is no topographical feature separating it on the southeast from the sandy plains of the Colorado and Concho Rivers. On the Texas Pacific Railroad, the traveler may be said to enter the Staked Plains at about Big Spring, although, at this latitude, the escarpment so conspicuous farther north is hardly perceptible.

There is no stream on the Plains. Salt lakes, ponds and holes, rarely fresh-water springs, are found in the long-winding cañons and valleys which open into the rivers named above. At several places along the Texas Pacific Railroad excellent water in fair abundance was struck at a depth of about 50 feet. It is quite probable that water could be obtained by digging or boring over many portions of the Plains. The western belt, along the Pecos, unsuccessfully bored by Captain Pope in 1856, seems in this respect the most unpromising.

The Northern Plains consist mostly of level or undulating prairies covered with good grass. Large bodies of cavalry have several times

traversed them without enduring special hardships or privations. They have but few sand belts and grass seldom fails; the only apprehension in dry seasons is about potable water.

The Southern Plains are much more barren; they include the notorious Sand Hills and large arenaceous sterile areas entirely destitute of surface water. No one can venture over them without running serious risk from scarcity of water, or sand-storms.

Big Spring is on the southeastern edge of the plains. This very remarkable spring, by far the most important between the Colorado and the Pecos, issues from under a cliff at the head of a ravine. In this as in the many other ravines running into the dry arroyo called Giraud's Creek, there is more or less arborescent vegetation. Hackberry and Willow predominate; Red Cedar and Gray Oak are common on the hills but neither of useful size. Conspicuous on the slopes are the tall *Eriogonum alatum*, the humbler *E. Jamesii*, the bushy *Hymenatherum acerosum*, and on the plains below the showy *Aplopappus ciliatus* and *Eryngium Leavenworthii*. One or two species of *Aristida*, *Bouteloua*, *Sporobolus*, and *Triodia* are the ordinary grasses.

For several miles west of Big Spring there is a thick growth of shrubby Mezquit; it becomes gradually thinner and disappears about 18 miles out. The flat, barren plains show large bald areas; patches of *Panicum obtusum* and *Brizopyrum spicatum* here and there cover the alkaline soil.

Mustang Spring lies in one of the drains of the Conecho, where crossed by the Texas Pacific Railroad. Here brackish water gravitates into a small basin and is obtained at a depth of a few feet. This basin is covered with *Helianthus lenticularis*, *Aplopappus rubiginosus*, *Flaveria* ———, *Bigelovia Wrightii*, and *Sporobolus airoides*. On surrounding mesas is a fair amount of Common Grama.

Following the railroad (past Midway Station) over the level prairie, burned in places by locomotive sparks, I noted the trailing *Tribulus maximus*, the common weeds *Nana hispidum* and *Coldenia hispidissima*, the pretty and ephemeral *Portulaca pilosa* and a homely form of *Enothera Greggii* with blotched ovate leaves.

Odessa Station stands in the midst of a prairie district, and as the vegetation hereabout is more or less typical of that of the better parts of the Staked Plains I shall briefly describe it. Bushes are scant and dwarfed; they consist of Mezquit only 1 or 2 feet high, a very slender form of *Yucca angustifolia*, the Creosote-bush (*Larrea Mexicana*), the Lotebush (*Zizyphus obtusifolius*), Canatilla (*Ephedra trifurca*). The most common non-ligneous plants are:

Verbena canescens and *bracteosa*.

Nyctaginia capitata.

Allionia incarnata.

Solanum elæagnifolium.

Physalis hederæfolia, and *mollis*, var. *einerascens*.

Croton eorymbulosus and *Texensis*.

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Euphorbia versicolor.
Aphora Neo-Mexicana.
Phyllanthus polygonoides.
Argyrothamnia Neo-Mexicana.
Oenothera Hartwegi and *Greggii.*
Mentzelia nuda.
Hoffmanseggia stricta and *Jamesii.*
Dalea nana.
Psoralea tenuiflora.
Collomia longiflora.
Plantago Virginica.

Also the following Composites :

Riddellia tagetina.
Gutierrezia eriocarpa.
Stephanomeria minor.
Grindelia squarrosa.
Helianthus ciliaris.
Melampodium cinereum.
Thelesperma gracile.
Gaillardia pulchella.
Pectis angustifolia and *papposa.*
Lindheimeria Texana.
Zinnia grandiflora.
Lygodesmia aphylla.

And the following Grasses :

Bouteloua oligostachya, *hirsuta*, *racemosa*, *eriopoda.*
Aristida purpurea and *stricta.*
Andropogon saccharoides.
Chloris cucullata.
Eragrostis poaeoides, var. *megastachya.*

On the bluffs edging the northeastern border of the Plains, we find a few Nut Pine (*Pinus edulis*), many straggling groves of small Cedar (*Juniperus occidentalis*), dwarf Gray Oak (*Quercus grisea*) and var. *pungens* of *Q. undulata*. The grass is abundant and nutritious.

West of Odessa, about 20 miles, the sand zone begins, running south and east nearly to the Pecos, and north to the very center of the Plains. In this zone are the Sand Hills, a dreary, chaotic belt of reddish sand tossed by the wind into hillocks, cones and ridges of various sizes and shapes. In these dunes I found but four shrubs: Mezquit, of a rather vigorous growth, hinting at the presence of water in some substratum within the reach of its long, penetrating roots; a "Shin" Oak, form closely allied to var. *Jamesii* of *Quercus undulata*, spreading into a low thicket, with shallow, strongly tuberculated cups and very large, edible acorns;

the slender-stemmed *Acacia constricta*, and the ample-paniced *Bigelovia pulchella*. Common also is a narrow-leaved, large-fruited form of *Yucca angustifolia*.

The other plants noted in the Sand Hills are: *Ænothera trichocalyx*, *rhomboidea* and *serrulata*; the tall *Gaura villosa*, with crisp, silvery leaves; a large-flowered flax (*Linum Berlandieri*); the showy *Heliotropium convolvulaceum*; the remarkable spectacle-fruited *Dithyræa Wislizeni*; a small-flowered form of *Jatropha Texana*, and—*Cristatella Jamesii*, *Hoffmanseggia Jamesii*, *Dalea lanata*, *Abronia fragrans*, *Oxybaphus angustifolius*, *Pentstemon ambiguus*, *Oldenlandia humifusa*, *Artemisia Canadensis* and *filifolia*, *Gaillardia pulchella*, *Palafoxia Hookeriana*.

The only Grasses seen were a stout *Andropogon* (near *A. furcatus*), 3 to 5 feet high, with running roots holding the loose soil in their meshes; a *Sporobolus* (probably form of *S. cryptandrus*), likewise erect and tall; and a large form of *Cenchrus myosuroides*.

PRAIRIES.

East of the Staked Plains, above, and of the Pecos, below, the land of Western and Southern Texas, either as broken plain or undulating prairie, is more or less covered with nutritious grass, and its capability for the raising of stock is chiefly limited by the water supply.

In the Pan Handle the grass is abundant and nutritious, but water is scant away from the Canadian and the forks of the Red River.

West of the Pecos there is a vast prairie region bounded about as follows: East, by a line running from the mouth of San Francisco Creek to Fort Davis; north, by the Limpio Mountains and the line of hills and bluffs extending thence to Sierra Blanca; west and south, by the mountain ranges lining the valley of the Rio Grande, viz., Eagle, Vieja, Capote, Chenate, Bofecillos, and Chisos Mountains, thus excluding the Rio Grande Valley and the Chisos Basin. Within these limits the grass can hardly be excelled. Unfortunately water is very scarce; there is no running stream, permanent springs are few, and most of the water-holes give out in dry seasons. There is hardly any doubt that in many places an abundant supply could be obtained by boring, as at Marfa. This prairie region is traversed by many ranges of hills and bluffs, and cut up by many arroyos and ravines; much of it, however, is simply undulating or nearly level. At Marfa, the eye ranges in all directions over a vast expanse of meadow land, level and smooth like a sea of grass.

Other excellent prairie land, west of the Pecos, deserves mention: A large area watered by Independence Creek and extending thence towards Meyer's Spring; the Delaware Creek Basin, and the eastern base of the Guadalupe Mountains north of this creek; the belt from the Cornudas to the Hueco Mountains extending north and south many miles.

West of the Santiago Range, between it and San Jacinto Peak, is a vast plain, timberless and waterless, but mostly covered with good grass. If water could be struck in places by boring, or collected in tanks, it would afford miles of excellent pasturage.

The gramineous vegetation of the prairie consists chiefly of the following species, arranged as far as possible in the order of their worth :

- Buchloe dactyloides* (Buffalo-Grass), east of the Pecos.
Bouteloua oligostachya, hirsuta, eriopoda, racemosa (Gramas).
Pappophorum Wrightii.
Triodia acuminata and *pulchella*.
Hilaria mutica (north) and *cenchroides* (south).
Aristida purpurea, dispersa, Schiediana, stricta.
Muhlenbergia Texana and *arenicola*.
Andropogon saccharoides and *scoparius*.
Lycurus phleoides.
Panicum obtusum, leucophæum, Hallii.
Setaria caudata.

The prairie, although apparently smooth, is seldom entirely free from shrubby plants, of which the most common are: A slender, straggling form of *Clematis Drummondii*; a small, branching variety of *Acacia filicina* (*A. Hartwegi* of Bentham); dwarf Mezquit, *Microrhamnus ericoides*, *Zizyphus obtusifolius*, *Ephedra trifurca* and *antisyphilitica*, *Larrea Mexicana*, *Yucca angustifolia*, *Nolina Texana*, *Opuntia arborescens*.

During the summer the prairie is decked with the blossoms of the following herbs :

- Talinum aurantiacum*.
Calophanes linearis.
Linum Berlandieri and *rigidum*.
Callirrhœ pedata and *digitata*.
Sida physocalyx and *diffusa*.
Sphæralcea hastulata.
Nyctaginia capitata.
Abronia turbinata.
Oxybaphus angustifolius and *aggregatus*.
Cooperia Drummondii.
Phaseolus retusus.
Rhynchosia Texana.
Petalostemon candidus and *multiflorus*.
Verbena bipinnatifida.
Chamæsaracha Coronopus.
Solanum elæagnifolium.
Tradescantia Virginica.
Commelina Virginica and *dianthifolia*.
Salvia lanceolata.

Tetradlea Coulteri.
Eriogonum annuum.
Croton corymbulosus.
Asclepias Jamesii.
Senecio longilobus.
Gaillardia pulchella.
Riddellia tagetina.
Aplopappus spinulosus.
Gutierrezia eriocarpa.
Lygodesmia aphylla.
Aster tanacetifolius.
Thelesperma gracile.

That large portion of Southeastern Texas included between the coast, the Rio Grande and the Nueces River, is a sandy, dry, riverless country, but mostly covered with fair grass, and therefore entitled to consideration under the heading of prairie. On account of its peculiar vegetation-I have deemed best to describe it separately.

Zones of chaparral and small timber traverse it in several directions, and trees of good size: Hackberry, Mezquit, Huisache, rarely Water Elm and Green Ash, fringe the dry forks and beds of the Olmos, San Diego, and Banquete Creeks. The absence of surface water and the uncertainty of obtaining it by deep boring, render the settlement of much of this vast region problematical.

Following the narrow-gauged railroad from Laredo, one crosses the chaparral belt, extending nearly 40 miles out; then begin undulating plains of red sand covered mostly with a coarse bunch-grass (stout, nearly smooth, form of *Elionurus ciliatus*); *Aristida purpurea* and *Sporobolus cryptandrus* are also common, and always abundant about settlements the very obnoxious Sand-bur (*Cenchrus tribuloides*). Near the Rio Grande and the coast, the Texas Grama (*Bouteloua Texana*) and Bermuda Grass (*Cynodon Dactylon*) are common, while the Common Grama (*Bouteloua oligostachya*) is only rarely seen.

The open, grassy plain is about 35 miles in width, measured by the railroad track. Ten or 15 miles east of Peña Station the shrubbery begins again and grows denser and larger until San Diego is reached. Farther on, it decreases and dwindles down to scrubby chaparral, which in places entirely disappears, leaving the ground covered with thin and sparse grass or, in dry seasons, quite bare. Beyond Collins the level land is lined for miles with a thick sod of excellent grass.

On approaching Corpus Christi the chaparral becomes thicker, but remains low and stunted. Clumps or "motts" of Live Oak occur farther south on the sandy plains between the Olmos, the Rio Grande, and the coast; the trees are small and not of much account.

Peña Station stands in the midst of the central grassy plain described above. The loose, sandy soil is mostly covered with the form of *Elio-*

nurus ciliatus already mentioned. Late in August I noted about here the handsome *Lantana Camara*, which cattle seem to avoid, the stinging *Jatropha Texana*, the purple-flowered *Callirrhoe involucrata*, and several pretty Leguminosæ, viz., *Hoffmanseggia caudata*, *Cassia procumbens*, *Zornia tetraphylla*, *Indigofera leptosepala*, *Tephrosia Lindheimeri*. Other conspicuous plants were *Heliotropium convolvulaceum*, *Commelina Virginica*, *Palafoxia Hookeriana*, *Gaillardia pulchella*, *Monarda punctata*, var. *lasiodonta*, a form with very narrow leaves. More homely and common herbs are, *Croton* —, tall and branching, *Carlowrightia parvifolia*, *Diodia teres*, *Lippia nodiflora*, *Acalypha radians*, *Gonolobus parviflorus*.

COAST.

The vicinity of the sea does not appear to have any favorable influence on either the nature or vigor of the vegetation. From the mouth of the Rio Grande to Corpus Christi the coast is low, mostly bare, and unattractive. The trees or arborescent shrubs seen at the above town are Mezquit, mostly shrubby, extending to the very edge of the bay, Huisache and Retama, both of large size and much cultivated, Ebony (*Acacia flexicaulis*, Black Willow, Hackberry, Texas Persimmon. These trees, or some of them, with the addition of the Green Ash, the Water Elm (*Ulmus crassifolia*), Anaqua (*Ehretia elliptica*) and Nacahuite (*Cordia Boissieri*) are seen in thin fringes on many of the drains, arroyos and creeks opening into the sea.

Of the trees or shrubs introduced at Corpus Christi, the Tamarisk, 2 feet in diameter, China Tree (*Melia*), Red Mulberry, Osage Orange and Oleander are quite thrifty.

The scrubby chaparral, extending from the shore inward for several miles, consists mostly of Mezquit, Granjeno, Texas Persimmon, Junco, Coyotillo (*Karwinskia*), *Acacia amentacea* and *flexicaulis*, *Condalia obovata*, *Castela Nicholsoni*, *Xanthoxylum Pterota*, *Lippia lycioides*, *Berberis trifoliata*, *Lantana Camara*, *Aster Palmeri*.

The vines are *Anredera scandens*, *Vitis incisa*, *Serjania brachycarpa*, *Maximowiczia Lindheimeri*.

Of Grasses, the most common are Bermuda Grass (*Cynodon Dactylon*), *Aristida purpurea*, *Bouteloua Texana*, *Eragrostis reptans*, and *Eleusine Ægyptica*.

MOUNTAINS.

The principal mountain ranges of Texas are the Guadalupe, Limpio, Eagle, Chenate, and Chisos, all lying beyond the Pecos, in the western part of the State. They extend from the border of New Mexico south-eastward into the Great Bend of the Rio Grande. Other elevations, with an altitude of 1,200 feet or less, also called mountains, intervene between these ranges and are also seen on the headwaters of the Brazos

and the Colorado, but their vegetation does not materially differ from that of hills and bluffs.

Guadalupe Peak, the highest in Texas, stands about 9,000 feet above the sea. Limpio Peak and the dome of the Chenates are from 500 to 800 feet lower, and lower still are the Chisos Mountains. Eagle Mountain has the least altitude, not exceeding 7,000 feet.

Good, serviceable timber is only found in the Guadalupe and Limpio Mountains. There is much arboreal vegetation in the other mountains but hardly of sufficient size for the saw-mill. Several species of Pine thrive in the Guadalupe and Limpio ranges; one species only, the Nut Pine, grows on the Chisos, and very sparingly on the north slope of the dome of the Chinates. There is none on Eagle Mountain.

GUADALUPE MOUNTAINS.

These mountains, on the south and west, are bounded by a chain of salt lakes stretching along the middle of wide alkali plains; on the contrary, their eastern base is covered with excellent grass and watered by permanent springs and brooks on which grow large Cottonwood.

They are well timbered on their broad summit (about 300 feet lower than the peak), and more or less on their eastern side, with Pine, Oak and Cedar, but the height and abruptness of the cliffs which encompass the forest would prove quite an obstacle to the removal of lumber.

The species of Pine are: Yellow Pine (*Pinus ponderosa*), the prevalent and most valuable large tree, 30 to 50 feet high and with trunk 1 to 2 feet in diameter, extending from the summit to the base of the mountain; Flexible Pine (*Pinus flexilis*), smaller than the last, with trunk seldom exceeding 1 foot in diameter, and hardly found below the summit; Nut Pine (*Pinus edulis*), a low, twisted tree straggling on the slopes; useless for lumber.

The only Fir seen here, or anywhere in Western Texas, is the *Pseudotsuga* (*Abies*) *Douglasii*, a fine tree, next in prevalence and size to the Yellow Pine.

The principal and characteristic "Cedar" of these mountains is the Thick-bark Juniper (*Juniperus pachyphlœa*), very common about Pine Spring and the only kind seen on the foot-hills. It has a short trunk, seldom 10 feet high, and from 1 to 3 feet in diameter. A smaller and rarer Juniper seen in some of the interior cañons, is *Juniperus occidentalis*, var. *conjungens*.

The Oaks are: Gray Oak (*Quercus grisea*), everywhere abundant, from a bush to a small round tree seldom a foot in diameter; Wavy Oak (*Q. undulata*), very common under two or three forms, especially the bushy var. *pungens*, near Pine Spring, and var. *Gambelii*, on the summit, a small shrub or gnarled tree 20 feet high; Chesnut Oak (*Q. Muhlenbergii*), in cañons, a rather rare but handsome tree 30 to 40 feet high.

The other trees are: The Madroña (*Arbutus Xalapensis*), common as a shrub, rare as a small tree a foot in diameter; the Red Ash (*Fraxinus*

pubescens), sparingly seen as a shrub or small tree on the summit; *Fraxinus pistaciæfolia*, shrub or small tree from 10 to 30 feet high, generally near water; the Wild Mulberry (*Morus microphylla*), in cañons, mostly small, an exceptional specimen (with very small, undivided leaves), measuring 15 inches in diameter; a Maple (*Acer grandidentatum*), uncommon shrub or middle-sized tree, in cañons, also found in the Organ Mountains; *Acacia Greggii*, small tree, oftener a shrub; a Maguey (*Agave Wislizeni* *), which may be placed here, very common on the slopes but smaller than the form of the same species growing in the Chenate and Chisos Mountains.

To this list we should add, as usual, the Mesquite, Hackberry, Soapberry, Nogal, and Mexican Buckeye.

The principal and characteristic shrubs, or bushy ligneous plants, are:

On the summit:

Cercocarpus parvifolius.

Symphoricarpus rotundifolius and *longiflorus*.

Whipplea Utahensis.

Ribes viscosissimum.

Neillia Torreyi.

In cañons:

Ptelea trifoliata.

Rhamnus Purshiana.

Lonicera dumosa.

Fendlera rupicola.

Forestiera Neo-Mexicana.

Robinia Neo-Mexicana.

Sophora secundiflora.

Vitis riparia.

Ampelopsis quinquefolia.

Berberis Fremonti and *repens*.

Astrophyllum dumosum.

Brickellia baccharidea.

On foot-hills:

Dalea formosa.

Acacia constructa.

Mimosa biuncifera.

Ceanothus Greggii.

Cercocarpus parvifolius, var. *paucidentatus*.

Prunus Capuli?

Spirea cespitosa (crevices of rocks).

Garrya ovata (first time collected in U. S.).

Krameria parviflora, var. *ramosissima*.

* Referred to this species by Dr. Engelmann. This is the Maguey found in all the mountains of Western Texas. It is allied to *A. Americana* and *A. Parryi*, but well distinguished from both.

Rhus virens and *copallina*.
Mortonia scabrella.
Chrysactinia Mexicana.
Diplopappus ericoides.
Brickellia Wrightii and *brachyphylla*.
Thymophylla Greggii.
Parthenium incanum.
Eupatorium Wrightii.
Heliomeris tenuifolia.

Of the large number of herbs observed in these mountains, the most conspicuous and characteristic are—

On foot-hills :

Nama origanifolium (on rocks, first time collected in U. S.).
Linum Berlandieri and *rigidum*.
Dalea aurea and *frutescens*.
Peteria scoparia.
Salvia chamædryoides, *farinacea* and *lanceolata*.
Seymeria scabra.
Pentstemon barbatus, var. *Torreyi*.
Sphæralcea Fendleri and var. *dissecta*.
Erysimum asperum.
Menodora longiflora and *heterophylla*.
Phlox nana.

On the summit and upper slopes :

Silene laciniata, var. *Greggii*.
Frasera speciosa.
Geranium cæspitosum.
Campanula rotundifolia (with white flowers).
Gilia aggregata, *rigidula* (and var. *acerosa*).
Erysimum —.

In cañons :

Linum Greggii.
Ipomœa Lindheimeri, *coccinea* (var. *hederifolia*), *Mexicana*.
Maurandia Wislizeni.
Mirabilis multiflora.

Composites (herbaceous):

Artemisia Ludoviciana and *dracunculoides*.
Liatris punctata.
Baccharis Havardi (Gray, n. sp.).
Riddellia tagetina.
Hymenatherum acerosum and *tenuifolium*.
Gallardia pinnatifida.
Leucampyx Newberryi (on summit).
Berlandiera lyrata.
Engelmannia pinnatifida.
Thelesperma longipes and *gracile*.

Aplopappus spinulosus, blephariphyllus, rubiginosus.

Chrysopsis villosa (vars. *canescens* and *foliosa*).

Actinella scaposa (var. *linearis*) and *linearifolia*.

Bidens Bigelovii.

Senecio longilobus.

Aster multiflorus.

Helianthus petiolaris and *lenticularis*.

Grasses :

Bouteloua oligostachya, racemosa (var. *aristosa*), *eriopoda*.

Andropogon saccharoides and *furcatus*.

Muhlenbergia Texana, pauciflora, arenicola, setifolia (Vasey, n. sp.).

Hilaria mutica.

Pappophorum Wrightii.

Triodia acuminata.

Sporobolus asperifolius.

Eragrostis tenuis and *capillaris*.

Setaria caudata.

Aristida dispersa and *purpurea*.

About 3 miles northeast of Pine Spring is a small valley down which runs Five Spring Creek, and containing large Cottonwood and Chestnut Oak. A giant Sunflower (*Helianthus grosse-serratus*), a large flowered form of *Oenothera biennis* and the Water Hemlock (*Cicuta maculata*) thrive in the marshy ground, mixed with Cat-tail (*Typha latifolia*) and Wild Broom Corn (*Phragmites communis*). A few miles further is another pretty brook (Marr's Creek), shaded with Ash (*Fraxinus pistaciifolia*) and Black willow. The grazing is excellent in the foot-hills. At Grapevine Creek there is hardly any timber, but the grass continues fine.

Snake Spring, a large body of slightly saline water, issues from the ground about 2 miles from the base of the mountain. The grazing in its immediate vicinity is poor, but the possibility of irrigation permits the raising of corn and vegetables. The country improves and fine rolling prairies are passed on the way north to Brigg's Ranch. Black River, where the road strikes it, is dry and timberless. Brigg's Creek, a permanent, salt-water stream, has its source in the foot-hills under a bower of Hackberry, Soapberry, and Sumac (*Rhus copallina*).

The mountain, here, is hardly more than a high table-land, gradually sloping northward to the level of the plain. It is bare of arborescent vegetation, and mostly covered with the exceedingly noisome Lechuquilla. The leaves of this *Agave* change very little, but the variations of its fruiting stem—from a stalk the thickness of the little finger, and 3 to 5 feet high, bearing few sessile, geminate pods, to a stalk 1½-inches thick and 10 feet high, bearing an ample pyramidal panicle 4 feet long—are puzzling and interesting.

A foot-trail, up Rattlesnake Cañon and over a rocky divide, led us into Guadalupe Cañon, a picturesque mountain valley in the heart of the range, fairly timbered with Chestnut Oak and Gray Oak, Cottonwood,

Juniper, Maple, Madroña, Choke-cherry, Mulberry, Willow, Shrubby Trefoil, &c. The Arroyo Grape (*Vitis riparia*) is abundant in places. About 8 miles above the point where the trail joins the cañon, Pine timber begins, and is thereafter quite common southward. Near its head the cañon spreads out and discloses vast grassy slopes covered with fine groves of large Gray Oak.

On old trails are found mescal pits where the Indians used to bake the bulbous bases of the *Agave Wislizeni*, the common Magney of these mountains.

FROM THE GUADALUPE MOUNTAINS TO EL PASO.

West of the Guadalupe Range, on the El Paso road, are small, isolated mountains: The Cornudas, irregular agglomerations of huge volcanic boulders; Wind, Alamo, and, farther west, Hueco Mountains, all containing, in the shelter of cañons, a fair growth of small timber, consisting principally of Gray Oak (*Quercus grisea*), under several interesting forms which seem to connect it with *Q. Emoryi*, and Red Cedar (*Juniperus occidentalis*), the latter bearing a peculiar pink-berried Mistletoe (*Phoradendron Bolleanum*). On the southwest slope of Alamo Mountain is a seeping spring around which stands a conspicuous grove of Cottonwood; it might prove interesting to speculate upon the manner of introduction of this tree at this remotely isolated point.

From the Cornudas to the Hueco Mountains, the luxuriant grass (mostly Gramas) could hardly be excelled in quantity and quality; unfortunately, water is almost entirely absent.

LIMPIO MOUNTAINS.

These mountains consist of several ranges extending north and west from Fort Davis for many miles. Several of their summits and slopes are finely timbered, while the main valleys are watered by clear, swift brooks emptying into the Limpio. Northeast of Limpio Peak is the "Pinery," where a Government saw-mill has been in operation for several years.

The timber trees are: Yellow Pine (*Pinus ponderosa*), most prevalent, yielding clear lumber 18 inches wide; Flexible Pine (*Pinus flexilis*), of about the same size but not so common; Nut Pine (*Pinus edulis*), plentiful on lower ridges and in valleys, often large enough to be sawn but making inferior lumber; Thick-bark Juniper (*Juniperus pachyphlœa*), the only kind seen in the Pine district.

Along the branches of the Limpio, grow: A shrubby Oak (*Quercus hypoleuca*), not before observed outside of Arizona; a somewhat larger kind, *Quercus rubra*, var. *Texana*, and scattered specimens of Texas Green Ash. The horridly spinose *Adolphia infesta* is abundant on interior foot-hills, and the hardly less obnoxious *Ceanothus Fendleri* hedges many arroyos. A new *Astragalus* (*A. giganteus*, Watson), remarkable for its size, was collected near the base of Limpio Peak.

Fort Davis stands under the Limpio Mountains, at an altitude of

4,700 feet. Common here and in the foot-hills are the small Gray Oak and Emory's Oak (*Quercus Emoryi*). The latter is larger than the preceding and of more elegant port and foliage. On the El Paso road, where it skirts the southern base of the mountains, this stately Oak becomes the main feature of the sylvia; its straight trunk is from 2 to 4 feet in diameter while the dark mass of shining foliage reaches the height of 60 feet. Here, also, the Nut Pine attains the unusual size of 18 inches in diameter and 40 feet in height.

In cañons near the Post, and on surrounding cliffs, are found: Frijolillo (*Sophora secundiflora*), Cedar (*Juniperus occidentalis*), Choke-Cherry (*Prunus Capuli*?), small tree 10 to 15 feet high; Madroña, small and uncommon; *Philadelphus serpyllifolius*, *Fendlera rupicola*, Sumachs (*Rhus microphylla* and *trilobata*), Wild Mulberry, and several suffruticose species of *Croton*. The Leguminous shrubs *Acacia Greggii* and *Mimosa biuncifera* are also prominent.

The Desert Willow (*Chilopsis saligna*) grows on the parade-ground.

Of the lignescent or herbaceous plants at and about Fort Davis the following are the most conspicuous:

Acacia filicina.

Bouvardia hirtella.

Tecoma stans.

Nolina erumpens.

Lithospermum multiflorum and *Cobrense*.

Cucurbita perennis.

Apodanthera undulata.

Houstonia angustifolia.

Pentstemon barbatus, *Fendleri*, *glaber* (var. *cyananthus*).

Castilleia integra and *lanata*.

Mimulus Jamesii, var. *Texensis*.

Oenothera speciosa, *triloba*, *tubicola*, *primiveris*, *pinnatifida*.

Gaura sinuata and *macrocarpa*.

Mentzelia Wrightii.

Aselepias tuberosa, *verticillata*, *longicornu*, *Jamesii*, *nummularia*, *perennis*.

Philibertia linearis.

Gonolobus reticulatus and *productus*.

Oxalis Wrightii.

Boerhaavia scandens and *Grahami*.

Phlox nana.

Phacelia glandulosa.

Astragalus Nuttallianus and *mollissimus*.

Dalea rubescens, *aurea*, *pogonathera*.

Phaseolus macropoides.

Cologania longifolia.

Linum multicaule and *perenne*.

Verbena bipinnatifida and *ciliata*.

Thamnosma Texanum.

FROM SIERRA BLANCA TO THE CHENATE MOUNTAINS.

Near the junction of the Texas Pacific with the Southern Pacific Railroads, is Sierra Blanca, so called from its whitish, barren aspect. It bears no other arborescent growth than a bushy form of Gray Oak and scrub Cedar. The Quitman Mountains, to the southwest, show dark fringes of the same small timber among their craggy outlines.

Eagle Mountain rises in successive grassy inclines to its conical summit, about 2,000 feet above the plain. It contains a considerable growth of Gray Oak and Red Cedar, but of too small size to make serviceable lumber. The best of the Oak, in cañons at the base, have a straight trunk 12 to 15 feet high and 1 foot in diameter. The Cedar is of two species: *Juniperus occidentalis* on foot-hills, and higher up, *J. pachyphloea*, already noticed as the prevalent Juniper of the Guadalupe and Limpio Mountains, but here much smaller. Choke-Cherry trees (*Prunus Capuli?*) of good size were seen in a basin between foot-hills, and, close by, a few specimens of *Berberis Fremonti*, an elegant shrub 10 to 12 feet high. *Cercocarpus parvifolius*, var. *paucidentatus*, and the obnoxious *Adolphia infesta* are common on foot-hills. In the shade of rocks, near the summit, *Heuchera rubescens* grows abundantly. Lower down are tufts of a large form of *Artemisia frigida*, contrasting with the showy panicles of *Gilia aggregata*.

Eagle Spring, at the northern base of the mountain, is a shallow hole in a bare, gravelly bank. Between it and Quitman Cañon, along the foot-hills, are large groves of Palmo (*Yucca baccata*, var. *australis*) 15 to 30 feet high.

Continuous with Eagle Mountain and running southeastward are several minor ranges, viz., Van Horn, Vieja, and Capote Mountains, which contain, in cañons, a small amount of timber consisting of the usual Gray Oak and Red Cedar, to which is added *Quercus Emoryi*, here of medium size. These mountains are precipitous on the river side but slope gradually to the north and east, merging in the vast prairie district extending thence to Fort Davis.

CHENATE MOUNTAINS.

These mountains, only second in altitude to the Guadalupe, are somewhat parallel with, and about 20 miles from, the Rio Grande.

There is no Pine on the two lower peaks nor on the summit or dome, but thin clumps of Nut Pine are found on the northern face of the latter. The timber of these mountains consists of Red Cedar, seldom of useful size, and Gray Oak, short stemmed and round headed, rarely a foot in diameter. Groves of this Oak fill ravines and creep up the mountain sides in dark, sinuous lines. The large timber in Cibolo Cañon has already been described.

Of the shrubbery should be noted:

Prosopis juliflora.

Acacia constricta and *Greggii*.

Mimosa Lindheimeri, borealis, biuncifera.

Dalea formosa.

Coldenia Greggii and *canescens.*

Celtis pallida.

Microrhamnus ericoides.

Lippia Wrightii, lycioides, graveolens.

Salvia Greggii.

Lonicera dumosa.

Anisacanthus Thurberi.

Leucophyllum Texanum and *minus.*

Berberis trifoliata.

Buddleia marrubifolia.

Mortonia scabrella.

Dicrourus diffusus.

Krameria canescens, parvifolia, and var. *ramosissima.*

Flourensia cernua.

Nolina Texana, Yucca baccata and Sotol are common. Lechuguilla, a form with low, slender stems and geminate flowers, besets the hill-sides; higher up is the large Maguey (*Agave Wislizeni*) already noticed in the Guadalupe and Limpio Mountains, here with stout stalks 15 to 18 feet high.

Of the flowering herbs the most characteristic are:

Aquilegia chrysantha.

Mirabilis Wrightii.

Boerhaavia paniculata and *erecta.*

Nicotiana trigonophylla.

Linum rigidum and *rupestre.*

Menodora scabra, pubens, longiflora.

Abutilon Wrightii and *crispum.*

Anoda cristata.

Paronia Wrightii.

Ænothera pinnatifida, tubicola, Greggii.

Gaura coccinea and *sinuata.*

Phacelia congesta and *integrifolia.*

Dalea frutescens, Wrightii, lachnostachys, aurea, mollis, rubescens.

Hosackia puberula.

Indigofera Lindheimeriana.

Desmanthus velutinus.

Rhynchosia Texana.

Galium Wrightii.

Eriogonum Abertianum, annuum, rotundifolium, Havardi.

Thamnosma Texanum.

BOFECILLOS MOUNTAINS.

About 15 miles below Presidio del Norte, begins the high, grassy plateau of the Bofecillos, drained, as already seen, by Ternero and Grape-

vine Creeks. Into these, and the Rio Grande, empty many cañons and ravines containing more or less Hackberry, Willow, Nogal (*Juglans rupestris*), Buckeye (*Ungnadia speciosa*), Sumac (*Rhus copallina* and *virens*); and Mulberry (*Morus microphylla*); sometimes, Cottonwood and Texas Green Ash, shading springs. The uplands bear scattered clumps of Cedar and Gray Oak. These general remarks apply to the range of smooth, grassy bluffs extending to Los Alamos de Cesario Creek; thence to Agua Fria, the country is more rocky and barren.

CHISOS MOUNTAINS.

The Great Bend of the Rio Grande, extending from the Tarlinga on the west, to the Maravillas on the east, is, with the exception of parts of the Staked Plains, the most sterile and unattractive region of West Texas. The Rossillo Mountains are the best part of it and the only one where the grazing of large herds is at all possible. They are covered from base to summit with fine grass in ordinary seasons, and have four or five permanent springs, two or three of which are shaded with Cottonwood.

The Chisos Mountains are very imposing from their height and bulk. They contain a fair amount of small timber and their valleys and slopes are lined with good grass, but, owing apparently to their geological formation, are so destitute of permanent water as to preclude their settlement by stockmen. The broad plains surrounding them are barren and dreary in the extreme.

The only Pine on the Chisos is the Nut Pine (*Pinus edulis*) which covers the summits and many of the upper slopes; it is often a foot in diameter and 40 feet high. With it are two species of Cedar, shrubs or small trees, *Juniperus occidentalis* and *J. flaccida*, the latter not before observed north of the Rio Grande.

In valleys, the Texas Red Oak (*Quercus rubra*, var. *Texana*), a medium tree, is the prevalent kind. Gray Oak (*Q. grisea*), of small size, is common on foot-hills. *Quercus Emoryi*, of medium size, occupies almost exclusively several of the cañons. More rare is *Q. Durandii*.

Other trees seen in high cañons, but uncommon, are: a Maple (*Acer grandidentatum*), also growing in the Guadalupe and Organ Mountains; a Cherry-tree (*Prunus Capuli*), both of medium size; and an Ash (*Fraxinus cuspidata*) somewhat smaller.

Of shrubs the following are sparingly found:

Cercis reniformis.

Sophora secundiflora.

Arbutus Xalapensis.

Sambucus Canadensis.

Rhamnus serrulata (new to the United States).

Spiræa discolor.

More common and characteristic are the following :

On slopes :

- Prosopis juliflora.*
- Zizyphus obtusifolius.*
- Cercocarpus parvifolius.*
- Rhus virens, microphylla, trilobata.*
- Forestiera angustifolia.*
- Lippia Wrightii.*
- Bouvardia hirtella.*
- Houstonia fusciculata.*
- Dalea formosa.*
- Calliandra conferta.*
- Acacia Ræmeriana, Greggii, constricta, filicina.*
- Porlieria angustifolia.*
- Bernardia myricæfolia.*
- Salvia chamædryoides* and *Regla* (new to the United States).
- Philadelphus microphyllus.*
- Berberis Fremontii.*

In valleys :

- Garrya ovata.*
- Rhamnus Purshiana.*
- Kæberlinia spinosa.*
- Prunus minutiflora.*
- Morus microphylla.*
- Diospyros Texana.*
- Condalia Mexicana* and *spathulata.*
- Mimosa biuncifera.*
- Ungnadia speciosa.*
- Sapindus marginatus.*

Abundant are Lechuguilla, Maguey, and Sotol. The former (*Agave heteracantha*) infests the foot-hills, and, in places, extends up high slopes where it mingles with the latter (*Dasylyrion Texanum*). The Maguey (*Agave Wislizeni*), already noticed in other mountains, thrives in high altitudes, even on the very summit. Its stem is from 3 to 5 inches in thickness, 13 to 18 feet high, and bears from eight to sixteen panicles.

To these plants should be added the usual *Yucca baccata* and *angustifolia*, *Nolina crumpens* and *Texana*, and the bushy Composites: *Hymenatherum acerosum*, *Zexmenia brevifolia*, *Trixis angustifolia*.

Of the Cactacæ the most prominent representative is the noted Strawberry Cactus (*Cereus stramineus*), with large, luscious fruit.

Of the many lignescient or herbaceous plants which characterize these mountains, the following are most conspicuous :

- Carlowrightia linearifolia*, common in arroyos.
- Pentstemon barbatus*, *Eatoni*, *Havardi*.

Castilleia integra.

Seymeria scabra.

Stachys Bigelovii, shade of rock near summit.

Poliomntha mollis.

Cedronella micrantha and *pallida* (var. *parviflora*).

Silene laciniata var. *Greggii*, upper slopes.

Aquilegia longissima (new to the United States), upper cañons.

Desmanthus velutinus.

Hosackia puberula.

Dalea frutescens.

Oxybaphus aggregatus, upper shady slopes.

Tradescantia leiandra, shade of rock.

Talinum parviflorum, shade of rock.

Sedum Liebmannianum (new to the United States), shade of rock.

Cotyledon strictiflora, sides of rocky cañons.

Hibiscus Coulteri, common on gravelly foot-hills.

Heuchera rubescens, upper shady slopes.

Spiranthes cinnabarina (new to the United States), only one specimen seen on rocky foot-hill.

Evolvulus alsinoides.

Asclepias perennis, var. *parvula.*

Gilia aggregata and *incisa.*

Phacelia congesta and *integrifolia.*

Linum perenne, *Greggii*, *multicaule.*

Eriogonum tenellum on hills, and *Wrightii* in cañons.

Thelypodium linarifolium.

Galium microphyllum.

Grasses :

Stipa tenuissima.

Lycurus phleoides.

Melica nutica, var. *glabra.*

Bromus ciliatus, var. *minor.*

Stipa fimbriata.

Cathestechum erectum.

Muhlenbergia distichophylla.

In arroyos, at the northern base of the mountains, the handsome *Anisacanthus pumilus* is common, and a new species, *Nama Havardi*, (Gray), stout and erect, was collected.

SALT LAKES BASIN.

This barren and desolate tract of alkali land begins at the western base of the Guadalupe Mountains, above Crow Spring, and extends in a south-southeast direction to Rattlesnake Spring, having Sierras Prieta and Diablo to the west, and to the east the Guadalupe Mount-

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ains and Sierra Pesuño de Caballo. It may be described as a sandy basin, about 50 miles long and from 15 to 20 miles wide, through the center of which stretches a chain of salt lakes, some not larger than ponds, others several miles long. The water is clear but quite brackish, and seldom drinkable even for animals. In a few places, however, near the edge of some of the lakes, springs are found with good water. Large deposits of chloride of sodium occur in places. Between Crow Spring and Guadalupe Peak, is a range of white sand-hills whose shifting, glistening surface is delicately undulated by the wind.

The smooth, broad beach of the lakes, more or less incrustated with alkali, is absolutely bare. Here and there, low sand hillocks are covered with *Spirostachys occidentalis*, *Larrea Mexicana*, and *Frankenia Jamesii*. Along the edge of the basin, the broken, gravelly ridges bear a fair amount of Grama, and afford refuge to the narrow-leaved Yucca, Bear-Grass, and Maguey (*Agave Wislizeni*).

Crow Spring, an appropriate name, suggestive of the only bird inhabiting this region, lies near the northern extremity of the basin, on the road to El Paso. The only ligneous vegetation visible here is a thicket of *Forestiera Neo-Mexicana*. The water is brackish and the grass salt, the latter consisting mostly of *Sporobolus airoides* and *Wrightii*.

PART II.

ECONOMIC NOTES ON THE TEXANO-MEXICAN FLORA.

The plants herein noticed are grouped together in their natural botanical orders and genera, while the orders succeed one another somewhat as convenience and usefulness suggested.

LEGUMINOSÆ.

Prosopis juliflora, DC. (*Algarobia glandulosa*). (Mezquit.)*

This tree constitutes the principal growth of the wooded table-lands and high valleys throughout South and Southwestern Texas. The trunk is seldom over a foot in diameter and generally too crooked and knotty to make serviceable lumber. Mezquit posts and rails, much used in fencing, are but slightly affected by exposure to ordinary weather influences, and if care be taken to strip off the bark so that the eggs of the Mez-

* The correct spelling of this Mexican name is Mezquite, with the accent on the penultimate. North of the Rio Grande the final e is generally omitted, but the accent should remain the same and the word be pronounced as if written 'Mezkeet'.

For fuller details see American Naturalist for May, 1884.

quit larva, a destructive borer, may not be laid in it, they will easily last a century.

Mezquit makes excellent hedges; as it grows readily, a vigorous shrub, on high plains where no other large spinose shrub will thrive, its value in this respect can hardly be overestimated. Seedlings are easily raised, and if transplanted in prepared ground wherever needed, during the rainy season, they should, in 3 or 4 years, develop into strong shoots which by proper pruning and trimming will form impenetrable hedges.

Wood very hard, heavy, fine-grained, taking a beautiful polish; it is also richly colored, its several zones varying from purple in the center to red and yellow towards the circumference. These qualities render it valuable for cabinet-work; unfortunately it too often happens that the zones of the heart-wood are cracked so that it is somewhat difficult to get flawless boards.

The heart-wood, stem and root, contains tannin in the proportion of 6 to 7 per cent. The bark and external white wood contain less than 1 per cent, and the leaves are entirely destitute of it. It yet remains to be ascertained, by practical test, whether the heart-wood can be used profitably by the tanner. Infusions and decoctions of it will be found useful in the Great American Desert, in default of other medicines, to purify water, prevent scurvy, or check dysentery.

In several Texas towns, pavement blocks of Mezquit are extensively used and have been found to answer the purpose excellently well.

As fuel, the wood from both root and stem is unsurpassed. It is the most commonly used from San Antonio, Tex., to San Diego, Cal., and often the only kind obtainable. According to Dr. Loew, the charcoal made from it is of the best quality for metallurgical and smelting purposes.

During the summer months the bark secretes an amber-colored gum which has the taste of gum arabic and, like it, makes excellent adhesive mucilage. Its solution in water is slightly acid and astringent; it is a useful and palatable drink in the diarrhea of children. The quantity of gum secreted by each tree is not large enough to make it an important article of commerce.

The ripe pod, or "bean," with thick and spongy mesocarp, contains more than half its weight of assimilable nutritive principles and is therefore a valuable article of food; the most important of these is sugar, in the proportion of 25 to 30 per cent. Most herbivorous animals, but especially the horse and the mule, are fond of this pod and thrive on it. In the field, it is a welcome though imperfect substitute for grain.

The Mezquit "bean" is one of the staple foods of Mexicans and Indians. They grind it on the "matate" and, after removing shell and seeds, boil the flour in water. The infusion of this flour can easily be made to undergo alcoholic fermentation whereby a weak beer is obtained, formerly much used by Comanche and Apache Indians.

Prosopis pubescens, Benth. (Screw Bean; Tornillo.)

Low, neat shrub, growing luxuriantly along the Rio Grande and many of its tributaries from El Paso to Devil's River. Its straight and long stems are useful for building huts, and fencing. It is also an effective hedge-plant on bottom-lands. The wood is not near as hard as that of Mezquit but makes good fuel.

The twisted pod, or "bean," contains a spongy and nutritious pulp rich in sugar, and is used as food by Mexicans and Indians. Herbivorous animals are very fond of it. Its smallness, however, and the stony hardness of the seeds render it less valuable than that of the Mezquit.

Acacia flexicaulis, Benth. (Mexican Ebony.)

Shrub, or small round-headed tree, with handsome evergreen foliage, common on the bluffs of the Lower Rio Grande and the Gulf Coast. Its straight trunk is seldom over a foot in diameter. Wood heavy and compact, with the several shades of ebony and taking nearly as fine a polish, hence its great value to cabinet-makers. As fuel it is even considered superior to that of Mezquit. Ebony posts are reputed the most durable of any made from Texas woods and may be said to last forever.

The thick, woody pods, 4 to 6 inches long, contain round seeds the size of peas, which, if boiled while still green, are quite palatable and nutritious. When ripe and dry they are toasted by the natives and the black outer skin, or testa, used as a substitute for coffee.

The flowers, in cream-colored catkins, exhale a very delicate fragrance.

Acacia Farnesiana, Willd. (Huisache.)

Spreading, round-headed, ornamental tree, with evergreen (in mild winters) and beautiful foliage; common at San Antonio and thence to the Lower Rio Grande and the Gulf Coast. Trunk seldom over a foot in diameter. The rose-colored wood is hard and compact, excellent for cabinet-work; probably contains tannin; makes very good fuel. Huisache posts rank next to those of Mezquit in durability.

The yellow, capitate flowers, which appear in great profusion during February and March, are very fragrant and would probably yield a rich essential oil.

A decoction of the pod contains tannin, and is used by Mexicans who mix it with an iron salt to make writing ink.

Acacia Greggii, Gray.

Mere straggling shrub above Laredo, becoming a small, slender tree 35 feet high, with stem 8 to 10 inches thick, on the Lower Rio Grande where it is called Uña de Gato. Forms most intricate spinose thickets on many gravelly bluffs where it would make excellent hedges. Wood exceedingly hard, close-grained and heavy.

Acacia Wrightii, Benth.

Often found west and south of San Antonio as a small, round tree, with stem 6 to 8 inches thick. Wood very hard.

Acacia Roemeriana, Schlecht.

Stout shrub, common in Western Texas, with foliage much like that of the preceding. Good hedge-plant.

Acacia Berlandieri, Benth., and *A. amentacea*, DC.

The former covering the arid bluffs of the Lower Rio Grande, the latter extending farther north and west, being common at San Antonio; both excellent hedge-shrubs, especially the *amentacea*, with its strong, stiff, prickly branches; unfortunately its seeds seldom develop and ripen; the *A. Berlandieri*, on the contrary, is very fructiferous.

Mimosa biuncifera, Benth., and *M. borealis*, Gray. (Uña de Gato.)

Common bushes west of the Pecos, on dry gravelly soil, noted for the abundance and stoutness of their prickles; possible hedge-plants.

Pithecolobium brevifolium, Benth. (Huaquillo.)

Shrub on the Lower Rio Grande, with permanent foliage readily eaten by sheep and goats in winter.

Sesbania Cavanillesii, Watson.

Very graceful shrub or small tree on the Lower Rio Grande, with showy racemes of bright yellow flowers in August, and winged legume. Seeds used as a substitute for coffee.

Sophora secundiflora, Lag. (Frijolillo; Coral Bean.)

Stout ornamental shrub, with deep green foliage, common from the Gulf Coast to the Pecos; thence smaller and less frequent, but found in mountain cañons as far west as El Paso. Only a shrub on the Lower Rio Grande, but described by Lindheimer as a small tree, 30 feet high, on the shores of Matagorda Bay. The showy bunches of violet flowers give off a strong, nauseating and very offensive smell. Wood yellow, hard and heavy, dyeing yellow.

The pod holds 3 or 4 round, red beans, the size of small marbles, and very poisonous. They contain an alkaloid, sophoria, isolated by Dr. H. C. Wood in 1877. It is a whitish, amorphous substance, with strong narcotic properties and capable of producing convulsions, temporary loss of voluntary movement and distressing vomiting. According to Dr. Rothrock (who quotes Mr. Bellanger, of Texas, as his informant) "The Indians near San Antonio used this bean as an intoxicant, half a bean producing delirious exhilaration followed by a sleep which lasts 2 or 3 days, and it is asserted that a whole bean would kill a man."

Sophora affinis, T. & G.

Small ornamental tree, 10 to 15 feet high, with stem 4 to 8 inches in diameter. At San Antonio and sparingly in Southern and Eastern Texas. Wood yellow and very heavy.

Parkinsonia aculeata, L. (Retama.)

San Antonio, Lower Rio Grande, Gulf Coast and Southeastern Texas. Very handsome tree, small or medium-sized, often cultivated for ornament. "According to Mr. Schott, it is valued by the Mexican Indians as a febrifuge and sudorific, and also as a remedy in epilepsy." Mexican women use an infusion of the leaves to induce abortion. Wood hard, making good fuel.

Parkinsonia Texana, Watson.

Bluffs of the Lower Rio Grande. Small spinose shrub, with golden blossoms, deserving introduction as one of the prettiest of ornamental plants. Burned in the green state, the branches yield ashes rich in alkali, and used by Mexicans to make soap.

Phaseolus retusus, Benth. (Prairie Bean.)

Common on prairies west of the Pecos, its creeping stems often 15 to 20 feet long. The seeds (3 to 5 in each pod) are about the size of peas; when still green and well cooked they make an acceptable dish in the field. When ripe they are too tough for use.

Pisoralea esculenta, Pursh. (Pomme Blanche.)

Small herb, very common on the prairies of the Northwest, but very sparingly found in Western Texas. Its esculent tuberous roots are nutritive, wholesome and pleasant to the taste.

Hoffmanseggia stricta, Benth. (Camote del Raton.)

Very pretty herb found in all valleys, with an esculent tuberous root-stock.

Peteria scoparia, Gray. (Camote del Monte.)

Stout, spiny, suffruticose herb, found sparingly in the foot-hills of the mountains west of the Pecos, also with a small, edible, tuberous root-stock.

Astragalus mollissimus, Torr.

Probably not specifically distinct from *A. Bigelovii*, Gray. The best known "loco" plant of Western Texas. Rather common on high prairies and mesas west of the Pecos, specially abundant about Peña Colorado and Fort Davis. Perennial plant, 6 to 10 inches high, with pinnate leaves quite silky, and rather conspicuous racemes of purple flowers in the early summer.

Animals, even goats, avoid this plant which has a very nauseous smell (much intensified by drying), and only eat it through inadvertence or necessity. Horses and cattle are similarly affected by it. They lose their appetite, become stupid, with spells of vicious exhilaration, grow thin, have tremors of the muscles, lose power to co-ordinate movements and estimate distances so that locomotion is rendered awkward and dangerous and finally becomes impossible. Horses may

even have blind-staggers. It is said that animals having once felt the effects of this weed are very likely to return to it until it kills them.

Oxytropis Lamberti, Pursh.

Herb, in habit bearing some resemblance to the preceding, only found in Northern Texas and nowhere common in the State. It is a loco plant of bad repute which, however, it may not deserve.

SALICACEÆ.

Populus monilifera, Ait. and *P. Fremonti*, Watson. (Cottonwood; the Alamo of the Mexicans.)

Species closely allied and hard to distinguish; the latter not extending east of the Pecos. Abundant on the Rio Grande, from El Paso to Presidio del Norte; common on the San Antonio and Medina Rivers, scant on the Nueces; also found on the headwaters of the many forks of the Colorado, Brazos and Red River where they indent the high plateau of the Staked Plains, and along water-courses at the base of the Guadalupe, Limpio, and Chenate Mountains.

In all of these places the Cottonwood reaches a large size, 1 to 5 feet in diameter, and is a valuable timber and lumber tree. If protected from rain and sun the wood is very durable; it possesses remarkable immunity from boring larvæ. I have seen beams of it quite sound in churches more than a century old. Boards, unless carefully dried, are liable to warp and crack; this is prevented by boiling in lye. Cottonwood makes poor fuel.

Salix nigra, Marsh. (Black Willow; Sauz of the Mexicans.)

Under several forms, the commonest species of Willow; grows on most streams as a small or medium-sized tree. On the Lower Rio Grande, where it is sometimes absurdly called Cottonwood, it attains a large size, 1 to 3 feet in diameter, and becomes an important timber tree.

Salix longifolia, Muhl. (Long-leafed Willow.)

Like the preceding, very common along water-courses, varying much in size from a small shrub along the Middle Pecos to a medium-sized tree in the Chenate Mountains.

Salix amygdaloides, Anders. ?

Good-sized tree, common on the Rio Grande from El Paso to old Fort Quitman.

The wood of these willows is tolerably hard and tough, but not very durable, and only makes passable fuel. The Mexicans scrape off the leaves, crush and make an infusion of them which is used internally and externally in yellow fever and other fevers of malarial origin. If there be any efficacy in the leaves thus used it seems as though there ought to be more in the bark.

The leaves of the Texas Fresno (*Fraxinus viridis*, var. *Berlandieriana*) are also used for the same purpose.

CONIFERÆ.

Pine timber is restricted to the Guadalupe, Limpio, Chisos, and Organ Mountains. No attempt has as yet been made to utilize it in the somewhat inaccessible Guadalupe and Chisos Mountains, while saw-mills have been in operation at several "pineries" in the Limpio Mountains.

Pinus ponderosa, Dougl. (Yellow Pine.)

The prevalent and most valuable Pine of the Guadalupe and Limpio Mountains; trunk 1 to 2 feet in diameter; hard, heavy, durable wood, making excellent lumber and very good fuel.

Pinus flexilis, James. (White Pine.)

In the Guadalupe and Limpio Mountains; a smaller tree than the preceding, and also inferior to it in the quality of its wood.

Pinus edulis, Engelm. (Piñon; Nut Pine.)

Common in the Guadalupe, Limpio, Organ, and Chisos Mountains; also found on the higher ridges and bluffs of the Great Bend of the Rio Grande as far north as the Southern Pacific Railroad, on the forks of the Nueces River and along the edges of the high plateau of the Staked Plains. In the Chisos Mountains, which it occupies exclusively, it becomes a tree with straight trunk 1 foot in diameter and could be sawn into useful lumber of very fair quality. It reaches about the same proportions in the Limpio and Organ Mountains. Elsewhere it is seldom large enough for anything but fuel and fence rails.

The Piñon bears small globose-ovate cones containing a few roundish, wingless seeds; these consist of a thin, fragile shell inclosing an edible kernel which is eaten raw or roasted.

Pseudotsuga (Abies) Douglasii, Carrière. (Douglas' Spruce.)

On the Guadalupe Mountains, the only Fir in Western Texas; a large tree, next in prevalence, size and quality to the Yellow Pine in those mountains.

Juniperus occidentalis, Hook. (Western Red Cedar.)

Very common shrub or stunted tree on the mountains, foot-hills, high ridges, and many of the bluffs of Western and Southern Texas; only fit for fencing and fuel. The variety *conjungens*, common on the Nueces and north of San Antonio, is quite rare west of the Pecos.

Juniperus pachyphlœa, Torr. (Thick-bark Juniper.)

Found in moderate abundance in the Guadalupe, Limpio, and Eagle Mountains. A larger tree than the preceding; trunk, 1 to 2 or more feet in diameter, but seldom more than 10 feet high. It is probably this tree which near Santa Fé, according to Dr. Loew, furnishes, by tapping the lower part of the trunk, a yellow, aromatic, transparent balsam used in various urinary disorders. Wood reddish, close-grained,

very hard and durable. Berries greenish, or at last becoming purplish, globose, half an inch in diameter, with sweetish and palatable pulp.

Juniperus flaccida, Schlecht.

Small tree, only seen in the Chisos Mountains.

Taxodium distichum, Richard. (Bald Cypress; the Sabino of the Mexicans.)

Large, valuable tree, growing sparingly on the San Antonio River and some few other streams between it and Devil's River; also at scattered points on the Lower Rio Grande.

Ephedra antisiphilitica, C. A. Meyer, and *E. trifurca*, Torr. (Cañatilla; Tepopote.)

Shrubs, 2 to 4 feet high, with long, slender, greenish branches, the leaves reduced to short bracts which are opposite in the first, and in threes in the second species. They are exactly alike in habit and mode of growth, and may be only forms of the same species. These shrubs are hardly ever absent from the gravelly mesas and bluffs of Western and Southern Texas. They are popular remedies among Mexicans and frontiersmen in the treatment of syphilis and gonorrhœa, especially the latter. The decoction or infusion of the stems has an acid reaction and an astringent taste resembling that of tannin. It is used as an injection and internally; some caution should be observed as it has been known to cause strangury. Dr. Rothrock [Botany West of the 100th Meridian], summing up Dr. Loew's analysis of *E. antisiphilitica*, says:

“The filtrate of the aqueous solution proved the presence of tannin and tartaric acid. Pectin was also shown to be in the filtrate by the jelly-like precipitate produced by the addition of alcohol. The tannin belongs to the glucosid group, furnishing sugar on treatment with acids and various other compounds, and, upon dry distillation, pyrogallic and carbonic acids. This tannin splits up into sugar and a red amorphous powder. The powder, Dr. Loew considers quite a distinct body which he names ephedrin, and to this he attributes (probably correctly) the remedial properties of the plant.”

CUPULIFERÆ.

Quercus virens, Ait. (Live Oak.)

Common along most water-courses from San Antonio to Eagle Pass and Devil's River; hardly extends beyond the Pecos. Tree of vigorous growth, with thick but short trunk; wood invaluable as timber or fuel.

Quercus grisea, Liebm. (Gray Oak.)

The most abundant, I may say the characteristic, Oak of Western Texas. Found west of the Pecos in all mountain cañons and on most foot-hills, high ridges, and bluffs. It is a small tree, seldom more than a foot thick, but its heavy, compact, tough and exceedingly hard wood could be used advantageously. The cross-section is remarkable for the

conspicuousness of its medullary rays, causing, in polished boards, beautiful effects of silver-grain.

Quercus rubra, var. *Texana*, Buckley. (Texas Red Oak.)

Good-sized tree at San Antonio, smaller westward and very sparsely scattered in hilly districts from San Antonio to the Limpio Mountains.

Quercus Emoryi, Torr. (Emory's Oak.)

Abundant in some of the cañons and along the southern base of the Limpio Mountains; forms the exclusive arboreal growth of some of the cañons of the Chisos Mountains. In the former habitat it is a handsome tree, with tall and straight stem 1 to 3 feet in diameter; in the Chisos Mountains it seldom exceeds 15 inches. Wood hard and valuable as timber and fuel.

Quercus Durandii, Buckley.

Seen on the forks of the Nueces and, what seems a form of it, in the Chisos Mountains. Small tree of little importance, good for fuel, fencing, &c.

Quercus Muhlenbergii, Engelm. (Chestnut Oak.)

Large, handsome tree on the forks of the Nueces, medium-sized in the cañons of the Guadalupe Mountains. Wood strong and durable.

Quercus stellata, Wang. (Post Oak.)

Sparse about San Antonio and northwest of it; nowhere common. I found large groves of it in the hills north of Fort Concho, apparently the westernmost extension of the species. Low, spreading tree, with short stem 1 to 3 feet in diameter; wood hard and durable, excellent for posts, rails, ties, &c., or as fuel.

Quercus undulata, Torr. (Wavy Oak.)

Very common, scrubby Oak in foot-hills west of Devil's River, affecting a great variety of forms. Several of the smaller forms (Shin Oak) produce edible acorns of various sizes, small in the Guadalupe Mountains, very large in the Sand Hills, which are eaten by Mexicans, raw or baked. They afford excellent mast to hogs in the vicinity of settlements.

Q. grisea and *Q. undulata* deserve notice as producers of tannin. They almost always bear nut-galls in large quantity. These vary in size from half an inch to an inch in diameter; they sometimes grow upon the smaller twigs, but much oftener spring from the under surface of leaves, generally from the midrib, more rarely from a main lateral nerve, never from the parenchyma. They are found in all stages of development, at first oblong, pointed and reddish, later becoming rounded and yellowish-white. A section of those growing on the leaves shows large open spaces between the central cyst and the external wall; those found on twigs are fuller and heavier. Wherever found, these nut-galls always plainly show the presence of tannic acid.

JUGLANDACEÆ.

Carya olivæformis, Nutt. (Pecan, the Nuez of the border Mexicans.)

Fringes the San Antonio, Medina and Nueces Rivers, many of their branches, and, more sparsely, other water-courses as far as Devil's River and Fort Concho, its western limit. Large and handsome tree, valuable alike for its hard, compact wood and its excellent fruit which forms an important article of trade.

No hickory was seen south of Austin.

Juglans nigra, L. (Black Walnut.)

Sparingly found at San Antonio as a medium-sized tree; does not extend westward. This tree could advantageously be introduced in many valleys.

Juglans rupestris, Engelm. (Cañon Nogal.)

Small tree, hardly ever a foot in diameter, very common in all the mountain arroyos of Western Texas.

Wood of a rich purple-brown, very hard, heavy and compact, not warping in drying. Medullary rays very close, giving a peculiarly fine appearance of silver-grain to a longitudinal section.

URTICACEÆ.

Ulmus Americana, L. (American Elm.)

On the Colorado River at Austin, and upward to a point 75 miles below the crossing of the Texas Pacific Railroad; from this river it ascends the Rio Concho up to Fort Concho. On the Texas Pacific Railroad it only extends to Elm Creek, a few miles west of Abilene.

Large tree on the Middle Colorado, but becoming smaller and of little economic value west of Austin.

Ulmus crassifolia, Nutt. (Water Elm; Small-leaved Elm.)

Much more common than the preceding; abounds on the San Antonio, Medina, Nueces, and other rivers as far as the Pecos. Middle-sized tree, 1 to 2 feet in diameter. Wood tough but not hard, making inferior lumber and poor fuel.

Celtis occidentalis, L. (Hackberry; Palo Blanco.)

The most common tree of valleys and low grounds in Southern and Western Texas. At San Antonio and westward, the straight, short trunk ranges from 6 to 24 inches in diameter; on the Lower Rio Grande it reaches greater proportions, being often 20 feet long and 2 to 3 feet in diameter, the total height of the tree being 50 or more feet. Wood close-grained and tough, but not very durable; makes poor fuel. The fruit is a yellowish-red berry, as large as a pea, with sweet, edible pulp.

This species passes through intermediate forms into the variety *reticulata*, which is very common throughout Western Texas.

Celtis pallida, Torr. (Granjeño.)

Very common on all mesas and foot-hills in Western and Southern Texas. Generally a shrub, but becomes arborescent on the Lower Rio Grande. Plant of quick growth in dry places, stiff and thorny, capable of making excellent hedges. The branches have a disposition to twist into curious shapes and make very pretty canes. Wood hard, making good posts and excellent fuel.

The orange-yellow berry, called capul* by the Mexicans, ripening in the fall, is oval in shape and about half an inch long; it has a mucilaginous and slightly astringent, but not unpleasant, taste, and is greedily eaten by all domestic fowls.

Morus rubra, L. (Red Mulberry.)

Common at San Antonio, where it may have been introduced; probably does not extend farther west. Small, ornamental tree of quick growth, prized for its beautiful foliage and delicious fruit.

Morus microphylla, Buckley. (Wild Mulberry.)

Shrub or small tree, with very variable foliage, common on Las Moras Creek and farther west in the cañons of the Guadalupe, Limpio, and Chenate Mountains. Wood soft and sappy, but tough and resilient, making very good bows. Its cambium is thick and milky, leaving a white deposit wherever it adheres and dries. Fruit round or oblong, rarely seen, much smaller than in the preceding species, maturing in May and very palatable.

Maclura aurantiaca, Nutt. (Osage Orange.)

Spontaneous in Eastern Texas; grows vigorously at San Antonio and wherever planted in Western Texas if near water. Its value as a hedge shrub for valleys and near water-courses is well known.

SAPINDACEÆ.

Ungnadia speciosa, Endl. (Mexican Buckeye.)

Shrub or very small tree, common along rocky valleys and in mountain arroyos west of San Antonio.

The 3-lobed pods contain 3 or more seeds, in shape and size much like small chestnuts. These, although pleasant to the taste, are quite poisonous; cooking does not render them innocuous. An adult can eat one or two with impunity; three or four soon produce giddiness and a sensation of heat and discomfort at the pit of the stomach. In a robust child four years old who came under my observation, after eating two or three of these "beans," the toxic symptoms were quickly produced. Within half an hour he grew very giddy, staggered up to his mother, asked for water and then fell. An emetic of mustard was promptly and successfully administered. A few minutes afterward I found the

* Capul is the Mexican equivalent for berry; it is applied to the fruit of several shrubs, and sometimes, by extension, to the shrubs themselves.

patient with face very pale but resting quietly, free from nausea or pain; there was no inclination to sleep, the pupils were about normal and the respiration natural; the pulse was very high and seemed to be the only serious symptom. Entire recovery followed in a few hours.

Æsculus flava, Ait., and var. *purpurascens*, Gray. (Sweet Buckeye.)

Arborescent shrubs, seen on the Comal near New Braunfels, not extending south or west of that point.

Acer grandidentatum, Nutt. (Small-leaved Maple.)

Small or medium-sized tree, seen in the cañons of the Guadalupe, Orgau and Chisos Mountains, the only maple of Western Texas. Wood hard, close-grained, and probably susceptible of a fine polish.

Negundo aceroides, Mœnch. (Box-Elder; Ash-leaved Maple.)

Medium-sized tree on the San Antonio, Medina and other streams east of the Pecos. The abundant sap of this tree contains a large proportion of sugar, together with mucilaginous and demulcent principles, which make it a very pleasant beverage. It is obtained in the early spring by driving a tube, or else cutting out a pocket, into the lower part of the trunk.

Sapindus marginatus, Willd. (Soap-berry.)

Tree often 30 feet or more high, with straight stem seldom a foot thick, common along creeks throughout Western Texas. As a green and thrifty shrub, in a dry and parched district, it is often an indicator of water on or near the surface.

Wood sulphur-yellow, hard, close-grained, resinous and brittle, susceptible of a very fine polish; makes excellent fuel.

The whitish berries, the size of small marbles, have a translucent pulp neutral to litmus paper, rich in mucilage and a detergent principle. A few of them rubbed between the hands will clean them, with hardly any lather, as well as soap. From their neutral reaction they might be found useful in the washing of delicate fabrics.

RHAMNACEÆ.

Rhamnus Carolinianus, Walt. (Alder-Buckthorn.)

Shrub or very small tree on the banks of streams; San Antonio westward to the Pecos; nowhere common.

Rhamnus Purshiana, DC.

Stout shrub in the Guadalupe and (what seems nearest to it) in the Chisos Mountains.

Zizyphus obtusifolius, Gray. (Lote-bush; Texas Buckthorn.)

Next to Mezquit, the most widespread and abundant shrub in Western and Southern Texas, on gravelly mesas, slopes and bluffs. Of quick growth and very hardy, with diffuse and strongly-armed branches, it makes excellent hedges in dry pastures. The large, round, black berries are eaten by Mexicans although nearly tasteless.

I failed to discover the *Z. lycioides* which I judge to be very rare, if at all present, in Texas.

Condalia obovata, Hook. (Brasil; Logwood.)

Shrub at San Antonio and westward, often with the preceding and nearly as common. Becomes a small tree, 20 feet high, on the Lower Rio Grande and along the coast. Wood very hard, of a brick-red color, containing a red (some say purplish) dye. Evergreen of hardy growth in dry, rocky soil, with stiff and thorny branches, making pretty and effective hedges. The small, deep-red berry (capul negro) is acidulous, nice to eat and makes fine jelly.

Condalia spathulata, Gray, and *C. Mexicana*, Watson.

Evergreen shrubs, smaller than the preceding, the former common in Western Texas, the latter on the Lower Rio Grande. Both horridly spinose and excellent hedge-plants. Berries the same as in the preceding.

Ceanothus Fendleri, Gray.

Very thorny and spreading bush in foot-hills beyond the Pecos; also a possible hedge-plant.

Karwinskia Humboldtiana, Zucc.

The Coyotillo of the Mexicans on the Lower Rio Grande; common on the Pecos near its mouth and thence eastward to the coast. Shrub with beautifully penninerved, ovate leaves, and brownish-black berries said to be very poisonous. The virulent principle lies in the seed, the pulp being innocuous. The symptoms are those of paralysis of the spinal cord, primarily affecting locomotion.

OLEACEÆ.

Fraxinus viridis, var. *Berlandieriana*, Torr. (Texas Green Ash.)

The most common Ash of Southern and Western Texas. Large tree in the Chenate Mountains, smaller in the Limpio and Guadalupe Mountains; found also as a medium-sized tree on the Pecos, Devil's River, and most streams farther eastward to San Antonio; occurs sparingly on the Lower Rio Grande, the Gulf Coast, and the water-courses of Southeastern Texas.

Wood hard, tough and close-grained, but rather devoid of elasticity.

Fraxinus pistaciæfolia, Torr.

Low, spreading tree, with trunk 1 foot or more in diameter; frequently planted about El Paso and down the Rio Grande to San Elizario, on account of its quick growth. Also seen as a small tree at the base of the Guadalupe Mountains.

Wood softer than that of the preceding.

Fraxinus pubescens, Lam.

Seen as a small tree on the summit of the Guadalupe Mountains, and nowhere else.

Fraxinus cuspidata, Torr.

Small tree in the Chisos Mountains and some of the cañons of the Great Bend.

Fraxinus Greggii, Gray.

Stout shrub, noticed near the mouth of the Pecos and at Maxou's Spring; only good for fuel.

Forestiera reticulata, Torr.

Small tree, only seen in cañons near the mouth of the Pecos.

Forestiera angustifolia, Torr.

Stout shrub, rather common on bluffs and in mountain arroyos, with a black, edible, but not very palatable, berry.

BORRAGINACEÆ.**Cordia Boissieri**, A. DC. (Anacahuíta.)

A small tree on the bluffs of the Lower Rio Grande, with hard, close-grained wood. Its various parts, flower, fruit, leaf and wood, all impregnated with the same pleasant aromatic principle, are popularly used by Mexicans in bronchial affections. An extract of the wood is kept in drug stores and prescribed for colds, asthma, phthisis, &c.; it probably acts as a stimulating expectorant and diaphoretic. The fruit is nearly an inch long, with a pointed stone and pulpy, sweet mesocarp of which Mexicans are fond. Most animals, likewise, eat it. A jelly made with it is given to coughing children. A decoction of the leaves is also used internally and externally in rheumatism.

Ehretia elliptica, DC. (Anaqua.)

Seen sparingly near New Braunfels; very common on the Lower Rio Grande as a tree 20 to 35 feet high and stem 1 to 2 feet in diameter, with dark green foliage. Wood tough, making good lumber and fair fuel. Fruit the size of a large pea, yellow, with a thin, edible pulp.

ANACARDIACEÆ.**Rhus copallina**, L. and var. **lanceolata**, Gray. (Dwarf Sumach.)

Shrub, 8 to 12 feet high, found, the variety chiefly, in many places west of San Antonio.

Rhus virens, Lindb. (Live Sumach.)

Shrub found in shady arroyos and on lower slopes of mountains, west of the Nueces River. The leaves, mixed with tobacco, are smoked by Mexicans and Indians.

Rhus aromatica, var. **trilobata**, Gray, and **R. microphylla**, Engelm.

Both abundant on bluffs and slopes.

R. copallina contains tannin in its leaves and bark; this acid may also be present in the other species mentioned. The berries of all Sumachs are astringent, acidulous, and make agreeable infusions.

Rhus Toxicodendron, L. (Poison Ivy.)

Very common woody climber on all the streams of Western and Southern Texas, readily recognized by its trifoliate (rarely quinquefoliate) leaves.

The peculiarly distressing eczematous inflammation produced by the leaves of this plant, even without actual contact, is well known. It is said to be promptly checked and cured by the fluid extract of *Serpentaria*. The tincture of *Grindelia robusta*, the Gum-plant of California, used as a remedy in poisoning by *Rhus diversiloba*, and that of *G. squarrosa*, a common herb in W. Texas, may also be found useful against Poison Ivy.

Pistacia Mexicana, HBK.

Small tree, with an edible nut, found by Bigelow near the mouth of the Pecos. I failed to see it in that locality or anywhere else in Texas.

VITACEÆ.

Vitis candicans, Engelm. (Mustang Grape.)

Common along streams, at San Antonio, westward to Devil's River and southward to the Rio Grande. The best of the wild Texas Grapes, the small bunches of large berries maturing late in June. A form was seen on the Rio Salado, near San Antonio, with more acidulous berries, ripening later in the summer.

Vitis æstivalis, Mx. (Summer Grape.)

High climber, common at San Antonio and westward to Devil's River. Berries rather acerb, much smaller and maturing later than in the preceding. The var. *cinerea*, common at Dallas, is rare in Southwestern Texas. A form (close to *V. riparia*) was seen in the cañons of the Bofecillos Mountains and farther west, with very palatable fruit ripe in August.

Vitis riparia, Mx. (Arroyo Grape.)

Common in most watered cañons in Western Texas. Thrifty climber, the small but excellent berries maturing in October.

Vitis rupestris, Scheele. (Mountain Grape.)

Small, bushy plant, a few feet high, rarely climbing. Said to grow on the hillsides of the Limpio and other mountains. I only found it in the valley of Devil's River. Berries in very small bunches, ripening in June.

Vitis incisa, Nutt. (Yerba del Buey.)

Ornamental vine, with 3-lobed, or trifoliate, shining, fleshy leaves; common on fences and walls at San Antonio, and south and west of it in shady places. The long, filamentous roots bear large, globose, tuberous thickenings, like marbles or balls strung on a string, which are very poisonous, causing violent vomiting and purging.

The stem and foliage are said to cause, on susceptible persons, the same eczematous eruption as Poison Ivy. The juice of the purple berry "is mixed with cochineal and used by Mexicans to dye red".

ROSACEÆ.

Prunus Americana, Marsh., var. *mollis*, T. & G. (Wild Yellow Plum.)

Small tree, rather sparse on the San Antonio River and tributaries, with yellow fruit, smaller and less palatable than that of the species in the Northern States.

Prunus rivularis, Scheele. (Creek Plum.)

Small shrub, not uncommon on the Colorado and its tributaries, bearing excellent red plums in August and September. Also found in foothills, but with smaller stem and fruit.

Prunus Capollin, Zucc. (Choke Cherry.)

Closely allied to *P. Virginiana* and *demissa*, into which it may run. Found in most mountain cañons of Western Texas, from a stout shrub to a tall, slender tree 1 foot in diameter (Chisos Mountains). The round, black fruit, the size of a large pea or small marble, is pleasantly acidulous.

Cratægus subvillosa, Schrad. (Texas Black Thorn.)

Small tree, on the San Antonio River and tributaries, rare farther west and south.

Rubus trivialis, Mx. (Low-Bush Blackberry.)

Common at San Antonio and along the streams farther west and south.

SOLANACEÆ.

Solanum elæagnifolium, Cav. (Trompillo.)

One of the most common of weeds in all valleys of Southern and Western Texas. To the large, purplish-violet flowers succeed berries, at first green, turning yellow and then black as they mature, the size of small marbles. These berries, when ripe, although they give no acid reaction, have the remarkable property of curdling milk, and are used for that purpose by the natives of Northern Mexico and Southern Texas. They are crushed into powder; this is put into a small muslin bag which is left suspended in the milk until coagulation has taken place.

According to Dr. Gregg, Mexicans also use the fruit as a sudorific and sternutatory.

Probably the larger berries of *S. Torreyi* have analogous properties.

Nicotiana glauca, L. (Coneton; Tronadora.)

Rare along the Rio Grande (only found at two or three places in the wild state); frequently cultivated in gardens as a handsome, ornamental shrub of very quick growth. The young stems are easily killed by

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frost, but new shoots spring forth which during the first summer reach the altitude of 12 to 15 feet.

The large, glaucous, thickish leaves are used as healing and anodine poultices.

Nicotiana repanda, Willd., and *N. trigonophylla*, Dunal. (Wild Tobacco.)

Herbs common, the first at San Antonio and westward to Devil's River, the second west of this stream; the nearest Texan relatives of smoking tobacco. Although not entirely devoid of aroma they do not seem of much account for smoking.

Capsicum baccatum, L. (Bird Pepper; the Chiltapin of Mexicans.)

Very small, slender shrub, sparsely found in Southwestern Texas. Its red, oval berries are exceedingly pungent and highly prized as condiment.

EUPHORBIACEÆ.

Euphorbia albomarginata, T. & G., *E. stictospora*, Engelm., *E. cinerascens*, Engelm., &c.

Small, prostrate herbs, common in Western Texas where, as in Chihuahua and Sonora, they are known as Golondrina and reputed effective antidotes against the poison of rattlesnake. The var. *appendiculata* of the last-named species, according to Mr. Thurber, is regarded by the Mexicans of Sonora as a certain cure for the bite of rattlesnake and other venomous animals: "The bruised fresh plant, or the dried, steeped in wine, is applied to the wound. A tincture of the plant is sometimes kept in the apothecary's shops of that country."

Euphorbia antisiphilitica, Zucc.

On the gravelly and limestone hills of the Rio Grande; "remarkable for its long, terete, nearly leafless branches, which resemble an *Equisetum*." Whether this herb is endowed with such properties as its name indicates, I have been unable to ascertain.

Mozinna spathulata, Orteg. (Sangre de Drago, or simply Drago.)

Erect, shrubby plant, with simple, flexible, brownish stems, bearing wart-like spurs from which grow linear spatulate, or 3-lobed, leaves. Common on the gravelly bluffs of the Rio Grande.

The stems, from their flexibility and toughness, can be used as withes and whips. They, as well as the roots, contain a reddish, astringent juice which becomes quite frothy when rubbed, and are employed by the natives as a remedy to cleanse the teeth and harden the gums. The juice can also be used to make indelible marks on linen.

Jatropha macrorrhiza, Benth. *J. multifida*.

Species of Spurge-Nettle, with slender, reclining stems and pretty foliage, growing from a large, globular rhizoma. Common on the Lower

Rio Grande where it is called Jalapa by Mexicans. The rhizoma is emetic and purgative; it is kept, powdered, in the drug stores of Northern Mexico. The seeds are also strongly purgative.

Croton corymbulosus, Engelm. (Encenilla; Chaparral Tea.)

Very common weed of valleys and prairies. An infusion of the flowering tops, either green or dried, makes an excellent tea having sudorific, carminative and tonic properties, but devoid of stimulating and astringent principles. It is much used by Mexicans, Indians and colored United States soldiers. The latter prefer it to coffee in the field.

The *C. suaveolens*, a small shrub in the foot-hills of mountains, exhaling a delicious fragrance, would probably likewise make an excellent tea.

Acalypha Lindheimeri, Müll.

Perennial herb, with many weak, ascending, downy stems, on hillsides in Western Texas. "According to Dr. Gregg, this plant is used by Mexicans as a wash for sore gums and loose teeth, and as an application to ulcers."

ZYGOPHYLLACEÆ.

Larrea Mexicana, Moric. (Creosote-Bush.)

Very common shrub on gravelly mesas and bluffs west of the Pecos. It owes its name to the unpleasant tarry odor which it exhales. The branchlets are often covered with an abundant red-brown exudate from which, according to Dr. Loew, can be obtained a red coloring matter showing all the reactions of cochineal. The leaves contain a peculiar resinous substance, soluble in alcohol, to which is due the peculiar smell of the plant and its active properties. It is principally used in rheumatic affections by the Mexicans, who bathe in an infusion of the branchlets and leaves. This infusion is acrid and nauseous and does not seem to be ever taken internally. It is used by Mexican shoemakers to dye leather red.

The green branches and foliage burn with a bright blaze giving off intense heat, and are much used in lime-kilns.

Porlieria angustifolia, Gray. (Guayacan.)

Evergreen, straggling shrub on bluffs, or a very small tree in valleys and sheltered cañons, from the Lower Rio Grande to San Antonio and the Pecos; more sparingly beyond.

This shrub has probably, in a varying degree, all the properties of the genus *Guayacum* to which it is closely allied botanically. Wood heavy, close-grained, very compact olive-green in the center and with a large yellowish zone of sap-wood. Although somewhat brittle, it must be of much value to cabinet-makers. A decoction of it is used by Mexicans as a vascular stimulant and sudorific, in rheumatism, amenorrhœa and venereal diseases.

Posts of Guayacan are said never to decay, and therefore must be of much value for fencing. The bark of the roots, ground, possesses strong detergent properties and is reputed excellent to wash woolen fabrics.

RUTACEÆ.

Xanthoxylum Clava-Herculis, L. *X. Carolinianum*, Lam. (Prickly Ash; Tooth-ache-Tree.)

Prickly shrub, with pinnate leaves; common on banks of streams.

Xanthoxylum Pterota, HBK. (Colima.)

Very common shrub on the Lower Rio Grande; distinguished from the preceding by the winged-margined petioles and smaller leaflets. Wood yellow, dense, exceedingly hard and heavy.

The bark, leaves and fruit of these two species are very pungent and acrid, causing a strong and lasting tingling sensation in the tongue and lips, followed by partial numbness. The former is officinally used in decoction as an arterial and nervous stimulant. The leaves of both, chewed, are an effective sialogogue.

Helietta parvifolia, Benth. (Barreta.)

Shrub common on the bluffs of the Lower Rio Grande, apparently only good for fuel.

Ptelea trifoliata, L. (Hop-Tree.)

Shrub or very small tree on the San Antonio River and other streams of Western Texas.

Ptelea angustifolia, Benth.

Shrub said to occur on the Lower Rio Grande; probably rare.

SIMARUBEÆ.

Castela erecta, Turpin. (Goat Bush; the Amargoso of the Mexicans.)

Stiff, branching, prickly shrub, 3 to 5 feet high, common on the gravelly bluffs of the Lower Rio Grande from Eagle Pass downward. An excellent hedge-plant for high and rocky places.

The bark is intensely bitter and probably contains tannin and some principle akin to quinine. Its decoction is used by Mexicans as an astringent, tonic, and febrifuge. The remarkable properties of this bark, and perhaps of the wood, seem to warrant fuller investigation.

Kœberlinia spinosa, Zucc. (Junco.)

Very curious shrub, destitute of apparent foliage, the green, stiff, very intricate branches all tapering into thorns. Common in Western and Southern Texas from El Paso to Brownsville. On the Lower Rio Grande it becomes arborescent. Makes quite formidable hedges.

Wood of a very deep brown color, resinous, hard and heavy; it burns with a bright blaze, giving off intense heat and a disagreeable smell.

LILIACEÆ.

Yucca baccata, including var. *australis*, Eng. (Spanish Bayonet or Dagger; the Palma Criolla of the Mexicans.)

Variable in size, from a mere cluster of leaves on a very short caudex to a tree 30 feet high and 18 inches or more in diameter. Common on high mesas throughout Western and Southern Texas; specially large and thrifty on the wide slopes leading up to the base of mountains.

The leaves of this *Yucca* yield an excellent textile fiber; for this and other reasons it is considered one of the most valuable economic plants of Texas.

Every year a tuft of leaves, from ten to twenty, grows on or near the summit of the plant; they attain their full development the second season, with the inflorescence of the gorgeous panicle of flowers, and for several years remain green and pliable. As the tree becomes fifteen or more years old, the lower leaves begin to shrink; later they droop and wither into membranaceous shreds, forming a thick thatch around the stem of the tree. This thatch is very useful for kindling fires in the field, the inner layer always remaining dry in rainy weather.

On old trees, the only available leaves, that is, those of the last four or five years, are about the summit and therefore of difficult access; they are also likely to be short and dwarfed. The best leaves are those produced by trees not more than about fifteen years old; before that age has been reached several hundreds of leaves can be collected. In order not to injure the growth of the stem, the last one or two clusters, near the top, should be spared. It would be well to cut off the young flower stalk as soon as it is fairly developed in order to divert the sap into the leaves.

The length of the full-grown leaf is 3 to 4 feet, yielding a fiber averaging 3 feet and 3 inches. This fiber is not as strong as that of the Lechuguilla, but is said to compare favorably with that of hemp; it is whiter, smoother and more flexible than the former, and makes prettier fabrics. It is obtained by the same process.

The leaf, when slightly parched, becomes very supple and can be split into several strands which are used as whips and withes, and made to answer all the purposes of rope and string; with them are tied up the sheaves at harvest time, the bundles of hay cut on the mesas, the various articles carried on the saddle and the burro's pack, &c.

The roots, pounded and reduced to a pulp by adding water, are used by Mexicans and Indians as an excellent substitute for soap, under the general name of "amole," and are not probably much inferior in this respect to Lechuguilla leaves. According to Dr. Loew, they contain sugar, resin, tannin, gum, and saponin. The latter substance is what makes this "amole" foam like soap when shaken or rubbed with water and gives it detergent properties. The parenchyma, or pith, remaining

after the extraction of the fibers, and constituting about one-third in weight of the leaves, may possibly also contain saponin.

Every year this plant puts forth a huge and dense cluster of white flowers, succeeded by fleshy pods which as they mature, assume somewhat the size and shape of bananas. The pulp, half an inch thick, which covers the seeds, is delicious if exactly ripe. Unfortunately it often happens that this pulp decays before, or is eaten up by insects after, maturity. If picked when still a little green and laid in a dry place, the pods will ripen sufficiently in a few days to be very palatable.

They are also distilled; from them much aguardiente, or rum, is made in Northern Mexico.

Yucca angustifolia, Pursh, and *Y. rupicola*, Scheele.

These two species, common, the former west and the latter east of the Pecos, are also "amole" plants, containing in their roots more or less of the detergent saponaceous substance described above. As textile plants they are of but little importance.

Dasyilirion Texanum, Scheele. (Bear Grass; the Sotol of the Mexicans.)

Characterized by a thick tuft or cluster of long, green, armed leaves, from the midst of which rises periodically a stout stem 10 to 12 feet high, bearing a long, close panicle. Abundant west of the Pecos, covering almost exclusively many square miles of arid and stony slopes, the most striking botanical feature of the country. Also found on nearly all the foot-hills of Western Texas.

The stems can be used in building huts where timber is scant, and make fair fuel in places where no other can be had.

The base of the leaves, and the young stems, are full of a nutritious saccharine and antiscorbutic pulp which supplies, specially when cooked, useful and palatable food. Bears are fond of it, as testify the many plants found pulled up and torn open in the spring. After the leaves have been chopped off close, leaving nothing but their white expanded and imbricated bases, the resulting "head" is ready for cooking; it can be boiled, broiled on coals, or baked. Baking, the usual mode of preparing it for food or the distillation of mescal, is done in a small heated pit where it is kept for about twenty-four hours.

The baked head, after pounding, fermentation and distillation, produces a limpid, colorless liquor of penetrating smell and peculiar taste not unlike the smoky flavor of Scotch whisky. It is the Sotol mescal, the ordinary alcoholic beverage of the frontier Mexican population, and in no way inferior to the average whisky found in that country.

The mescal, vino mescal or taquile, of the interior of Mexico, is obtained in a similar manner by the baking and distillation of the head, or cajeta, of the Mexican Maguey (*Agave Americana*). It is a liquor of superior quality to Sotol mescal. It should not be confounded with "pulque," the sweetish, mild beverage so popular in the cities of Mexico,

obtained from the sap of the *Agave Americana*, gathered in the cavity made in the heart of the plant by the removal of the young central leaves.

As a textile plant Sotol is worthless.

Nolina Texana, Watson.

Abundant on all the foot-hills of Western Texas. Used by Mexicans to thatch their huts, or jacals, and make brooms.

AMARYLLIDACEÆ.

Agave heteracantha, Zucc. (Lechuguilla.)

This notorious plant begins west of Devil's River and infests most of the limestone highlands of Southwestern Texas, often covering the ground in such dense patches as to make it impassable for man or beast. It is pre-eminently the textile plant of Northern Mexico.

It blossoms when three or four years old and then dies. Its reproduction from root-stock and seed is easy and rapid. Each plant consists of a cluster of about a dozen leaves armed on the edges with hooked prickles and tipped with a stiff, black spine. They vary in length from 1 to 2 feet and in width from 1 to 2 inches, and yield a fiber of an average length of 15 inches, which is considered the toughest and most durable of any produced in Mexico. With it are made all the ropes (not hair) and most of the bags, mats, &c., used in the Republic. The defects of the Lechuguilla fiber are its coarseness and shortness. It is obtained as follows: The leaves, trimmed and separated, are crushed between rollers which squeeze out a large amount of glutinous, soapy, connective pith; they are then exposed to the sun for half a day or more, when the fibers are easily separated by hand or still better by machinery which, at the same time, removes the remaining pith. The Mexicans, mostly unprovided with machinery, still scrape the green leaves with knives; the shreds and shavings thus obtained are left to dry a few hours upon the ground, then they are thoroughly washed to rid them of all the mucilaginous pith, and finally the fibers are picked or combed apart.

Lechuguilla is the most important of the soap or "amole" plants of Southwestern Texas and Northern Mexico. In the process described above to extract the fiber, the parenchyma or pith squeezed out, constitutes about 40 per cent. of the green leaf; when dried it is a white-yellowish, mucilaginous powder which possesses remarkable cleansing properties, principally due to the presence of saponin. Its composition is very probably analogous to that of the root of *Yucca baccata*, already noticed. Rubbed with water, it foams and lathers, answering the purpose of good soap without, owing to its freedom from alkali, its disadvantages. It imparts a smooth and satiny appearance to the skin, and is used successfully in removing stains from the most delicate fabrics. It tends rather to set than to displace colors, and articles likely

to fade may be washed with this in safety. It is also an excellent wash for the scalp and hair, leaving the latter soft and glossy. If this powder could be compressed into small cakes or tablets, it would doubtless become an important article of trade.

Mexicans and Indians, after removing the prickles, pound the leaves into a pulp which they use instead of soap.

Agave Wislizeni, Engelm. (Texas Mescal.)

The noted Mescal plants of the Arizona Apaches (*Agave Palmeri* and *Parryi*) do not extend to Texas. They are replaced in all the mountains of Western Texas, from the Guadalupe to the Chisos, by a larger and taller species, *A. Wislizeni*, formerly used by Texas Indians in the same way. The heart of the plant, before it puts forth the flowering stalk, with the leaves trimmed off close, forms the "head" which is baked in heated pits. Some of the old pits can still be seen in the Guadalupe Mountains. Cooking develops a large proportion of grape-sugar which renders this head pleasant and nutritious food. The sugar, according to Dr. Loew, exists in combination with citric acid, as a citro-glucosid, and is set free by exposure to heat or on application of cold water.

The leaf contains textile fibers, but they are too short and too few to be of much account. When young it yields by pressure a juice slightly acidulous, laxative and diuretic, therefore a good antiscorbutic.

The young stems, when they shoot out in the spring, are tender and sweet-tasted; they are then eaten with great relish by Mexicans and Indians.

It is probable enough that the leaves and roots contain more or less of the same detergent saponaceous substance as *Lechuguilla*.

Agave Americana, L. (Mexican Maguey.)

This plant, of such vital importance to Mexico, is also spontaneous at a few points in Southeastern Texas where it might be advantageously cultivated, not only for its fiber but also for the pulque and mescal which it yields.

Agave Sisalana, Perrine.

The Ixtli or Pita plant of Mexico, the most valuable of the fiber-producing Agaves, naturalized in South Florida. It has been successfully introduced on the Lower Rio Grande.

CACTACEÆ.

Cereus stramineus, Eng. (Strawberry Cactus; Pitalaya.)

Very common west of the Pecos where it grows in large hemispherical masses; rarer in Southeastern Texas. The ripe fruit is red, 1½ inches long, 1 inch thick, with thin skin bearing but few spines and easily peeled off. It is equal or superior, in quality and flavor, to the best strawberry. The seeds, scattered through the pulp, are so fine as to be unnoticed. Only a comparatively small number of blossoms ripen

their fruit, so that, although the plant is abundant, the berry exactly ripe and untouched by insects is never common. Whenever the traveler notices the pink fruit, glowing through the long spiny straws besetting the stem, he seldom fails to dismount and secure it, even at the risk of getting his hands badly punctured.

Cereus dubius, Eng., and *C. enneacanthus*, Eng.

Species allied to the preceding and common from El Paso down to the Lower Rio Grande; edible fruit, varying in size and quality, seldom ripening.

Cereus dasyacanthus, Eng.

About El Paso and downward to the Cañon of the Rio Grande, on rocky hills. "Fruit subglobose, 1 inch in diameter, green or greenish purple, when fully ripe delicious to eat, much like a gooseberry."

Echinocactus longehamatus, Galeotti. (Turk's Head.)

Common along the Rio Grande, specially in the Great Bend country. Heads 1 to 2 feet in diameter, with long, hooked spines. Fruit ripening in September, 1 to 2 inches long, red, and as delicious as that of the Strawberry Cactus.

E. horizontalionius, Lemaire, and perhaps others, under the name of Bisagre, are sliced, candied in Mexican sugar and kept in confectioneries.

Mamillaria meiacantha, Eng.

Common at San Antonio and southwestward into the Great Bend. The oblong scarlet berries, an inch or less long, are very good to eat.

Mamillaria tuberculosa, Eng.

Common west of Devil's River. The red berries are also very palatable.

Opuntia Engelmanni, Salm. (Prickly Pear.)

This and other species of flat-jointed *Opuntia*, known under the name of Nopal,* abound all over Southern and Western Texas.

The joints, erroneously called "leaves," are readily eaten by cattle and sheep for which they are an important article of food. It is well, as far as practicable, to make them undergo a preliminary scorching for a few moments, over a bright fire, to burn off the bristles and blunt the spines. I have seen cattle eating Nopal leaves with great relish in the open field, although there was good green Grama near by, seemingly indifferent to the many bristles and spines sticking to their noses. There are times when they prefer them to any other food. These leaves contain a large proportion of water and often save cattle and sheep from great suffering in dry seasons. If the time of drought be much pro-

* The Mexican names Nopal and Tuna should not be confounded; the former refers to the leaves, the latter to the fruit of the several species of Prickly Pear.

longed, however, they lose much of their water by evaporation and become very thin; the pulp shrinks and the fibrous frame-work preponderates; in this state they are liable to cause sickness in animals feeding on them. During the three or four winter months, on the Lower Rio Grande, sheep often get no other food than Nopal leaves. Every morning the shepherd cuts down, with his hand-ax, or "machete," the amount required for the day; as a rule he does not fire them. It is to be noted that as long as they feed on them the sheep require no drinking water.

The Nopal leaf is much used by Mexicans and frontiersmen as a poultice in bruises, ulcers and sores of all kinds. It is first slightly toasted to remove bristles and thorns, as well as to warm and soften the pulp; then it is split in two, or simply one of the surfaces shaved off, and the exposed pulp applied to the part. From the testimony of many intelligent people I am inclined to regard this as an excellent healing and gently stimulating application.

It is also useful to clarify water. After being scorched it is mashed into a pulp which when thrown in water, like egg albumen, drags all impurities to the bottom.

Again, this leaf may be prepared for food by boiling it in salt water; if afterwards cut up into a hash with eggs and chile colorado, it makes quite a savory dish.

Opuntia Engelmanni, *dulcis*, and other species of flat-jointed Prickly Pear, common along the Rio Grande and Southwestern Texas, produce large berries, 1 to 2 inches long, full of a purplish pulp, sometimes sweet and pleasantly acidulous, at other times insipid and nauseous, and always full of small, indigestible seeds. Mexicans and Indians are fond of them.

The *O. Engelmanni*, on the Lower Rio Grande, and *O. tuna* in Northern Mexico and California, which under favorable conditions grow stout and tall, with a tendency to spread, are often trained into hedges around houses and gardens, which are as effective as ornamental. These plants are easily grown, as any joint stuck in the ground generally takes root.

Anhalonium fissuratum, Eng. (Peyote.)

Napiform cactus, with flat, fissured top, hardly rising above the ground, producing a handsome pink flower in the early summer. Found on rocky highlands west of Devil's River, specially in Presidio County, extending thence into Mexico.

The fleshy part of the plant is used, and pieces are found in most Mexican houses. An infusion of it is said to be good in fevers. It is principally as an intoxicant that the Peyote has become noted, being often added to "tizwin" or other mild fermented native drink to render it more inebriating. If chewed it produces a sort of delirious exhilaration which has won for it the designation of "dry whisky."

CUCURBITACEÆ.

Cucurbita perennis, Gray. (Calabacilla.)

This creeping vine, with its large, rough, whitish, triangular leaves, is very abundant in all valleys of Western Texas, and extends to California. The fruit, when ripe, is about the color and size of an orange.

Brewer and Watson state, in Fl. Cal., "that the pulp of the green fruit is used with soap to remove stains from clothing, and that the macerated root is used as a remedy for piles and the seeds are eaten by the Indians."

The leaves bruised between the fingers emit a nauseous smell. When eaten by cows in the spring, as sometimes happens, a very disagreeable flavor is given to their milk and butter.

This plant has an enormous fleshy root which enjoys medicinal properties among Texans, but I was not able to ascertain what they are.

Apodanthera undulata, Gray. (Melon Loco.)

Common in places. As the name indicates, the fruit is considered poisonous by the Mexicans. On the contrary, the large napiform root is said to be esculent.

Maximowiczia (Sicydium) Lindheimeri, Watson.

Common in the valleys of Southern and Western Texas. Thrifty ornamental vine, climbing over trees and bushes, with beautiful scarlet, pendent berries, the size of large pigeon's eggs.

Citrullus vulgaris. (Watermelon.)

Found in the wild state, west of the Pecos, in many places where the seeds were carried by water or other agencies.

KRAMERIACEÆ.

Three species and one variety of *Krameria* are common in Western and Southern Texas. They all contain tannin, and, like *K. triandra* of South America, to which they are closely allied, may be found useful medicinal plants.

They are: *K. lanceolata*, a decumbent herb, only ligneous at the base; *K. parvifolia* and its var. *ramosissima*, low, straggling, much branched bushes; *K. canescens*, small bush, one to three feet high, particularly abundant in the Great Bend of the Rio Grande. The latter is called Chacate by the Mexicans who use an infusion of the bark of the root to dye leather brownish-red.

COMPOSITÆ.

Helianthus annuus, L., including *H. lenticularis* of Douglas. (Common Sunflower.)

Abundant in all valleys. Seeds used for food by Indians and to fatten poultry by Mexicans, yielding by expression a fair quality of oil.

Grindelia squarrosa, Dunal. (Gum Plant.)

Common on prairies west of the Pecos, and, like its congener, *G. robusta* of California, probably useful in bronchial affections and as a topical application in poisoning by *Rhus toxicodendron*.

Parthenium hysterophorus, L.

One of the commonest weeds about the streets of San Antonio. Contains a bitter principle associated with an essential oil. An infusion from the tops is said to be useful in some forms of dyspepsia and in intermittent fever.

Hymenatherum Gnaphaliopsis, Gray.

Small, spreading, woolly herb of Southern Texas, called *Lepiana* by the Mexicans, and used by them and the Indians as a remedy for catarrh.

Engelmannia pinnatifida, T. & G.

Perennial herb, common on the high prairies of Western Texas, said to be poisonous.

Bidens Bigelovii, Gray.

Species of Spanish Needles, common in the foot-hills of Presidio County, and valued by Mexicans as one of their best tea plants. The leaves are collected during the time of inflorescence, parboiled and then dried in the sun, when they are ready for use. Their infusion has sudorific, carminative and tonic properties.

Chrysactinia Mexicana, Gray.

One of the *Damianas* of the Mexicans. Small, branching bush, a foot high or more, with heath-like leaves, punctate with round oil glands, exhaling a strong resinous, aromatic odor. Found rather sparingly in rocky foot-hills of Western Texas. Used by Mexicans, mostly as a sudorific, in rheumatism and fevers.

Pectis angustifolia, Torr., P. longipes, Gray, and P. papposa, Gray.

Small, lemon-scented herbs, with abundant star-like yellow blossoms, filling the air with their fragrance. Common in Western and Southern Texas. It is probable they would yield by distillation a rich perfume.

Actinella odorata, Gray. (Limonillo.)

Herb with filiform-dissected leaves, in Southern Texas. Also a perfume plant.

MISCELLANEOUS.

TREES AND SHRUBS.

Diospyros Texana, Scheele. (Mexican Persimmon; the Chapote of the Mexicans.)

Often found on rocky mesas but thrives best in cañons and on the edges of ravines. Common from San Antonio westward and southward. Shrub or small tree 10 to 20 feet high, with soft, white wood.

The black, globose fruit, smaller than its congener of the Eastern States, is about as astringent when green and as sweet when ripe, in August and September. I have not seen any unpleasant effect from its free use in the field. Stains black everything it touches, and Mexicans use it to dye sheep skins by boiling.

Chilopsis saligna, Don. (Desert Willow.)

Small ornamental tree of the Bignonia Order, with willow-like foliage and handsome pink or purplish flowers. Common in all dry mountain arroyos west of the Pecos. Often cultivated in gardens. Mexicans use the flowers in fevers and as a stimulant in cardiac diseases.

Berberis trifoliolata, Moric. (Three-foil Barberry.)

Pretty shrub, 2 to 5 feet high, with stiff, trifoliolate, spinescent leaves, on gravelly slopes and foot-hills; common from the Gulf Coast to San Antonio, and westward to the Limpio Mountains.

Produces red berries as large as peas, in handsome clusters, ripening in May; they are acidulous, pleasantly flavored, and make excellent jelly.

Berberis Fremonti, Torr.

Rare shrub in mountain cañons, with yellow, very hard wood, and dark-blue berries the size of currants.

Fouquieria splendens, Eng. (Ocotillo; Jacob's Wand.)

Very striking and ornamental plant, with long, prickly shoots, tipped in summer with a cluster of scarlet flowers. Common on rocky mesas from the Pecos to the Colorado.

The cut stems, stuck into the ground, grow with remarkable facility, and are much used by Mexicans who plant them close to one another, forming tall, impenetrable barriers around yards. They are impregnated with a resinous substance which makes them excellent fuel; the small scales, or chips, which can generally be detached from the base, are of great service in starting a camp-fire. The leaves, chewed, are pleasantly acidulous.

Sabal Palmetto, R. & S.? (Palmetto.)

In sparse clumps from the mouth of the Rio Grande up the river to Edinburgh. Tree 20 to 30 feet high, apparently identical with the Palmetto of South Carolina.

Arbutus Xalapenses, HBK.? (Madroña.)

Shrub and small tree in the foot-hills of the Guadalupe, Limpio and Chisos Mountains, with soft wood only fit for fuel. Yellowish-red berries, the size of currants, rather pleasant-tasted.

Bumelia lycioides, Gærtn.

Called Coma by the Mexicans on the Lower Rio Grande where it becomes a tree with stem a foot thick. Wood tough and compact, making excellent ax-handles. The black berries are edible but not very palatable.

Ribes viscosissimum, Pursh.

The only Gooseberry seen in Western Texas, growing sparingly in the Guadalupe Mountains.

Ribes aureum, Pursh. (Buffalo Currant.)

The only Currant seen; in shady ravines; rare.

Cocculus Carolinus, DC.

Very common climber along streams, with edible red berries the size of small peas.

Lippia lycioides, Steud.

Very common shrub on rocky slopes, with long sprays of white flowers exquisitely fragrant. Foliage eaten by cattle, sheep and goats.

Lantana Camara, L.

Low bush, with dark green foliage and handsome golden-orange flowers, considered poisonous to sheep and cattle in Southeastern Texas; it is noticed they always shun it, even where grass is scant.

HERBS.

Rumex hymenosepalus, Torr. (Cañagre.)

This Dock or Sorrel, a noted tannin plant, is easily distinguished by its very large, ovate-lanceolate leaves, a foot or more long, but more particularly by the large membranaceous, pinkish sepals, half an inch or more broad. Common west of the Pecos, in valleys and generally not far from streams. Thrives best in light, sandy or gravelly soil. I have seen it flourishing, near El Paso, on sand hills 30 feet or more above the level of the Rio Grande.

Annual, chiefly propagated by its tubers. Stem 2 to 3 feet high, withering early in summer. Followed under ground, it becomes white and slender, and at a depth of about a foot gives off a first cluster of tuberous roots which lead to other clusters, so that a single plant often yields ten to fifteen tubers. Each of these is 2 to 4 inches long and 1 to 2 thick, with yellowish-brown pulp very astringent and bitter to the taste.

When dug out during the winter, Cañagre tubers can be kept a year or more without deteriorating or impairment of their germinative power. If planted in the spring, they sprout in three or four weeks. At San Antonio, where Colonel Terrell, U. S. A., had quite a number planted, apparently under favorable conditions, they nearly all sprouted in time and the young plants thrived until they became 6 inches or more high when they suddenly withered and died; whether from drought, careless tilling, or other cause, I was unable to ascertain.

According to the analysis made by the Department of Agriculture (Report for 1878), the air-dry roots, with 11.17 per cent. of moisture, contain 23.45 per cent. of tannic acid, equivalent to 26.30 per cent. of tannin in strictly dry root. This tannic acid is of the variety known as rheo-tannic acid and identical with that existing in rhubarb. Besides this acid, alcohol also extracts some sugar and a red substance

soluble in water (aporetin). This root contains also a considerable proportion of starch.

Mexicans use an infusion of the mashed tubers for tanning. The skins, after being dried, are simply placed in vats full of this infusion. A reddish color is at the same time imparted to the leather.

The foliage is intensely bitter and astringent so that it probably also contains tannin.

Eriogonum.

Several species of *Eriogonum* grow abundantly on the slopes and foot-hills of Western Texas. It is probable that the roots of some of them contain tannin. The long, tapering roots of *E. longifolium* are very astringent to the taste, probably owing to the presence of this acid.

Calophanes linearis, Gray.

An inconspicuous member of the Acanthus Family, common herb on dry prairies, with opposite, narrow leaves one to two inches long, and showy purple axillary flowers leaving after them the persistent calyx with long, hispid sepals. This is the Snake-Plant of Northern Coahuila and the Lower Rio Grande.

The plant, root and all, is bruised or pounded with a little water, or partly chewed in the mouth, and applied to the bite without any further preparation. At the same time it should also be eaten, or, still better, an infusion of it administered internally, *ad libitum*. It is tasteless and to all appearances devoid of active properties. In the Mexican colonial troops stationed along the river, every man carries, by orders, a small package of this plant in his pocket, and the officers are most emphatic in their assurances of its efficacy. I have heard of a man in one of the interior towns of Coahuila who will cause himself to be bitten by a rattlesnake for a dollar, if allowed to use this antidote.

In a region where venomous animals are so common it does not seem improbable that nature may have provided vegetable antidotes against their poison. Every Mexican State boasts a certain number of *yerbas de la vibora*, for the wonderful powers of which everybody seems willing and anxious to vouch. Their very multiplicity, however, makes one seriously doubt the value of any particular one. Whether such natural antidotes exist has not yet been scientifically demonstrated.

Rivina lævis, L. (Small Poke-Weed.)

Herb with lignescent base, common in all shady places, producing red berries with a thin, edible pulp.

Malvaviscus Drummondii, T. & G. (Wild Fuschia.)

Tall and pretty herb of the Mallow Family, at San Antonio and North-eastward, producing, late in summer, palatable scarlet berries which are eaten raw or cooked.

Talinum aurantiacum, Eng.

Elegant little plant, with fleshy leaves and golden flowers, found everywhere west of the Pecos; has a tuberous root good to eat when cooked.

Martynia fragrans, Lindl. (Toloache.)

This Unicorn-plant, not unfrequent in Western and Southern Texas, is endowed, in the fertile imagination of the Mexicans, with the remarkable property of developing, in those to whom it is administered, gradual and permanent insanity.

Nasturtium officinale, R. Br. (Water Cress.)

Whether introduced or native, has taken possession of most of the streams in Western Texas.

Selaginella lepidophylla, Spring. (Siempre Vive; Rock Rose.)

Very remarkable moss-like plant, common on the limestone bluffs of the Lower Pecos and of the Rio Grande. While apparently withered and dead, it can be collected and kept for months in a dry place, when, if the roots be placed in water, it begins to unfold its curled and prettily dissected fronds, fully expands and becomes green again, remaining so as long as moisture is furnished. It can be allowed to dry and made to revive again many times before losing its vitality.

Eurotia lanata, Moq. (White Sage; Winter Fat.)

Herb of some repute in the Northwest as a winter forage, but of less importance in Western Texas where it is also common, on account of the good quality and abundance of the grass at all seasons.

It is said, by S. Watson, to impart a disagreeable flavor to the meat of cattle fed upon it, and to be used as a remedy in intermittent fever.

Ipomœa Jalapa, Pursh., and *I. Nil*, Roth.

Two species of Morning Glory rather sparingly found in Southern and Southwestern Texas, with thick napiform roots which are more or less cathartic.

PASTURE AND HAY GRASSES OF SOUTH AND WEST TEXAS.

As has already been stated in the first part of this report, the larger part of the State of Texas—that is, about three-fifths of its area—is useless for the purposes of agriculture, but is covered by many species of grasses, which make it excellent pasture-ground. Unfortunately streams and springs are very few, so that immense tracts of luxuriant prairie remain untouched by cattle or sheep on account of the absence of surface water.

The grasses growing on the plains of New Mexico, Arizona, and Western Texas, as well as on the Rocky Mountain plateaus farther north, have acquired a wide reputation “for their rich, nutritious properties, for their ability to withstand the dry seasons, and for the quality

of self-drying or curing, so as to be available for pasturage in the winter."* This property of self-curing is well worthy of consideration. It enables cattle to find ample food during the winter by roaming at freedom, without shelter, over the vast western table-lands, where they are rapidly increasing, taking the place of the nearly extinct buffalo. It renders the raising of sheep particularly remunerative in Arizona and Western Texas, where frost and snow are rare.

According to General Alvord, quoted by Dr. Vasey, grasses are self-cured only on plains and plateaus 3,000 feet or more above sea-level. The Staked Plains and most of the prairie lands west of the Pecos are at or above that elevation, but the greater part of the pasturage east of the Pecos and south of Austin is below it; and yet it can hardly be denied that the grasses of this lower region, even those of Southeastern Texas between the Nueces and the Rio Grande, are also capable of the autumnal drying, which makes them available for winter grazing. On the very coast, two or three hundred feet above sea-level, between San Diego and Corpus Christi, are large herds of cattle and flocks of sheep, which during the winter get no other food than the native grasses of the prairie. It seems, therefore, that elevation, although an ordinary, is not a necessary factor in the process under consideration, and that the degree of atmospheric dryness required for its (perhaps less perfect) accomplishment can exist at low altitudes.

Among the many excellent grasses clothing the vast prairies of South and West Texas the Gramas, owing to their abundance and nutritive qualities, stand pre-eminent. Of the ten species collected the following are most worthy of note:

Common or Blue Grama (*Bouteloua oligostachya*); grows everywhere throughout Texas, wherever grass can fairly grow—in thrifty, dense patches on low prairies, thin and sparse on alkali flats and rocky slopes. It forms a large proportion of the hay delivered at the various military posts and stage stations, and is considered the best obtainable. It cures itself in the most perfect way, so that, although often dead and dry on the parched prairie, it suffers no loss of properties. Analysis (Rothrock, Bot. West of the One Hundredth Meridian) shows that it contains comparatively little water and fiber, a large quantity of sugar or sugar-forming material, fat, and aqueous extract.

Black Grama (*B. hirsuta*); hardly distinguishable from the last in appearance, and equally good; found with it in many places, but in much less abundance.

Tall Grama (*B. racemosa*); grows sparsely with the two preceding species, but is inferior to them in quality.

Many-eared Grama (*B. polystachya*); small, slender grass of good quality, common in thin, scattered bunches on the arid bluffs of the Rio Grande, from El Paso to Eagle Pass and Laredo.

Woolly-jointed Grama (*B. eriopoda*); tall and thrifty, forming dense

* The Agricultural Grasses of the United States, by Dr. George Vasey.

and excellent pastures in the Limpio, Guadalupe, and Eagle Mountains, on the Staked Plains, Upper Pecos, Delaware Creek, &c.

Texas Grama (*B. Texana*); small but excellent, common about San Antonio, thence eastward and southward to the coast and the Rio Grande.

B. Humboldtiana, common on the mesas of Eagle Pass and Lower Rio Grande; *B. Havardii*, on the high prairies of Presidio County.

Equal or superior to the Gramas in quality, but less generally distributed, is the famed Buffalo or Mezquit-Grass (*Buchloë dactyloides*). This invaluable grass, densely tufted and spreading by stolons into broad mats, is the best constituent of sheep pastures. It extends from Northeastern Texas, San Antonio, and Laredo westward to the branches of the Concho. Although hardy and fast spreading, it does not thrive on the dry, sandy plains of the far Southwest, and is rare beyond the Pecos.

A bunch-grass, frequently seen on the bluffs of the Rio Grande and its tributaries, from El Paso to the Great Cañon, with the habit of a Grama, and of excellent quality, is *Cathestechum erectum*, hitherto unnoticed north of the Rio Grande.

From the Concho and Abilene westward to El Paso the most common grass on bottoms and low prairies is *Hilaria mutica*, sometimes called Wire-Grass, which, in the absence of Gramas, affords good grazing for horses and cattle. It forms the bulk of the hay consumed at Camp Rice. Another species of this genus, *H. cenchroides*, a smaller and more delicate grass, grows on the high prairies of Eagle Pass, extending sparingly westward to the prairie district of Marfa.

Common and important is the Red Awned-Grass (*Aristida purpurea*). Under different forms it extends from Dallas, San Antonio, and the Lower Rio Grande to the Rio Concho and the Pecos; thence, in less frequency, over the Staked Plains to El Paso. It forms a large proportion and is one of the best constituents of the hay cut about San Antonio. Another species, *A. dispersa*, is likewise common in the West, but of inferior quality.

The *Pappophorum Wrightii*, which from its hue might be called Purple Grass, is fully the equal of Grama or Buffalo-Grass in nutritive value. I have seen horses and mules turn from green and thrifty Grama to feed on this plant. Unfortunately it is nowhere common; I noticed it on the Pecos and Concho, in the Guadalupe Mountains, and on the broad plains between Alamo Spring and the Hueco Mountains. Another species, *P. vaginatum*, common about Eagle Pass, is a coarser grass.

Less important than the preceding, but also of considerable value, are the following:

Sporobolus airoides, the Salt Grass of the Pecos; grows on all the low

saline prairies of that stream and farther west and north. It purges at first, and may cause severe colic in horses and mules; cattle are but slightly affected, and seem to relish it; it probably affords a useful change of diet.

S. Wrightii, the Maton of the Mexicans, is a tall, coarse grass, growing in large clumps over the Rio Grande bottom. During the winter, in the absence of other grazing, Mexican ponies feed on the Maton, and keep in fair condition. As a hardy perennial grass for saline bottoms, subject to flooding and incapable of cultivation, this plant deserves notice.

Brizopyrum spicatum (Spike-Grass); another salt grass, common on low, marshy places, sometimes affords fair pasturage where hardly any other grass can be found.

Muhlenbergia Texana; abundant on the low, fertile meadows of the West, adding much to the value of pastures.

Andropogon saccharoides and *scoparius* (Beard-Grass); widespread and forming notable constituents of the hay cured in Western Texas, but not considered of very good quality.

Cynodon dactylon (Bermuda-Grass); low and creeping; found mostly along the coast and the Lower Rio Grande; becoming widely introduced and forming most of the lawns in San Antonio; able to withstand heat and drought, and therefore well adapted to dry, sandy soils. It is esteemed a good pasture grass.

Triodia acuminata and var. *monstrosa*; *T. pulchella*; common and widespread, but of inferior quality.

Other grasses highly prized for pasture or hay, and recommended as worthy of propagation on the central and some of the western prairies of Texas, are: Texas Millet (*Panicum Texanum*), spontaneous in the Colorado Valley, where it is much valued, and by many farmers preferred to any other grass; Texas Blue-Grass (*Poa arachnifera*), native on the prairies of the Brazos and the Trinity; in appearance very much like its Kentucky congener, and, it is reported, not inferior to it in quality; Johnson-Grass, or Cuba-Grass (*Sorghum Halapense*), a tall, perennial broom-corn, quick to spread by its root-stocks, very nutritious and productive, yielding three or four crops a year, but most difficult of eradication; Shrader's Grass, also called Johnson Grass at San Antonio (*Bromus unioloides*), a very productive winter grass, of good quality, very hardy on dry prairie, and rapidly spreading on vacant lands about San Antonio.

HEDGE PLANTS OF SOUTH AND WESTERN TEXAS.

In a country where thorny shrubbery abounds we naturally find quite a number of excellent hedge plants, and it is probable that in many places they might advantageously take the place of fences. Hedges can be grown in almost any soil and situation if the right plant

be selected and some care be given to its planting and first growth. Wild seedlings of the proper size, and in sufficient quantity, are always hard to find; it is much better to sow, in a nursery, the seeds of the shrubs selected and raise our own seedlings, which we then can transplant at the most opportune time. This nursery ought to be made in well prepared and manured ground, and freely watered. The following year, the young stems can be transplanted, wherever needed, at the beginning of or during the rainy season; that is, in September in Western Texas, and later east of San Antonio. Transplantation done in the dry season, or without the prospect of several heavy rains to start the plant, would be futile.

Mezquit, as a hedge plant, deserves particular attention. I believe it offers the best chances of success on plains and high prairies. Next in value, in the same situation, I would recommend *Zizyphus obtusifolius* and the several species of *Condalia*. The other native shrubs capable of making good hedges are: *Celtis pallida*, *Castela Nicholsoni*, *Kæberlinia spinosa*, *Prosopis pubescens*, *Acacia Greggii*, *A. Berlandieri*, *A. amentacea*, *A. Wrightii*, *A. Ræmeriana*, *A. Farnesiana*, *Mimosa biuncifera*, *Ceanothus Fendleri*. They have all been already noticed.

SYNOPSIS.

As a useful synopsis, and for convenient reference, the economic plants, already noticed in their proper botanical order, are here grouped according to their several uses and properties, under the following headings:

Used in construction; trees of medium or large size: *Prosopis juliflora*; *Populus monilifera* and *Fremonti*; *Salix nigra* and *amygdaloides*; *Pinus ponderosa* and *flexilis*; *Pseudotsuga Douglasii*; *Quercus virens*, *grisea*, *rubra*, *Emoryi*, *Muhlenbergii*; *Carya olivæformis*; *Ulmus Americana* and *crassifolia*; *Celtis occidentalis*; *Acer grandidentatum*; *Fraxinus viridis* (var. *Berlandieriana*), and *pistaciæfolia*; *Ehretia elliptica*.

Used in cabinet-making, turnery, &c.; trees with hard, colored, close-grained wood: *Prosopis juliflora*; *Acacia Farnesiana*, *flexilis*, *Greggii*; *Sophora secundiflora* and *affinis*; *Juniperus pachyphlæa*; *Juglans rupestris*; *Sapindus marginatus*; *Condalia obovata*; *Celtis pallida*; *Porliera angustifolia*; *Kæberlinia spinosa*; *Cordia Boissieri*.

Used for posts, fencing, fuel; small trees, or stout shrubs: *Prosopis juliflora* and *pubescens*; *Acacia Farnesiana*, *Greggii*, *Wrightii*, *Ræmeriana*, *flexilis*; *Sophora secundiflora* and *affinis*; *Parkinsonia aculeata*; *Salix nigra*, *longifolia*, and *amygdaloides*; *Pinus edulis*; *Juniperus occidentalis* and *flaccida*; *Quercus grisea*, *undulata*, *Durandii*, *stellata*; *Celtis pallida*; *Morus microphylla*; *Ungnadia speciosa*; *Æsculus flava*; *Acer grandidentatum*; *Negundo aceroides*; *Sapindus marginatus*; *Rhamnus Caroliana* and *Purshiana*; *Karwinskia Humboldtiana*; *Fraxinus cuspidata* and *Greggii*; *Forestiera reticulata* and *angustifolia*; *Cordia Boissieri*; *Prunus Americana*, var. *mollis*; *Cratægus subvillosa*; *Larrea Mexicana*; *Por-*

liera angustifolia; *Helietta parvifolia*; *Ptelea trifoliata*; *Kæberlinia spinosa*; *Diospyros Texana*; *Berberis Fremonti*; *Fouquieria splendens*; *Arbutus Xalapensis*; *Bumelia lycioides*.

Furnishing edible fruit: *Prosopis juliflora* and *pubescens*; *Phaseolus retusus*; *Pinus edulis*; *Juniperus pachyphlæa*; *Carya olivæformis*; *Juglans nigra*; *Celtis occidentalis* and *pallida*; *Morus rubra* and *microphylla*; *Condalia obovata*, *spathulata*, *Mexicana*; *Ehretia elliptica*; *Cordia Boissieri*; *Vitis candicans*, *estivalis*, *riparia*, *rupestris*; *Prunus Americana*, var. *mollis*, *P. rivularis* and *Capollin*; *Rubus trivialis*; *Capsicum baccatum*; *Yucca baccata*; *Helianthus lenticularis*; *Cereus stramineus*, *dubius*, *enneacanthus*, *dasyacanthus*; *Echinocactus longehamatus* and *horizonthalonius*; *Mamillaria meiacantha* and *tuberculosa*; *Opuntia Engelmanni* and *dulcis*; *Diospyros Texana*; *Berberis trifoliata*; *Cocculus Carolinus*; *Rivina levis*; *Malvaviscus Drummondii*.

Furnishing esculent parts other than the fruit: *Psoralea esculenta*; *Hoffmanseggia stricta*; *Peteria scoparia*; *Dasylyrion Texanum*; *Agave Wislizeni* and *Americana*; *Opuntia Engelmanni*; *Apodanthera undulata*; *Talinum aurantiacum*; *Nasturtium officinale*.

Yielding sap, gum, or alcoholic liquor: *Prosopis juliflora*; *Negundo accroides*; *Dasylyrion Texanum*; *Yucca baccata*; *Agave Americana* and *Wislizeni*; *Juniperus pachyphlæa*.

Textile plants: *Yucca baccata*; *Agave heteracantha*, *Americana*, *Sisilana*.

Amole or soap plants: *Yucca baccata* and *angustifolia*; *Agave heteracantha*; *Sapindus marginatus*.

Poisonous plants: *Sophora secundiflora*; *Astragalus mollissimus*; *Oxytropis Lamberti*; *Ungnadia speciosa*; *Karwinskia Humboldtiana*; *Rhus Toxicodendron*; *Vitis incisa*; *Apodanthera undulata*; *Engelmannia pinnatifida*; *Lantana Camara*.

Dye plants: *Sophora secundiflora*; *Condalia obovata*; *Vitis incisa*; *Larrea Mexicana*; *Krameria canescens*; *Diospyros Texana*; *Rumex hymenosepalus*.

Tea and coffee plants: *Sesbania cavanillesii*; *Acacia flexilis*; *Croton corybulosus* and *suaveolens*; *Bidens Bigelovii*; *Salvia ballotæflora*; *Hedeoma Drummondii*.

Antidotes against the bites of venomous animals: *Euphorbia albomarginata*, *stictospora*, *cinerascens* (var. *appendiculata*); *Calophanes linearis*.

Tannin plants: *Prosopis juliflora*; *Acacia Farnesiana*; *Rhus copallina*; *Krameria lanceolata*, *parrifolia*, *canescens*; *Rumex hymenosepalus*; *Eriogonum longifolium*.

Perfume plants: *Acacia Farnesiana* and *flexilis*; *Pectis angustifolia*, *longipes*, *papposa*; *Actinella odorata*; *Lippia lycioides*.

Medicinal plants: *Acacia Farnesiana*; *Parkinsonia aculeata*; *Ephedra antisiphilitica* and *trifurca*; *Cordia Boissieri*; *Solanum elæagnifolium*; *Nicotiana glauca*; *Mozinna spatulata*; *Jatropha macrorrhiza*; *Acalypha*

Lindheimeri; *Larrea Mexicana*; *Portiera angustifolia*; *Xanthoxylum Clava-Herculis* and *Pterota*; *Castela erecta*; *Agave Wislizeni*; *Opuntia Engelmanni*; *Anhalonium fissuratum*; *Cucurbita perennis*; *Krameria canescens*, *lanceolata*, *parvifolia*; *Grindelia squarrosa*; *Parthenium hysterophorus*; *Hymenatherum gnaphaliopsis*; *Chrysactinia Mexicana*; *Chilopsis saligna*; *Eurotia lanata*; *Ipomoea Jalapa* and *Nil*.

Ornamental trees and shrubs: *Acacia Farnesiana* and *constricta*; *Sophora secundiflora* and *affinis*; *Parkinsonia aculeata* and *Texana*; *Sesbania Cavanillesii*; *Cassia Wislizeni*; *Leucophyllum Texanum* and *minus*; *Pentstemon baccharifolius*; *Morus rubra*; *Fraxinus pistaciifolia*; *Portiera angustifolia*; *Chilopsis saligna*; *Tecoma stans*; *Salvia regla*; *Nicotiana glauca*; *Berberis trifoliata*; *Fouquieria splendens*; *Buddleia marubiiifolia*; *Yucca baccata* and *angustifolia*.

Pasture and hay grasses: See special section under this heading.

Hedge plants: See special section under this heading.

Forage plants, not grasses: *Prosopis juliflora* and *pubescens*; *Pithecolobium brevifolium*; *Opuntia Engelmanni* and others; *Eurotia lanata*.

Miscellaneous: *Prosopis juliflora*; *Parkinsonia Texana*; *Rhus virens*; *Solanum elaeagnifolium*; *Mozinna spathulata*; *Nolina Texana*; *Opuntia Engelmanni*; *Anhalonium fissuratum*; *Cucurbita perennis*; *Martynia fragrans*; *Sabal Palmetto*.