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The Botany of Texas

An Account of Botanical Investigations in Texas and
Adjoining Territory

by

CHARLES HERMAN WINKLER, M. A.



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COURTESY MO. BOT. GARDEN

FERDINAND JACOB LINDHEIMER
"Father of Texas Botany"

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The benefits of education and of useful knowledge, generally diffused through a community, are essential to the preservation of a free government.

Sam Houston.

Cultivated mind is the guardian genius of democracy. . . . It is the only dictator that freemen acknowledge and the only security that freemen desire.

Mirabeau B. Lamar.

INTRODUCTION

It is the purpose of this bulletin to give an account of investigations of a botanic nature pertaining more or less directly to the flora of Texas and adjoining territory. The information has been gathered from numerous sources—botanical journals, government publications, etc.—that are not generally available to the teacher and student. An annotated list of publications on the botany of Texas has been prepared for the aid of teachers of botany, and is appended hereto.

An Account of Botanical Investigations in Texas and Adjoining Territory

The study of Texas plants, though fragmentary and unsystematic, is as old as the State itself. Prior to her annexation to the Union, and even before the period of the Republic of Texas, Texas had become an interesting field of observation and research for botanists and naturalists.

This early interest in the flora of Texas had its origin in a small collection of about one hundred and fifty species of plants made by Dr. Luis Berlandier, a French scientist travelling in Mexico and Texas during the years 1826 to 1834. As naturalist of the *Mier y Teran expedition*, or *Comision de Limites*, sent out by the Mexican Government to determine the character of the country along the proposed United States and Mexican boundary in 1828, Berlandier made this earliest collection of Texas plants along a route between Laredo and San Antonio. These plants were sent to the Royal Museum at the *Jardin des Plantes*, Paris, and probably to other European herbaria.*

A set of Berlandier's Texas plants came into the hands of Thomas Drummond, an English botanist-collector who had made extensive collections of plants in various parts of North America, and at once revealed to him how different the vegetation of this region is, in general, from that of the United States. He was therefore very desirous of an opportunity for an expedition into this region and, in 1831, while on a collecting expedition into the central and northern portion of the United States, leaving the rest of his party, went to St. Louis, thence south to New Orleans, and in 1833-34 made a botanical tour into Texas, spending about sixteen months collecting plants and birds in the vicinity of Galveston Island. These Texas collections, comprising 700 species of plants and 180 birds, were sent to Sir Wm. Hooker at Glasgow, who liberally patronized this and many similar expeditions in the interest of the advancement of botanical knowledge.

Drummond's letters, written while in Texas, were published

*A set of Berlandier's Texas plants was secured by the Smithsonian Institution in 1855. *The Smith. Inst. 1846-1896*, p. 707.

in *Hooker's Comp. to Bot. Mag.* (1:39-49). They describe the conditions as he found them in this frontier country and enumerate the many difficulties with which the botanist and naturalist of his time had to cope. Transportation with sufficient materials to properly preserve collections was a serious problem, and many plants, sometimes entire collections, reached their destination in a worthless condition. (*)

In 1836, less than two years after Drummond's brief explorations in the vicinity of Galveston Island, Ferdinand J. Lindheimer began a work of the most far reaching importance to Texas botany. Lindheimer had received botanical training at several of the leading universities in Europe, and upon his arrival in Texas he at once recognized the unparalleled opportunity which this region offered to the plant lover. The disturbances incident to the Texas War of Independence and the unsettled political conditions during the early days of the Republic, however, were great hindrances in carrying on his work, and it was not until 1842 that Lindheimer collected plants in large quantities. In 1843, his friend and schoolmate, Dr. Geo. Engelmann, suggested to Dr. Asa Gray that they cooperate with Lindheimer in the classification and distribution of his collections and thus enable him to give his entire time to field work.

During the nine years following this agreement Lindheimer devoted himself almost exclusively to botanical work—collecting and taking notes on the habitat of plants in this region. These collections, consisting of five fascicles, and representing more than 1400 species, were classified and issued to subscribers by Drs. Engelmann and Gray under the title "*Flora Texana Exsiccata.*" The date and size of these several Lindheimer collections is given by Blankinship as follows: Fascicle I, containing 214 species, collected in 1843; Fascicle II, represented in the 1844 collection, with Nos. 215-318; Fascicle III, consisting of Nos. 319-574, of 1845-6; Fascicle IV, comprising Nos. 575-754, collected in 1847-8; and Fascicle V, containing about

*For a brief biographical sketch of Thomas Drummond, see Appleton's *Cyc. of Amer. Biog.*

650 species collected 1849-51. (*) Each fascicle consists of from ten to thirty sets, thus making it possible to distribute the collections to a number of herbaria and subscribers.

The following list of subscribers to "*Flora Texana Exsiccata*," as shown by Gray's unpublished letters to Engelmann, was prepared by Blankinship, and deserves special mention since it shows the very wide interest in Texas botany more than sixty years ago (8).

Alexander, Dr.; England.	Kew Gardens; England.
Bentham, Geo.; England.	Lamson, Prof.; Canada.
Boissier Herbarium; Geneva.	Leman.
British Museum; London.	Lowell, Jno.; Cambridge, Mass.
Braun, Alex.; Berlin.	Oakes, Wm.; Ipswich, Mass.
Buckley, S. B.; Texas.	Olney, S. T.; Providence, R. I.
Carey, S. T.; New York.	Saunders, Wm.; England.
Cleveland, Prof. P.; Maine.	Shuttleworth, R. J.; England.
Durand, Elias.	Smithsonian Institute; Wash.
Engelmann, Geo.; St. Louis.	Stevens.
Fielding, H. B.; England.	Sullivant, W. L.; Ohio.
Gray, Asa; Cambridge, Mass.	Thurber, George.
Greene, B. D.; Boston.	Torrey, Jno.; New York.
Harvey, Prof.; Dublin.	Webb, Barker; France.
Jardin des Plantes; Paris.	

The importance of Lindheimer's work is not generally appreciated. In fact, prior to the publication of Part III of *Plantae Lindheimerianae* (8) very little of this pioneer botanist was known beyond his friends and colleagues, and even now no records of his contributions to the botany of Texas are available to the general reader. Though editor of the leading German paper in Texas for more than twenty years, he never wrote about himself nor his achievements, and praise received for his labors from other publishers and editors was never republished in the columns of his paper.

While his greatest activity as a collector was during the period from 1842 to 1852, Lindheimer did not give up his interest in plants when, in the latter year, he assumed the management and editorship of the "*Neu Braunfelser Zeitung*." For more

**Plantae Lindheimerianae*. III. p. 124.

than twenty-five years he continued to devote such time as his professional duties allowed to botany and added many new species to the collections in his private herbarium. Upon his death in 1879 this entire herbarium came into the hands of the late Prof. Emil Dapprich of Milwaukee, Wisconsin, and together with his collection was exhibited at the World's Fair at Paris. This combined collection of Lindheimer and Dapprich, as preserved in the museum of the National German-American Academy and Teacher's Seminary at Milwaukee, consists of about six thousand species.

In an article on the flora of Texas—"Eine Uebersicht der Flora von Texas"—published in "Aufsaetze und Abhandlungen" (72), we get a glimpse of Lindheimer's knowledge of the botany of this region. We here have an account of the different regions of Texas with their characteristic floras, and a masterly discussion of the ecological factors influencing same. So accurate and complete were the notes accompanying Lindheimer's collections that Dr. Engelmann, although he had never seen this section of the country, could therefrom write an authoritative article "on the Character of the Vegetation of Southwestern Texas" (45).

Lindheimer well deserved the title—"Father of Texas Botany"—given him by American botanists. He was the first to discover the wonderful richness of the Texas flora, and it was his collections together with those of Chas. Wright (also made in Texas) that formed the nucleus of an important and authentic North American herbarium. (See Smith. Rep. 1851, p. 11). (*)

Closely associated with Lindheimer's work, being coincident with it, is the botanical work of Ferdinand Roemer during his sojourn of almost a year and a half in Texas in 1845-6. Roemer was a geologist, but while studying the geology and geography of Texas he also collected plants and made observations on the flora along the route of his travels. In his book—"Texas"—(91) Roemer gives a pleasing description of his visit with Lindheimer in his little cabin on the Comal, near Neu Braunfels, and expresses a high appreciation of him as a scientist and botanist.

*For a biographical sketch of Lindheimer see (1) *Plantae Lindheimerianae* III. pp. 127-141; (2) *Allg. Deutsch. Biog.* 18:697.

Roemer and Lindheimer made numerous botanical excursions in the vicinity of Neu Braunfels, and when the former left to return to Europe collections were exchanged, so that many of the species published in the Roemer collections were really collected by Lindheimer. Upon his arrival in Berlin, Roemer placed his collections in the hands of Adolph Scheele, whose classification and description of them was published in *Linnaea* (95), (96), (97), and in appendix to Roemer's "Texas" (91).

It is quite evident that the work of Roemer in so far as it pertains to the botany of Texas is merely incidental. His collections, although made at a later date than the early collections of *Plantae Lindheimerianae* (46), were published earlier, and thus were given undue prominence in the annals of Texas botany.

Thus far botanical collections in Texas had been confined to the central and southern portions of the State, it being unsafe for the naturalist to venture far beyond the border of the settlements. Following the annexation of Texas, however, one of the first acts of the United States Government was the establishment of a chain of forts along the north and west frontier, which became the base of a series of military explorations that afforded an excellent opportunity for making a study of the flora of the western part of the State.

It was in connection with the movement of troops to these western forts that Charles Wright made his first collections in this region. In 1847-8 he accompanied a troop of soldiers to Eagle Pass, "where he botanized on both sides of the river." (*) In the summer of 1849 he accompanied a small body of troops across the unexplored region between San Antonio and El Paso, returning again in November. The collections of this trip, to the end of Compositae (418 species), are described in Part I of *Plantae Wrightianae Texano-Neo-Mexicanae*, Smithsonian Contributions to Knowledge, 1852. A fact of special interest connected with this trip is that it constitutes the first step taken by the Smithsonian Institution toward the formation of a National Herbarium. The Institution contributed \$150 to-

*Scientific Papers of Asa Gray. II. p. 409.

ward defraying Wright's expenses, in consideration of which it was to be entitled to a full set of the plants collected. (*)

Although Wright's explorations into this western region were fostered by United States troops—for without their protection the journey would have been impossible—and notwithstanding the fact that a part of the expenses were borne by the Smithsonian Institution, all botanical work in Texas thus far has been accomplished through private enterprise. To their love for science, and to that alone, may we attribute the work of Lindheimer, Roemer, and Charles Wright. Enduring many privations and hardships, and with no other hope of reward than the satisfaction of having contributed to the enrichment of the botanical knowledge concerning a region practically unknown, they toiled faithfully and persistently on.

Beginning with the Mexican Boundary survey (1848-1855) the Federal Government inaugurated a plan that in connection with a series of expeditions into this western region resulted in the accumulation of a vast amount of scientific data upon which numerous publications were afterwards based. Under this plan the various corps of engineers engaged in this and subsequent surveys were usually accompanied by a scientific specialist whose duty it was to report upon the natural history of the region traversed. In some instances, in the absence of a naturalist detailed especially for this task, the surgeon of the party acted in his capacity. These natural history reports, in so far as they pertain to botany, were accompanied by large collections of plants and constitute a most valuable addition to the botany of Texas.

A little more than a year after his first botanical tour from San Antonio to El Paso, Charles Wright had an opportunity for further explorations in this section. In the spring of 1851, partly as botanist and partly as one of the surveyors, he accompanied the party under Col. Graham, sent out by the Department of the Interior to survey and determine the United States and Mexican Boundary from the Rio Grande to the

*Smith. Inst. 1846-1896. A history of its first half century. p. 706.

Pacific. The party extended their explorations as far westward as the middle of Arizona, returning in the summer of 1852.

The collections of this second expedition by Charles Wright, of which approximately 650 species are from Texas (117), were the basis of the second part of *Plantae Wrightianae* (51) published by the Smithsonian Institution in 1853. "As Mr. Wright collected more largely than his associate botanists (of the Mexican Boundary Survey), and divided his collections into sets, his specimens are incorporated into a considerable number of herbaria, at home and abroad, and are the types of many new species and genera. No name is more largely commemorated in the botany of Texas, New Mexico, and Arizona, than that of Charles Wright. * * * * Surely no botanist ever better earned such scientific remembrance by entire devotion, acute observation, severe exertion and perseverance under hardship and privation." (*)

Simultaneous with the later surveys of the Mexican boundary were the Pacific Railway Surveys made under the direction of the Secretary of War to ascertain the most practical and economic route for a railroad from the Mississippi River to the Pacific Ocean, (1852-1855). Two lines of the survey crossed portions of the State of Texas: (1) the Whipple Expedition, near the 35th parallel, and (2) the Pope Expedition along the 32nd parallel. "The Botany of the Whipple Expedition" (103), based upon observations and collections made by Dr. J. M. Bigelow, is considered the most important of all the Railroad Surveys. This route traversed the extreme northwestern portion of the state, however, and only a small number of the collections were made on Texas' soil. Dr. Geo. G. Shumard, of the Pope Expedition, made a collection of about 320 species in Texas and New Mexico, which were reported by Torrey and Gray in Volume 2 of the Report of the Pacific Railway Survey (105).

The explorations of the Red River to its source, by Capt. R. B. Marcy in 1852, offered an opportunity for scientific observations in the northern part of the State. Two hundred species

*From biographical sketch of Chas. Wright. Sci. Papers of Asa Gray. II. pp. 468-474.

were collected, chiefly along the headwaters of the Trinity river, by Dr. Geo. G. Shumard, surgeon of the expedition (101).

The years between 1843 and 1855 constitute the period of greatest activity, as well as discovery, in the early history of Texas botany. This period embraces all of the published collections of Lindheimer, the collections of Roemer and Wright, and the collections of the Mexican Boundary and Pacific Railway surveys, as well as the small collection made during the exploration of the Red River. The twenty or thirty years following this period, though there is an occasional report of a small collection, contributed little of importance to Texas botany. S. B. Buckley reported several small collections from central Texas (26, 27, 28) in 1860-1862, and made a collection of 46 species of Cyperaceae in the lower Rio Grande valley in 1878-1883 (21). In 1877 Lester F. Ward, while on an excursion of the members of the American Association for the Advancement of Science through Texas and Arkansas, made a collection of 370 species (266 from Texas). Elihu Hall, in 1872, made a collection of 861 species in eastern Texas, which were listed in *Plantae Texanae* (53).

The next contribution of importance to Texas botany is "A Report on the Flora of Western and Southern Texas," by Dr. V. Harvard, published in the Proceedings of the U. S. National Museum in 1885 (57). This report, based on observations and collections made at several army posts where Dr. Harvard was stationed during the years 1880-1885, gives a general description of the vegetation of the region: but, unlike all previous reports on Texas botany, which were purely descriptive, this report deals with plant formations and discusses them in relation to their environment. In this respect the report really marks the first step in Texas in the transition from a purely descriptive botany to a study of plants in relation to their environment—ecology and pathology. Dr. Harvard also made a study of the economic plants of the region, and in the latter part of his report we have the first account of the economic importance of numerous species having useful or harmful properties.

The publication of Coulter's "Botany of Western Texas" (40), which appeared as Volume II. of the Contributions from the U. S. National Herbarium, 1891-1894, closed the epoch of

descriptive botany in Texas. Henceforth, though this phase of botanical work deserves and will continue to receive attention, descriptive botany is of secondary importance, and the dominant interest in the Texas flora is in its relation to the environment.

Coulter's manual of the Phanerogams and Pteridophytes of Western Texas, as stated in the prefatory note, was compiled for the purpose of bringing together and making easily accessible our scattered information concerning the flora of western Texas. In thus bringing together this botanical knowledge Dr. Coulter has contributed much to Texas botany. His book, appearing just at the time that botany was being added to the curricula in our schools, has been an important factor in stimulating an interest in the flora of our state and an invaluable aid to students in botany. (*).

During the past two decades the ecological phase of botany has received considerable attention in Texas, and a number of publications dealing with the flora in its relation to environmental factors are now available. Dr. Wm. L. Bray, first incumbent of the chair of botany in the University of Texas (**), published several important bulletins upon the ecological relations and adaptations of the vegetation of Texas, particularly the western part of the State. (12, 15, 16, 18, and 19). In 1905, "A Biological Survey of Texas," by Veron Bailey, was published by the U. S. Department of Agriculture, in which the author has mapped out the principle life zones and the range of some of the prominent species of this section of the country.

Occasional monographs upon some particular order or genus, and a number of articles and bulletins in the field of pathology, have appeared during this latest period in the history of Texas botany. The names of Long, Lewis, Heald, and Wolf are especially prominent in this connection. (See Nos. 59-63, 70, and 73-75 in bibliography). Prior to the publication of Long's

*For biographical sketch of Dr. J. M. Coulter, see Appleton's Cyc. of Amer. Biog.

**Botanical courses were first offered in the Univ. of Tex. in Sept. 1897. The School of Botany was established by the Regents of the University in 1899.

articles on Texas fungi, and the results of Heald's and Wolf's "Plant Disease Survey" (63), little had been published upon this important group of plants. The only important references in all previous literature being several lists of collections of Texas fungi (38, 69).

In justice to the investigators engaged in botanical work in this region during this period of the history of Texas botany it should be stated that their achievements, however important, are yet too close to us to be seen in their proper relation to Texas botany as a whole. A glance at the bibliography is sufficient to show the activity in the field of Texas botany during these last two decades.

An Annotated List of Publications on the Botany of Texas

1. Bailey, V. (1905).
Biological Survey of Texas..
N. A. Fauna No. 25, U. S. Biol. Surv. 222 pp.
The life zones, with native species and important crops
2. Bentley, H. L. (1898).
Grasses and forage plants for central Texas.
Bull. 10. Div. Agros. U. S. D. A. 38 pp.
3. ————— (1902).
Range improvement in central Texas.
Bull. 13. B. P. I. U. S. D. A. 72 pp.
A discussion of range conditions, with a description of the native grasses and forage plants recommended for grazing and propagation in central Texas.
4. Berlandier, L. (1850).
Espedicion scientifica a Tejas del general Teran. Diario de viage de la Comision de Limites y R. Chovel. pp. 292-298. Mexico.
A general description of the botanical features of southwest Texas and northern Mexico.
5. ————— (1857).
Espedicion botanica a Tejas.
Bol. Geograf. 5:125-133. Mexico.
6. Bigelow, J. M. (1856).
 - a. General description of the botanical character of the country along a route near the 35th parallel. (The Whipple Expedition).
 - b. Description of the forest trees. (18 species).
Pac. Ry. Surv. 4:1-26. Washington.
7. Birge, W. S. (1911).
The anatomy and some biological aspects of the "Ball Moss," *Tillandsia recurvata* L.
U. of T. Bull. 194. (Ser. ser. 20). 24 pp. pl. 1-10.
8. Blankinship, J. W. (1907).
Plantae Lindheimerianae. Part III.
An. Rep. Mo. Bot. Gard. 18:119-223.
An account of Lindheimer's collections; a sketch of his life; a list of the plants of Fascicles III & IV not previously enumerated, and of Fascicle V; an index to Plantae Lindenheimerianae I-III; with bibliography of Texas botany.

9. Boison, A. T. (1910).
The commercial hickories.
Bull. 80, U. S. For. Serv. 64 pp. pl. 1-6.
Contains maps showing range of eight pecans and hickories.
10. Bray, W. L. (1899).
The flora of Texas as a field for botanical study. *Univ. Tex. Record.* 1:153-171.
Refers to what has been done along botanical lines in Texas and emphasizes the importance of the ecological phase of Texas botany. A discussion of the environmental factors and their influence upon plants.
11. ————— (1900).
Some practical phases of the study of botany.
Univ. Texas Record. 2:136-143.
12. ————— (1901).
Ecological relations of the vegetation of western Texas.
Bot. Gaz. 32:99-123, 195-217, 262-291.
The climatic and edaphic factors in their relation to the vegetation of this region.
13. ————— (1901).
Destruction of timber by the Galveston Storm.
The Forester. 7:53-56.
14. ————— (1901).
Texas forests and the problem of forest management for the long leaf pine lands.
The Forester. 71:131-138.
15. ————— (1903).
The tissues of some of the plants of the sotol region. *Torr. Bull.* 30:621-633.
16. ————— (1904).
The timber of the Edwards Plateau of Texas; its relation to climate, water supply, and soil.
Bu. For. Bull. 49 U. S. D. A. 30 pp. pl. 1-5.
17. ————— (1904).
Forest resources of Texas.
Bu. For. Bull. 47. U. S. D. A. 71 pp. pl. 1-8.
A discussion of the forest resources of Texas, with maps showing (1) natural divisions; (2) chief timber regions; (3) rainfall; (4) distribution of mesquite, and (5) alluvial bottom hardwoods of Texas. Also a list of sixty timber trees native to Texas, giving their distribution, habits and uses.

18. ————— (1905).
The vegetation of the soto country in Texas.
U. of T. Bull. 60. (Sc. ser. 6). 24 pp. pl. 1-11.
Discusses characters of vegetation of this region; the ecological factors; and describes many of the characteristic types.
19. ————— (1906).
Distribution and adaptation of the vegetation of Texas.
U. of T. Bull. 82. (Sc. ser. 10). 108 pp. pl. 1-14.
A consideration of the plant environment and its factors, and of the plant societies of the Texas region.
20. ————— (1910).
The Mistletoe pest in the Southwest.
Bull. 166. B. P. I., U. S. D. A. 39 pp. 2 pls.
A report of investigations of the various phases of the mistletoe and suggestions as to methods of combating the pest.
21. Britton, N. L. (1884).
A list of the Cyperaceae collected by the late Mr. S. B. Buckley from 1878 to 1883, in the valley of the lower Rio Grande in Texas and northern Mexico. (46 species).
Torr. Bull. 11:85-87.
22. ————— (1890).
Contributions to Texas Botany.
Trans. N. Y. Acad. Sc. 9:181-183.
Additions to the list of plants collected by Miss Mary B. Croft at San Diego, Texas.
23. ————— (1890).
Notes on some plants collected by Mr. Frank Tweedy in Tom Greene Co., Texas, in 1879.
Trans. N. Y. Acad. Sc. 9:183-185.
24. ————— & H. H. Rusby. (1887).
A list of plants collected by Miss Mary B. Croft at San Diego, Texas.
Trans. N. Y. Acad. Sc. 7:7-14.
25. Boot, F. (1845).
Descriptions of six new North American Carices.
Boston Jour. Nat. Hist. 5:112-116.
New species of Drummond's Texas Collection.
26. Buckley, S. B. (1860).
Descriptions of several new species of plants.
Proc. Phila. Acad. pp. 443-445.
Nine species from Texas and Louisiana.
27. ————— (1861).
Descriptions of new plants from Texas.
Proc. Phila. Acad. pp. 448-463.
Describes 78 species collected in 1860-1861.

28. ————— (1862).
 Descriptions of new plants from Texas—No. 2.
Proc. Phila. Acad. pp. 5-10.
 Description of 24 species collected in Texas.
29. ————— (1866).
 A preliminary report of the Texas Geological Survey.
 Austin. 92 pp.
 Chiefly geological. Pages 62-87 on trees, fruits and
 grapes. Appendix, pp. 1-4, description of nine new spe-
 cies of Texas grasses.
30. ————— (1870).
 Remarks on Dr. Gray's notes on Buckley's new plants
 of Texas.
Proc. Phila. Acad. pp. 135-138.
 (Also in No. 31, appendix, pp. 137-142).
31. ————— (1874-1876).
 Geological and Agricultural Survey of Texas.
 First and Second An. Rep. of State Geologist.
 General discussion of economic plant resources of Texas.
32. ————— (1883).
 Some new Texas plants.
Torr. Bull. 10:90-91.
 Describes five shrubs and trees.
33. Bush, B. F. (1903).
 A list of the ferns of Texas.
Torr. Bull. 30:343-358.
 A complete list of ferns known to occur in Texas—59
 species. Also a brief review of work on ferns.
34. ————— (1904).
 The Texas Tradescantias.
Trans. St. Louis Acad. Sc. 14:181-193.
 Description of 18 species with key to the Tradescantias.
35. ————— (1905).
 Two new Texas Tradescantias.
Rep. Mo. Bot. Garden. 16:100-101.
36. ————— (1906).
 Some new Texas plants.
Rep. Mo. Bot. Garden. 17:119-125.
 Description of nine species.
37. Carleton, M. A. (1891).
 Observations on the native plants of Oklahoma and adja-
 cent districts.
Contrib. U. S. Nat. Herb. 1:220-232.
 Characteristics of flora of Texas Panhandle north of
 Canadian river.

38. Cooke, M. C. (1878).
List of the Fungi of Texas.
Ann. N. Y. Acad. Sc. 1:177-187.
A record of collections of fungi, in Texas, to date, embracing 149 species.
39. Coulter, J. M. (1890).
Upon a collection of plants made by Mr. G. C. Nealley in the region of the Rio Grande, in Texas, from Brazos Santiago to El Paso county. *Contrib. U. S. Nat. Herb.* 1:29-61.
A list of 851 species including many of the rarer species of the early collections in this region.
40. ————— (1891-1894).
Botany of Western Texas.
Contrib. U. S. Nat. Herb. 2:1-588.
A manual of the Phanerogams and Pteridophytes of western Texas prepared as a convenient reference book for botanists and a handbook for students.
41. Coville, F. V. & D. T. MacDougal. (1903).
Desert Botanical Laboratory of the Carnegie institution. *Pub. Carneg. Inst.* 6:3-4. Washington.
Some characteristic features of the flora of western Texas.
42. Curtis, G. W. (1885).
Grasses.
Bull. Tex. A. & M. Coll. 3:11-13.
43. Engelmann, Geo. (1848).
Plantae Wislizenianae. An addendum to "Memoir of a tour to northern Mexico connected with Col. Doniphan's Expedition in 1846 and 1847 by A. Wislizenus." pp. 87-115. Washington.
44. ————— (1859).
Cactaceae of the Boundary.
U. S. Mex. Bound, Surv. 2:1-78. pl. 1-75.
Catalog and description of 103 species.
45. ————— (1851).
On the character of the vegetation of southwestern Texas. Characteristic features of the vegetation based chiefly on Lindheimer's notes and collections.
46. ————— & Asa Gray. (1845 & 1850).
Plantae Lindheimerianae.
Boston Jour. Nat. Hist. 5:210-264; 6:141-240.
An enumeration of F. Lindheimer's collection of Texas plants, with remarks and descriptions of new species.
47. ————— & J. M. Bigelow. (1856).
Description of the Cactaceae of the Whipple Expedition. *Pac. Ry. Surv.* 4:27-58. pl. 1-24.
Twenty-seven species. Few if any from Texas.

48. Gray, Asa. (1846).
 Characters of some new genera and species of Compositae from Texas.
Proc. Amr. Acad. 1:46-49.
49. ————— (1849).
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