

Proceedings of the Iowa Academy of Science

Volume 26 | Annual Issue

Article 29

1919

The Fern Flora of Nebraska

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Recommended Citation

Fitzpatrick, T. J. (1919) "The Fern Flora of Nebraska," *Proceedings of the Iowa Academy of Science*, 26(1), 311-326.

Available at: <https://scholarworks.uni.edu/pias/vol26/iss1/29>

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THE FERN FLORA OF NEBRASKA*

T. J. FITZPATRICK

Nebraska lies near the center of the region known as the great plains of North America and near the eastern side of the semiarid district. The boundaries are natural or nearly so. Missouri river forms the eastern boundary, the northern boundary lies in the valley of the Niobrara, the southern in the valley of the Republican, while the western boundary is in the foothills. The range is from the 40th to the 43d parallel and the western border is the 104th meridian. The greatest width is 208 miles, the greatest length is 455 miles, the area is 77,530 square miles, of which 712 square miles are water. As to comparative size Nebraska is much larger than all of New England and considerably larger than England and Wales together. The elevation varies from 785 feet to about 5390 feet. As a whole the state has the aspect of a rolling prairie, there being plateaux and foothills only in the western portion. The annual rainfall varies from 35 inches along Missouri river in southeastern Nebraska to 14 inches in the semiarid districts in the western portion. The mean annual temperature varies from 52°F. in the southeastern corner to 45° in the northwest corner. The recorded evaporation data give the average annual total amount from April to September inclusive, for Lincoln, during an eleven year period, as 34.8 inches, and for a three year period at North Platte as 41.3 inches.

The physiographic regions of the state are: (1) river valleys, (2) wooded bluffs, (3) prairies, (4) sandhills, (5) plateau or foot-hill region, (6) pine ridge, and (7) bad lands.

RIVER VALLEY REGION

On the eastern side of the state is the narrow valley of Missouri river. It is bordered by steep and wooded bluffs, broken by numerous ravines. The width varies from half a mile to as much as eight miles. Missouri river meanders between the bordering bluffs, thus leaving a variable width of valley to the Nebraska side. Horseshoe lakes or lagoons are abundant. The soil is of alluvial origin, being of fine silt and sand. Old woods are common.

Platte river, with its main tributary the North Platte, flows across the state through the central portion from west to east. The width of the North Platte where it enters the state is about five hundred feet, while the width of the Platte at its mouth is more than a mile. The valley of the North Platte is deep and narrow, usually less than half a mile in width, but the valley of the Platte varies in width from one to eight miles. The river banks are low and for the most part are treeless. The water is shallow and in many places divides into several streams which are separated by long sandbars or low wooded islands.

Niobrara river flows in a narrow gorge for more than two-thirds of its course in Nebraska. The last fifty miles of its course is through a valley varying in width from half a mile to a mile. Here the banks are low and wooded, the bluffs are steep and densely covered with thickets and young trees, and in places the valleys are heavily wooded.

Republican river enters the state near the southwestern corner, flows eastward through eight counties of the southern tier, then turns southward into Kansas. The valleys are rather broad and treeless, the bluffs low and bare of trees, in the ravines are willow, cottonwood and ash trees, the river banks usually have a fringe of willows. The river is broad and shallow with abundant sandbars.

Big Blue river with its tributaries drains much of the southeastern portion of the state. The current is slow, the bed and banks are muddy, the valleys are broad, level and rich, and along much of their extent are heavily wooded.

The fern species that may be found in the river valleys are *Osmunda regalis* (rarely), *Dryopteris thelypteris*, and *Onoclea sensibilis*. The fern allies are *Equisetum robustum* and *Equisetum fluviatile*.

WOODED BLUFFS REGION

This region consists of narrow strips of country bordering on the river valleys on one side and the uplands on the other. The line of demarcation with the river valley is rather sharp although the woods are in many cases continuous. The separation of the wooded bluffs from the uplands is often not sharply drawn, there being varying degrees of divergence, yet within limits it is distinctive. The wooded bluffs extend in narrow dichotomous strips over much of the state, paralleling the valleys of the main water courses. They reach their greatest development near Missouri river which is the center of their extension westward. Upland woods are an extension

from the wooded bluffs into favorable situations. The trees are of the broad leaf species except in the northwest where there is a development of the yellow pine.

In Nebraska the fern flora reaches its greatest development in this region. The principal fern species of this region are *Botrychium virginianum*, *Adiantum pedatum*, and *Filix fragilis*. In the crevices of the rock cliffs, often more or less exposed, are found: *Cryptogramme acrostichoides* (rarely), *Notholaena dealbata* (rarely and locally), *Pellaea atropurpurea*, *Woodsia obtusa*, and on dry rocky soil *Selaginella rupestris* (rarely).

THE PRAIRIE REGION

The prairies lie immediately west of the Missouri river bluffs and in general cover the eastern half of the state, extending farther westward in the southern portion and being much restricted in the northcentral portion. These prairies with their gently undulating surfaces are the western representatives of those characteristic of Iowa and Illinois and are made up of indiscriminately arranged series of low rounded swells or hills interspersed with broad shallow depressions or limited valleys. The soil is of glacial drift which is quite deep in many places and is more or less veneered with loess. Drainage systems are well established and ponds or lakes are uncommon or rare.

This region is not conducive to fern growth. Where a belt of upland woods occurs *Botrychium virginianum* and *Adiantum pedatum* may be found. *Onoclea sensibilis* and *Dryopteris thelypteris* occur in wet prairie bottoms. Of the fern allies there are *Equisetum arvense*, preferring dry soil, and *Equisetum laevigatum*, preferring moist soil. Both species are abundant to common and widely distributed in this region. *Equisetum variegatum* is rarely found. In ponds *Marsilea vestita* occurs in small numbers or locally abundant. *Isoetes melanopoda* occurs rarely and locally.

THE SANDHILL REGION

The sandhills lie west of the prairies and cover much of the western half of the state, being confined largely to the central and westcentral portions. The eastern boundary of this region is not well marked, the prairies passing gradually into the sandhills, but in general the boundary line is irregular, receding westward in the river valleys and extending eastward along the watersheds. The greatest eastern extension is in the northcentral portion. The western boundary is quite distinct, although there are outlying sandhills in the foothill region. The area is about 18,000 square miles,

a little less than two-fifths of the area of the state. The soil is porous and sandy. The hills are broken, abrupt or rounded, many of them are pitted with blow-outs or crater-like depressions, and the valleys are deep and narrow. The variable contours of the hills and blow-outs are the direct result of the prevailing winds. Drainage systems are poorly established. Large ponds and small lakes occur throughout the region and lakes of considerable size occur near the heads of the water courses, particularly in Cherry, Grant, and Hooker counties. Lost creeks are numerous. These are streams which rise in ponds or springs and flow on the surface for a distance and then sink in the soil to pursue a subterranean course, in some instances coming to the surface for a short distance only to be lost again. The valleys are broad and marshy and their limits are marked by high sandhills. A few buttes occur in the western part. This is the bunch-grass region of the state. Woodland vegetation is scanty.

In favorable situations, usually in moist soil, there occur: *Dryopteris cristata* (rarely), *Dryopteris spinulosa* (rarely), *Dryopteris thelypteris* (locally abundant), *Onoclea sensibilis*, *Woodsia oregana* (rarely), *Marsilea vestita*, *Azolla caroliniana* (rarely), *Equisetum arvense* (in dry soil), *Equisetum laevigatum*, *Equisetum variegatum* (rarely), and *Selaginella rupestris* (locally) which forms mats on sandhills.

THE PLATEAU OR FOOTHILL REGION.

The plateau region, in the western part of the state, comes rather abruptly from the sandhill region. It is an elevated district well marked by numerous isolated buttes and by deep and precipitous ravines. It is the short-grass region of Nebraska.

The fern flora of this region is scanty. The following species have been collected: *Cheilanthes feci*, in canons; *Woodsia oregana*, on buttes; *Marsilea vestita* in ponds; and *Selaginella rupestris*, on exposed dry situations, often forming dense mats on high hills and buttes.

PINE RIDGE REGION

Pine Ridge is a northerly facing escarpment extending from Wyoming into Nebraska near the northwest corner and in the middle western part of Sioux county and extending eastward across Sioux, Dawes, Sheridan, and Cherry counties, approximately parallel with the northern boundary of the state. The ridge varies from a mile to several miles in width and has its greatest develop-

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ment in Nebraska in Sioux and Dawes counties. Eastward it becomes lower and narrower. The ridge is much broken by deeply cut canons crossing transversely to the general trend. Along this ridge upon the canon sides is a development of the western yellow pine (*Pinus ponderosa scopulorum*). The vegetation peculiar to Pine Ridge extends farther eastward across Brown, Rock, and Keya Paha counties. Pine Ridge is essentially a variation of the wooded bluffs region.

In favorable, usually moist situations are found: *Botrychium virginianum*, *Athyrium filix-foemina* (rarely), *Cystopteris fragilis*, *Dryopteris spinulosa*, *Dryopteris thelypteris*, *Woodsia oregana*, and *Equisetum laevigatum*.

BAD LANDS REGION

The bad lands in Nebraska are confined largely to Sioux and Dawes counties, in the northwestern part of the state, with occasional outliers in the foothill region south of the North Platte river in Scottsbluff county. The region is a rugged, submontane one, marked with deep canons, mostly drained by Hat creek and White river and their tributaries. The larger part of the region is known as the Hat creek basin. The soil is largely clays and marls, absorbs little water, and readily erodes. This unstable soil receives little rain and much summer heat, hence there is little or no vegetation.

In favorable situations in the canons are found: *Botrychium virginianum*, *Filix fragilis*, *Woodsia oregana*, *Equisetum arvense*, *Equisetum laevigatum*, and *Equisetum robustum*.

GENERAL DISTRIBUTION

The fern flora in Nebraska is represented by seventeen genera and twenty-six species. Of these *Botrychium neglectum*, *Osmunda regalis*, *Osmunda claytoniana*, *Cryptogramma acrostichoides*, *Dryopteris cristata*, *Notholaena dealbata*, and *Isoetes melanopoda* are quite rare, each being known from but one locality in the state. *Cheilanthes feci*, *Dryopteris spinulosa*, and *Azolla caroliniana* are each known from two localities. *Pellaea atropurpurea* and *Athyrium filix-foemina* have been collected in three or four localities. *Adiantum pedatum*, a common eastern fern but which ranges across the continent, occurs in Nebraska only in the southeastern quarter. *Botrychium virginianum*, *Filix fragilis*, *Dryopteris thelypteris*, *Onoclea sensibilis*, *Marsilia vestita*, *Equisetum arvense*, *Equisetum laevigatum*, and *Equisetum robustum* are the only species that are

frequent to common and widely distributed over the state. *Pteris aquilina*, the nearly cosmopolitan species, does not occur, neither does *Polypodium vulgare* nor *Camptosorus rhizophyllus*. There are no Lycopodiums. The nearly cosmopolitan species, *Athyrium filix-foemina*, is found in Nebraska only in two or three favorable locations.

SUMMARY AND CONCLUSIONS

From this it is readily seen that the fern flora of Nebraska is conspicuous for its poor development. The reasons for this paucity may be due to the effects or mutual reactions of the effects of several causes. Some of these are:

(1) The greater portion of the state is too arid for a rich development of fern growth; much of the surface is unsuitable for any ferns, the suitable areas being few and restricted, thus limiting the possible number of species.

(2) Entire absence of endemic forms; there are no species peculiar to Nebraska.

(3) Lack of development of features favorable to distributional adaptation; ferns are rather rigid in their requirements and do not readily overcome new environmental difficulties.

(4) Ferns are comparatively old from the standpoint of evolution, being far beyond their period of culmination, while the soil of Nebraska is comparatively new.

(5) The centers of migration for the ferns into this area are the Appalachian and the Rocky Mountains. The broad prairies of northern Missouri, of Iowa, and of southern Minnesota prevent migration from the east. A number of species of ferns that are absent from similar localities in eastern Nebraska, are found along the eastern border of Iowa. The aridity of the western portion of the state prevents migration from the Rocky Mountains.

(6) The line of easiest migration into Nebraska is by way of the Missouri river valley, a route suitable to only a limited number of ferns.

(7) Lack of development of a mountain range within the state or near by with a humid climate, the submontane region of western Nebraska being too arid.

(8) The area of fern distribution tends to lessen, many species are now quite limited in range, and ferns as a whole have little

ACKNOWLEDGMENT

The material on which this paper is based is in the herbarium of the department of botany of the University of Nebraska. This material was largely collected or contributed during the botanical survey of Nebraska conducted by the botanical seminar, an organization founded and promoted by Dr. C. E. Bessey and his co-workers.

ANNOTATED LIST OF SPECIES

Ophloglossaceae

Botrychium virginianum (L.) Swartz. Grape fern. In rich woods, preferring bluffs and canons, rather common in favorable locations.

Douglas county: woods near Florence, July 9, 1897, *Wm. Cleburne*.

Sarpy county: Bellevue, open woods, June 3, 1887, *Wm. Cleburne*; Bellevue, May 2, 1893, No. 3232, *Roscoe Pound and DeAlton Saunders*.

Cass county: Weeping Water, June, 1889, *Tom A. Williams*.

Lancaster county: Lincoln, June 30, 1886, No. 6102, woods west of Saltillo, *H. J. Webber*.

Thomas county: in woods near Plummer ford, Dismal river, July 3, 1893, No. 1467, *P. A. Rydberg*; Halsey, June 18, 1912, *Raymond J. Pool and Donald Folsom*.

Dawes county: Belmont, wooded bluffs, July 18, 1889, No. 6103, *H. J. Webber*.

Sioux county: Squaw canon, August, 1892, No. 444, *Albert F. Woods*; Monroe canon, north of Harrison, June 21, 1911, *Raymond J. Pool and C. V. Williams*.

Botrychium neglectum Wood. (*Botrychium ramosum* (Roth) Aschers.) Franklin county; one specimen in the herbarium, collected by E. M. Hussong, in August, 1895, copses and meadows on Mr. Ewing's farm, one mile northeast of Franklin, not abundant, No. 4689. It is labeled *Botrychium ternatum australe*.

Osmundaceae

Osmunda regalis L. Royal fern. Flowering fern. Franklin county: in original prairie in Republican river valley, near Franklin, May 5, 1896, No. 6776; also one and one-half miles southwest of Franklin, near Ashby's mill and on low ground near the river, June, 1896, No. 4693, both specimens collected by E. M. Hussong.

Osmunda claytoniana L. One specimen, No. 7516, without definite locality and doubtfully referred to Nebraska.

Polypodiaceae

Adiantum pedatum L. Maidenhair. This species is frequent to common in rich woods, especially in the southeastern quarter of Nebraska, the region of the state having the greatest rainfall.

Douglas county: June 29, 1875, *Samuel Aughey*; woods, south of Omaha, June 25, 1873, *William Cleburne*; Florence, October 3, 1908, *N. F. Petersen*.

Sarpy county: Bellevue, September 2, 1893, No. 3146, *Roscoe Pound* and *D. A. Saunders*; south of Albright, September 1, 1908, *F. G. Ernst*.

Cass county: Plattsmouth, woods of the Missouri river bluffs, May 15, 1886, No. 6127, *H. J. Webber*.

Nemaha county: Nemaha, July 5, 1910, No. 5145, *Rev. J. M. Bates*; also reported from the vicinity of Peru by *Bessey* and *Webber*.

Richardson county: wooded bluffs of Missouri river, common. August 26, 1889, No. 6129, *H. J. Webber*.

Pawnee county: Table Rock, May, 1896, *J. E. Shue*.

Lancaster county: Lincoln, June 3, 1890, No. 6128, *H. J. Webber*. from Lucena Hardin; Lincoln, May, 1895, rich, moist woods, *E. B. Robinson*; another specimen by *Fred C. Cooley* without further data.

Athyrium filix-foemina (L.) Roth. (*Asplenium filix-foemina* (L.) Bernh.) Lady fern. Woods and thickets, frequent only in favorable places, but not found in most portions of the state. A widely variable species and widely distributed, ranging generally throughout North America, also found in Europe and Asia.

Brown county: Long Pine, Seven Springs, July, 1892, No. 441, *Albert F. Woods*; Long Pine, September, 1893, No. 2938, *Fred Clements*.

Douglas county: Omaha, from garden, from a plant got from 2569 Pierce St., July 27, 1901; also September 16, 1901, and September 2, 1902, *William Cleburne*.

Lancaster county: Lincoln, July, 1886, No. 6122, *H. J. Webber*, a poor and fragmentary specimen but clearly this species. It is labeled *Asplenium thelypteroides* Michx.

Cheilanthes feei Moore. (*Cheilanthes lanuginosa* Nutt.) Lip fern. Known only from the extreme western and southwestern parts of the state, occurs on exposed rocks.

Banner county: Exposed rocks of a canon, one mile southwest from Hackberry Springs, August, 1890, *P. A. Rydberg*; August 8,

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Redwillow county: reported by C. E. Bessey.

Cryptogramma acrostichoides R. Br. Rock-brake. Rocky places, rare, known only from one locality.

Franklin county: Franklin, 1893, *E. M. Hussong*. A single fruiting blade sent to Dr. C. E. Bessey for determination. The locality is somewhat outside of the known range of the species but the specimen seems properly referred.

Cystopteris fragilis (L.) Bernh. (*Filix fragilis* (L.) Underw.) Brittle fern. This species is found in rich woods, along wooded banks of streams and in canons, and is rather common in most portions of the state. It is the most abundant fern of Nebraska.

Dixon county: Ponca, bluffs of Missouri river, June 15, 1893, No. 2556, *Fred Clements*.

Douglas county: Omaha, April, 1889, No. 6118, *H. J. Webber*.

Cass county: Plattsmouth, shaded ravines, Missouri river bluffs, May 15, 1886, No. 6117, *H. J. Webber*; also reported from the vicinity of Weeping Water by Bessey and Webber. There is an immature specimen from Weeping Water, collected in moist rocky places, May 14, 1892, by *Emma Stover*.

Otoe county: Nebraska City, June 1, 1889, No. 6115, *H. J. Webber*.

Saunders county: Ashland, June 24, 1890, *Tom A. Williams*.

Nemaha county: Nemaha, July 5, 1910, No. 5140, *Rev. J. M. Bates*; also reported from the vicinity of Peru by Bessey and Webber.

Johnson county: Tecumseh, *Anna Pinnel*.

Jefferson county: Endicott, Republican valley, August 23, 1893, No. 2002, *A. F. Woods and DeAlton Saunders*.

Lancaster county: Lincoln, damp wooded banks, June 3, 1890, No. 6120, *H. J. Webber* from Lucena Hardin; old sandstone quarry, June, 1886, *J. G. Smith*; on banks of Antelope creek, opposite H. street, May 20, 1886, *T. Walton*; Lincoln, shaded cliffs, May, 1895, *C. B. Robinson*.

Seward county: Milford, May, 1886, No. 6116, *H. J. Webber*.

Custer county: Anselmo, wooded bluffs, July 8, 1889, No. 6121, *H. J. Webber*.

Thomas county: near Plummer ford, shaded banks of Dismal river, July 3, 1893, No. 1452, *P. A. Rydberg*; Halsey, June 24, 1912, *Raymond J. Pool and Donald Folsom*.

Antelope county: on Verdigris creek, near Royal, 1908, *N. F. Petersen*.

Brown county: Long Pine, canons, July 23, 1887, *C. E. Bessey*; Long Pine, Seven Springs, July, 1892, No. 439, *Albert F. Woods*; Long Pine, July 29, 1892, No. 270, *J. G. Smith and Roscoe Pound*.

Dawes county: Belmont, wooded bluffs, July 18, 1889, No. 6119, *H. J. Webber*.

Sioux county: Squaw canon, August, 1892, No. 439, *Albert F. Woods*; Monroe canon, north of Harrison, June 22, 1911, *Raymond J. Pool and C. V. Williams*.

Dryopteris cristata (L.) A. Gray. (*Aspidium cristatum* (L.) Swartz.) Crested shield-fern. This species is known only from one locality in the state.

Thomas county: central Nebraska, on south fork of Dismal river, on wet meadows, August 14, 1893, No. 1530, *P. A. Rydberg*.

Dryopteris spinulosa (Muell.) Kuntze. (*Aspidium spinulosum* (Muell.) Swartz.) Spinulose shield-fern. Rarely found in Nebraska and known from only two localities.

Thomas county: damp shaded banks, near water's edge, Dismal river, July 12, 1889, Nos. 6125, 6126, 6127, *H. J. Webber*; near Plummer ford, Dismal river, in damp woods, July 4, 1893, No. 1484, *P. A. Rydberg*.

Brown county: Long Pine, June 25, 1892, *Rev. J. M. Bates*; September 4, 1893, No. 2939, *Fred Clements*.

Dryopteris thelypteris (L.) A. Gray. (*Aspidium thelypteris* (L.) Swartz.) Marsh shield-fern. This species is common in most portions of the state. It occurs in moist shaded places and grassy wet bottoms, often associated with *Onoclea sensibilis*, and forming with it a fern meadow.

Jefferson county: Endicott, Republican valley, August 23, 1893, No. 2004, *A. F. Woods and DeAlton Saunders*.

Franklin county: in prairie hay, cut in the Republican valley, near Franklin, May 5, 1896, No. 6777, *E. M. Hussong*.

Kearney county: marsh near Platte river, June 15, 1891, No. 478, *P. A. Rydberg*; Newark, July, 1892, *Dr. H. Hapeman*.

Buffalo county: Kearney, 1887, *G. A. Beecher*; August, 1893, *Misses Smith and Lee*.

Thomas county: wet bottoms, Loup river, July 11, 1889, No. 6123, *H. J. Webber*; wet bottoms, Dismal river, July 12, 1889, No. 6124, *H. J. Webber*; on south fork of Dismal river, in wet meadow, August 14, 1893, No. 1684, *P. A. Rydberg*; Halsey, July, 1911, *R. J. Pool*; also reported from the vicinity of Thedford by Bessey and Webber.

Dodge county: Fremont, August 9, 1872, *C. E. Bessey*.

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Brown county: Long Pine, July 23, 1887, *C. E. Bessey*; Long Pine, Seven Springs, July, 1892, No. 443, *Albert F. Woods*; Long Pine, September 2, 1893, No. 2936, *Fred Clements*.

Cherry county: July 19, 1892, No. 278, *J. G. Smith and Roscoe Pound*.

Dawes county: reported from the vicinity of Crawford by Bessey and Webber.

Notholæna dealbata (Pursh) Kunze. (*Notholæna nivea dealbata* (Pursh) Davenport.) This species reaches its northern limit in Nebraska, ranging from Nebraska and Missouri to Texas and Arizona. Known in Nebraska only from a single locality.

Cass county: Weeping Water, growing from crevices in rocks, August 22, 1888, No. 6112, *H. J. Webber*; dry rocks, August 22, 1888, *Tom A. Williams*; November 11, 1895, No. 6773, *T. A. Williams*.

Onoclea sensibilis L. Sensitive fern. Frequent to common in low wet soil, often in grassy places, in some localities becoming a weed, ranges generally throughout the state.

Otoe county: Nebraska City, March, 1904, *Cooper Dunn*, a weather beaten fragment of the preceding year's growth.

Jefferson county: Fairbury, southern Nebraska, September 1, 1892, No. 7270, *Ruth A. Price*; Endicott, Republican valley, August 23, 1893, No. 2003, *A. F. Woods and DeAlton Saunders*.

Buffalo county: Kearney, August, 1893, No. 7703; along Platte river, 1894, both by *Misses Smith and Lee*; Kearney, No. 6111, *H. J. Webber*.

Franklin county: in prairie hay cut in the Republican valley near Franklin, May 5, 1896, No. 6775, *E. M. Hussong*.

Thomas county: in woods near Plummer ford, Dismal river, August 23, 1893, No. 1377, *P. A. Rydberg*; low prairies, very common, Dismal river, July 12, 1889, No. 6110, *H. J. Webber*; Halsey, July, 1911, *R. J. Pool*.

Antelope county: reported by Bessey and Webber.

Holt county: Paddock, July 29, 1893, No. 2802, *Fred Clements*.

Brown county: Long Pine, June 25, 1892, *Rev. J. M. Bates*, an unusual specimen with tips of the lobes coarsely crenately toothed or incised and fluted; Long Pine, July, 1892, No. 442, *Albert F. Woods*; Long Pine, August 25, 1908, *Rev. J. M. Bates*.

Cherry county: July 19, 1892, No. 277, *J. G. Smith and Roscoe Pound*; also a specimen collected twenty miles southwest of Valentine, no further data.

Pellaea atropurpurea (L.) Cliff brake. In localities where it is found this species is frequent in crevices of rocks; in Nebraska found only in the southeastern portion.

Cass county: Weeping Water, dry calcareous rocks, May 23, 1887, No. 6108, *H. J. Webber*; April 19, 1919, *R. J. Pool*.

Nemaha county: Brownville, January 2, 1889, No. 6109, *H. J. Webber*; reported from the vicinity of Peru by Bessy and Webber.

Jefferson county: Endicott, July 17, 1892, *Miss Case*; August 23, 1893, No. 2001, *A. F. Woods and DeAlton Saunders*.

Woodsia obtusa (Spreng.) Torrey. This species seems to be limited mostly to the southeastern portion of the state, rarely found in the central and western portions. Found in crevices of rock cliffs.

Pawnee county: Pawnee City, 1892, *C. H. Barnard*.

Lancaster county: Emerald, December 7, 1895, No. 6774, *A. S. Hunter*.

Custer county: Callaway, July 3, 1902, No. 2370, *Rev. J. M. Bates*.

Brown county: Long Pine, reported by Bessey and Webber.

Woodsia oregana D. C. Eaton. This species apparently is confined to the western half of the state; it is frequent on dry open bluffs.

Thomas county: Dry banks, Dismal river, July 12, 1889, No. 6106, *H. J. Webber*; on hillside near Plummer ford, Dismal river, July 3, 1893, No. 1479, *P. A. Rydberg*.

Brown county: Long Pine, collected by *J. Conklin*, No. 8 ex-herbarium G. D. Swezey; Long Pine, canons, July 23, 1887, *C. E. Bessey*.

Dawes county: Belmont, dry banks, July 18, 1889, No. 6105, *H. J. Webber*.

Sioux county: on buttes, August, 1892, No. 440, *Albert F. Woods*; Hat creek, June 24, 1890, *Tom A. Williams*.

Marsiliaceae.

Marsilea vestita Hook. and Grev. Hairy pepperwort. In ponds, frequent in many places in the state. During periods of drought terrestrial specimens may be found having hairy and narrow leaflets and these have been named the variety *tenuifolia* Und. and Cook.

Jefferson county: Meridian township, section 22, 1891, *E. F. Lange*; Fairbury, September 3, 1892, *E. F. Lange*.

Fillmore county: Fairmont, August, 1890, and August 4, 1891, *H. J. Webber*; August, 1890, No. 6113, labeled var. *tenuifolia*

Und. and Cook, *H. J. Webber*; ponds, August 1, 1890, *J. H. Haughawout*, labeled var. *tenuifolia* Und. and Cook.

Webster county: Red Cloud, *Rev. J. M. Bates*.

Kearney county: Minden, August 13, 1891, *Dr. H. Hapeman*, labeled var. *tenuifolia*, prairies and sandhills of central Nebraska. July 13, 1900, altitude 500 meters, No. 6604, *P. A. Rydberg*.

Deuel county: July 3, 1893, *E. M. Gilliard*:

Box Butte county: July 7, 1892, No. 275, *J. G. Smith and Roscoe Pound*.

Pierce county: Plainview, July 2, 1907, in shallow ponds, *N. F. Petersen*.

Antelope county: Clearwater, June 16, 1899, reported as a weed, No. 12036, *D. M. Decamp*; Brunswick, June, 1909, *N. F. Petersen*.

Salviniaceae.

Azolla caroliniana Willd. Apparently known from only one or two localities, rare.

Thomas county: on ground at edge of water, Dismal river, July 12, 1889, No. 6101, *H. J. Webber*; in a spring near Plummer ford, Dismal river, August 24, 1893, *P. A. Rydberg*.

Garden county: Doctor R. J. Pool reports finding this species in great abundance along Blue creek in May, 1912.

Equisetaceae.

Equisetum arvense L. Common in sandy soil, fields, pastures, waste places, roadsides. The simple fertile stems appear in March and April and soon wither after fruiting, the branched sterile stems come later and persist throughout the summer. This species seems to appear mostly as a weed and will be found in low wet grounds to rather high and dry situations.

Sarpy county: Bellevue, May 13, 1893, No. 4097, *Roscoe Pound and DeAlton Saunders*.

Saunders county; Ashland, June 24, 1890, *Tom A. Williams*.

Cass county: Weeping Water, reported by Bessey and Webber.

Otoe county: Nebraska City, May 28, 1893, No. 4067, *Roscoe Pound and F. E. Clements*.

Nemaha county: Brownville, reported by Bessey and Webber.

Gage county: Wymore, reported by Bessey and Webber.

Lancaster county: Lincoln, May, 1890; May 2, 1893, No. 3230, *Pound, Clements and Saunders*; also a specimen without definite date by *U. N. Shreve* and a similar one by *Fred C. Cooley*.

Seward county: Milford, low wet ground, May 23, 1886, No. 6138, *H. J. Webber*.

Custer county: Anselmo, reported by Bessey and Webber.

Thomas county: near Thedford, in meadow on Middle Loup river, September 9, 1893, No. 1378, *P. A. Rydberg*; on wet meadow near Nattick, June 20, 1893, No. 1378, *P. A. Rydberg*.

Brown county: Long Pine, reported by Bessey and Webber.

Dawes county: near Pine Ridge, July 24, 1889, *H. J. Webber*.

Sioux county: Squaw canon, August, 1892, No. 447, *Albert F. Woods*; Hat Creek basin, August 1, 1889, No. 6133, *H. J. Webber*.

Equisetum fluviatile L. (*E. limosum* L.) This species apparently is infrequent in Nebraska. It occurs in swampy places and along borders of streams and ponds.

Kearney county: Platte river, June 15, 1891, No. 475, *P. A. Rydberg*.

Garfield county: Burwell, July 22, 1909, No. 4917, *Rev. J. M. Bates*.

Holt county: southwest part, along Holt creek, August 2, 1892, *Rev. J. M. Bates*.

Brown county: Long Pine, August 3, 1909, No. 4933, *Rev. J. M. Bates*.

Equisetum laevigatum A. Braun. Common in moist soil in low fields, pastures and waste places.

Dixon county: Ponca, June 14, 1893, No. 2542, *Fred Clements*.

Cass county: Weeping Water, reported by Bessey and Webber.

Lancaster county: Lincoln, prairie bank of Antelope, northeast of town, May 8, 1885, No. 6139, *H. J. Webber*; marshy prairie, Lincoln, April, 1886, *J. G. Smith*; marshy grounds, Lincoln, May, 1886, *J. G. Smith*.

Saline county: Crete, reported by Bessey and Webber.

Jefferson county: Fairbury, low land near water, May 31, 1886, No. 32.

Webster county: Red Cloud, June 2, 1908, No. 4509, *Rev. J. M. Bates*.

Kearney county: wet prairie, June 15, 1891, No. 476, *P. A. Rydberg*.

Dundy county: Benkelman, August 5, 1893, No. 2000, *A. F. Woods and DeAlton Saunders*.

Custer county: Callaway, May 28, 1902, No. 2225, *Rev. J. M. Bates*.

Thomas county: in wet meadow on Middle Loup river near Thedford, June 14, 1893, Nos. 1260 and 1283, *P. A. Rydberg*; Thed-

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ford, July 11 and 14, 1889, Nos. 6136 and 6131, *H. J. Webber*; Halsey, July, 1911, *R. J. Pool*.

Garden county: Oshkosh, June 6, 1912, *Raymond J. Pool*.

Brown county: Long Pine, reported by Bessey and Webber.

Sheridan county: July 9, 1892, No. 276, *J. G. Smith and Roscoe Pound*.

Dawes county: Pine Ridge, July 24, 1889, No. 6130, *H. J. Webber*.

Sioux county: Squaw canon, August, 1892, No. 445, *Albert F. Woods*; Hat creek basin, August 2, 1889, *H. J. Webber*.

There are also two sheets collected by Samuel Aughey, about 1875, without definite data.

Equisetum robustum A. Braun. This species is quite common along river banks throughout the state.

Dixon county: Ponca, June 14, 1893, No. 2543, *Fred Clements*.

Sarpy county: Bellevue, September 3, 1893, No. 3189, *Roscoe Pound and D. A. Saunders*.

Cass county: South Bend, *Mr. Kemble*, no further data.

Nemaha county: Missouri bottoms, Brownville, January 2, 1889, Nos. 6132 and 6140, *H. J. Webber*, specimens with branches.

Kearney county: along Platte river, June 15, 1891, No. 475, *P. A. Rydberg*.

Buffalo county: Kearney, banks of Platte river, July 20, 1901, No. 54, *J. J. Thornber*.

Thomas county: on hillside near Plummer ford, Dismal river, August 24, 1893, No. 1722, *P. A. Rydberg*; Thedford, July 10, 1889, No. 6135, *H. J. Webber*.

Cherry county: Fort Niobrara, August, 1890, No. 38, *Rev. J. M. Bates*. This fragmentary specimen is labeled *Equisetum hymale* L. and it was published as such by Dr. C. E. Bessey.

Dawes county: Pine Ridge, July 14, 1889, No. 6134, and July 24, 1889, No. 6137, *H. J. Webber*.

Sioux county: Squaw canon, August, 1892, No. 446, *Albert F. Woods*; Monroe canon, north of Harrison, June 18, 1911, *Raymond J. Pool and C. V. Williams*.

Equisetum variegatum Schleich. This species seems to be infrequent or rare; it occurs usually in wet soil.

Lancaster county: Lincoln, Antelope creek, May, 1887, *J. R. Schofield*.

Kearney county: wet prairies, June 13, 1891, No. 477, *P. A. Rydberg*.

Hooker county: on wet meadow near Middle Loup river, July 17, 1893, No. 1801, *P. A. Rydberg*.

Brown county: Long Pine, reported by Bessey and Webber.

Cherry county: Valentine, July, 1891, No. 39, *Rev. J. M. Bates*.

Selaginaceae.

Selaginella rupestris (L.) Spring. Dry rocky soil or cliffs, infrequent or rare, apparently confined to certain localities, sometimes locally frequent.

Brown county: sandhills, Long Pine, July 23, 1887, also 1890. C. E. Bessey; July 28, 1892, No. 271, *J. G. Smith and Roscoe Pound*.

Antelope county: near Royal, August 7, 1907, *N. F. Petersen*.

Lincoln county: reported by Bessey and Webber.

Cheyenne county: reported by Bessey and Webber.

Isoetaceae.

Isoetes melanopoda J. Gay. Known in Nebraska from one locality in the southeastern portion, rarely collected.

Fillmore county: northeastern part of the county, roadside ditches on road north from Exeter, about one-half mile from the depot. September 8, 1888, *Dr. J. Herman Wibbe*.

DEPARTMENT OF BOTANY,
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