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BOTANICAL ASPECTS OF MASSARD PRAIRIE, ARKANSAS*

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INTRODUCTION

Prairies have long attracted the attention of botanists, largely because of their distinctive flora. But when a prairie occurs within an area that is predominantly forested, it is likely to arouse unusual interest and pose interesting questions. Certain areas in Arkansas have been persistently covered with prairie vegetation since before the arrival of white men. Massard prairie is one such area. The present study was undertaken to obtain definite data concerning the present plant cover, that it may be used for comparison with other such areas and with descriptions made by the earliest botanists to visit the area. Climatic data are included in the hope that they may aid in accounting for the occurrence and phenology of the plants of the prairie.

HISTORICAL

The first descriptive account of the prairie areas of the Fort Smith region was given by Thomas Nuttall (1819), who was the first botanist to visit the Arkansas territory. His account of the prairies in this area was not so complete as that of Grand Prairie in southeastern Arkansas, but he did note the similarity of the vegetation. This will afford opportunity for study of changes over more than a century.

In 1856, Lesquereux described several counties including prairies and his descriptions coincide very closely with those of Nuttall.

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*This paper is based on the work and thesis of the senior author as part requirement for the M.S. degree. It has been condensed and brought down to date by the junior author.

BOTANICAL ASPECTS OF MASSARD PRAIRIE, ARKANSAS

In the Geological Survey of Arkansas, 1880, Sargent presented a map of the State showing the forested and the prairie areas. This map, Plate I, was among the first to give a clear concept of the size and location of the original prairie areas of the State. Except for the fact that some of these areas have been put into cultivation, there is little apparent change in them since that time.

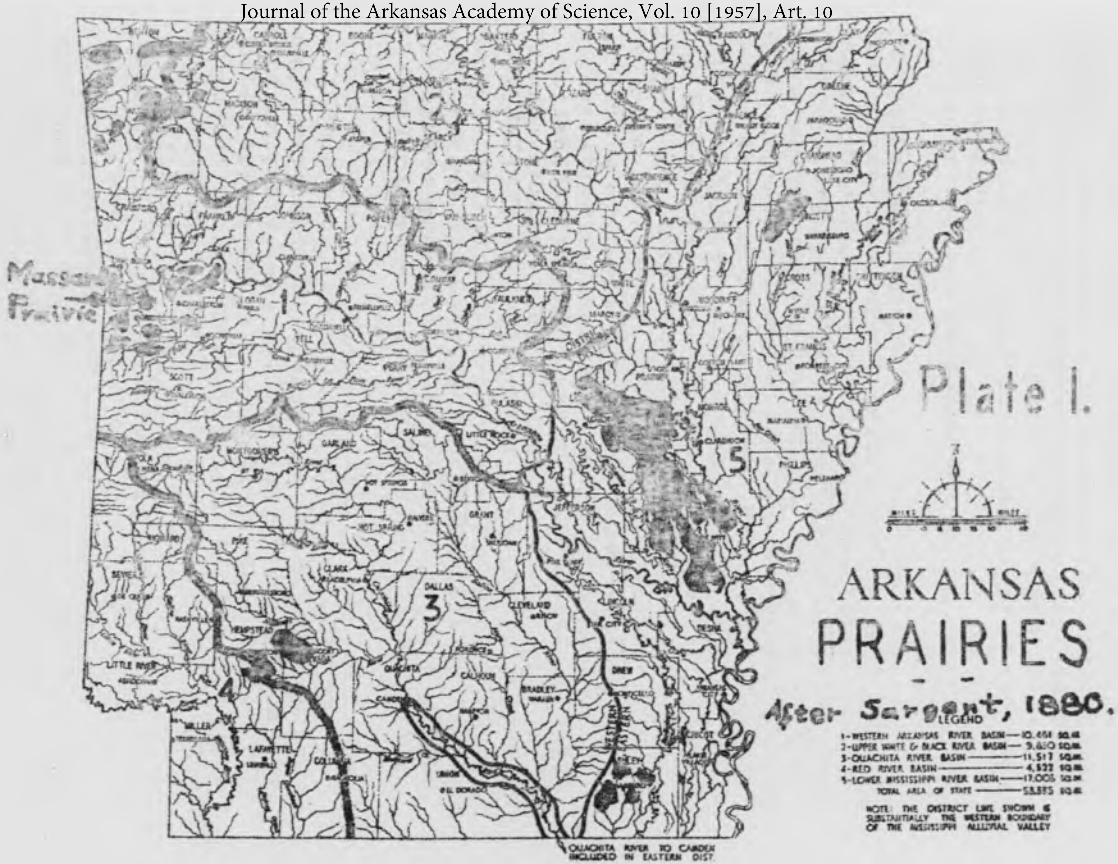
MASSARD PRAIRIE

The present studies were limited to a portion of a prairie in the northern part of Sebastian County, about six miles south of Fort Smith, designated locally as Massard Prairie. This prairie comprises approximately 10,360 acres and extends about six and one-half miles east and west and two to three miles north and south. It is traversed by Highway 71 in the western half and by the Fort Smith and Western Railroad paralleling the highway. This area was chosen because it is a typical prairie area that had been continuously owned and occupied by the same family for 150 years, and it was near enough to Fort Smith that frequent observations could be made.

Massard Prairie has the appearance of a basin nestled between two hills, known locally as Wolf Mountain and South Ridge, which have elevations of about 600 feet above sea level. The elevation of the prairie proper averages about 500 feet. This prairie is cut from southwest to northeast by Massard Creek, whose waters have been impounded by several earthen dams. The surface of the prairie is gently rolling and dotted with numerous small mounds which have been designated "pimple hills." These are quite prominent; sometimes there are as many as fifteen in an acre. They are approximately three to four feet in height and average twenty feet in diameter.

PROCEDURE

Studies of the vegetation were begun in the fall of 1939 and continued throughout the growing season of 1940. During the winter of 1939-40 observations of winter developments were made, and records of blossoming were kept throughout the growing season


Massard Prairie
Plate I.
ARKANSAS
PRAIRIES
After Sargent, 1880.
LEGEND
3-OUACHITA RIVER BASIN—11,517 SQ.MI.
5-LOWER MISSISSIPPI RIVER BASIN—17,005 SQ.MI.
TOTAL AREA OF STATE
NOTE: THE DISTRICT LINE SHOWN IS SUBSTANTIALLY THE WESTERN BOUNDARY OF THE MISSISSIPPI ALLUVIAL VALLEY
OUACHITA RIVER TO CAMDEN INCLUDED IN EASTERN DIST.

of 1940. Before the growing season, these observations were made either at four week or two week intervals, but during the growing season they were made each week. Comparative observations were made of (1) the growth in areas frequently cut over for hay and areas not cut over; (2) the different topographical areas, such as high and low prairies, and (3) the vegetation of the "pimple hills." Specimens were collected and pressed for later identification and study. These were deposited in the University of Arkansas Herbarium.

Ecological data secured include records of temperature, rainfall, evaporation, and soil acidity. The effect of fires on the vegetation was noted. Information about them was secured from the farmers, railroad attorneys, and claim agents.

OBSERVATIONS

PHENOLOGY: The successions of blooms on the prairie was most striking from March until September. The low white patches of _Draba caroliniana_, in March, were the first to appear. _Nothoscordum_ and _Sisyrinchium_ were extremely abundant in April and covered several hundreds of acres. As these began to disappear in late April, the prairie presented a quilt-like pattern of patches of blue _Phacelia glabra_ and white _Arenaria patula var. robusta_. Both of these were found in low moist areas. Golden patches were made by _Selenia aurea_ and _Corydalis crystallina_ which occurred on higher and better drained places, as the "pimple hills." The baptisias appeared in different areas -- _B. leucantha_ in poorer soil, _B. sphaerocarpa_ along the highway and ditches, and _B. leucophaea_ on well-drained soil. A small group of _Nemastylis coelestina_ with their pale violet flowers and peculiar habit of blossoming were seen. These opened about five in the afternoon, remained open for only about an hour, and then twisted and died. This is one of the many flowers first described and named by Thomas Nuttall from material found on these Arkansas prairies.

The climax of the color show came in May and June with the acres of blue _Delphinium_ and white _Penstemon_ on low moist areas, and pink _Echinacea pallida_ on elevated or better-drained areas. Blue _Tradescantia ohiensis_ and _Camassia scilloides_ were more restricted. In July, taller flowers such as Silphium laciniatum and Liatris spp., appeared. These grow in patches as large as an acre among the tall grasses, varying in size with the environmental conditions. Stillingia sylvatica, Agave virginica, and Eryngium yuccifolium were found in few areas and were very limited as to number.

August, with its lower precipitation, higher temperatures and shorter days brought out Centaurea americana, Vernonia, and nine species of Solidago. These began to bloom in midsummer and continued until frost. Another plant, very striking because of its azure blue flowers was Salvia azurea. The gay fall tints of the sassafras and sumac leaves also began to appear during August. The asters were scattered throughout the prairie and flourished until frost, and Boltonia diffusa was most abundant in the ditches.

This definite sequence of floral aspects seen on the prairie in 1940 is shown in Fig. I, which presents the periods of total and maximum blooming of forty of the more prominent and showy species. Camassia bloomed for three weeks while Verbena canadensis was in blossom for thirty. Many grasses also were quite showy by August. Andropogon Gerardi, Sorgastrum nutans, Spenopholis intermedia, Bromus arvensis, Paspalum circulare, and P. capillare were conspicuous because of their height, bloom, and fruiting clusters. Sorgastrum nutans made a very striking display; Andropogon gerardi is the tallest of the grasses. The awns of Aristida prupurascens and the silky tops of Andropogon ternarius, A. virginicus and A. scoparius were as spectacular as the height and size of head in other grasses.

VEGETATION OF "PIMPLE HILLS"

When these were studied in large numbers, it was found that ligneous species were more likely on these than elsewhere, but in general there was no consistency in the vegetation on the "pimple hills." Since they tended to be dryer than lower land, some species were found on them to the exclusion of other areas.

CUTOVER AND UNCUT AREAS

Two list transects 5 m. x 1 m. were taken in an

BOTANICAL ASPECTS OF MASSARD PRAIRIE, ARKANSAS

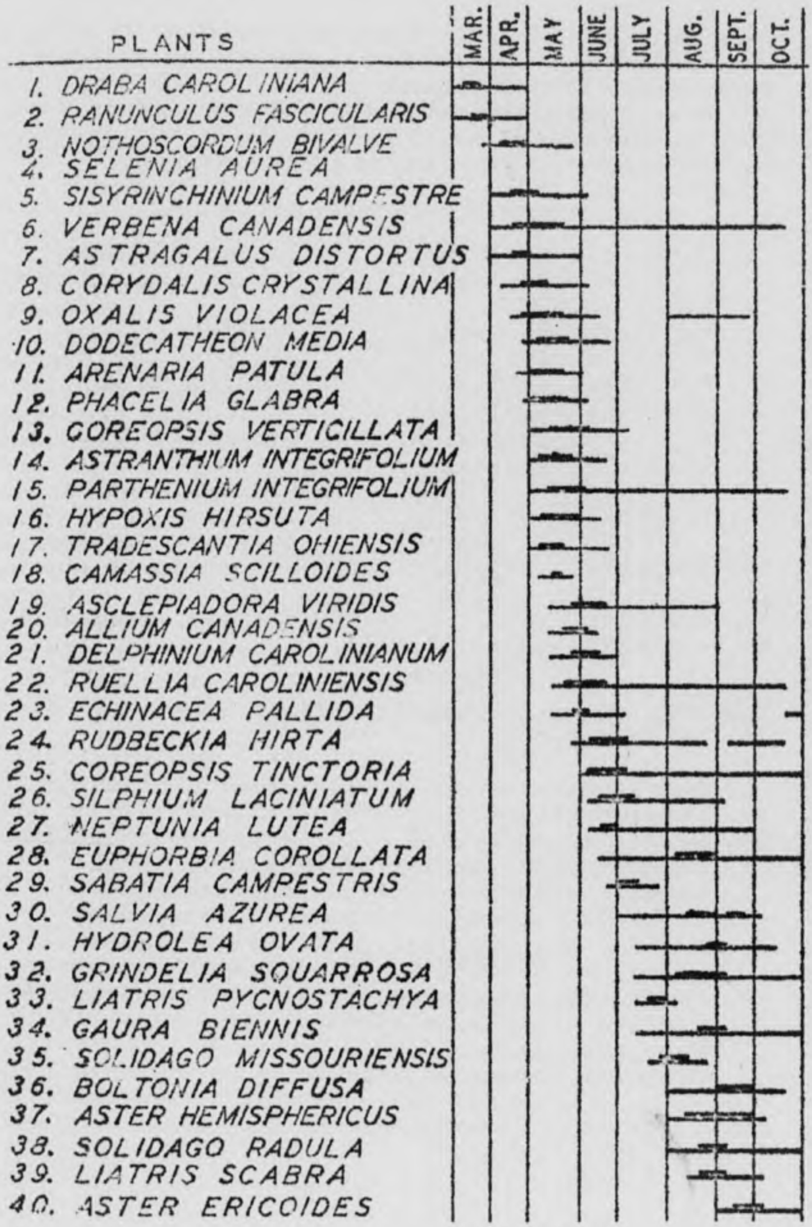


Fig. 1. Total and Maximum Blooming Periods of Forty Species

area not cut for many years and another which had been regularly cut for hay. Twenty-three species were common to both areas; fifteen found in the uncut area were not found in the cut-over area, while nine species were found in the cutover area and not in the other. The plots are listed below:

SPECIES IN BOTH AREAS

1. Asclepias viridiflora
2. Aster ericoides
3. Baptisia leucantha
4. Boltonia diffusa
5. Echinacea pallida
6. Camassia scilloides
7. Centaurea americana
8. Corydalis crystallina
9. Delphinium carolinianum
10. Helianthus hirsutus
11. Helianthus mollis
12. Hydrolea ovata
13. Liatris pycnostachya
14. Oxalis violacea
15. Parthenium integrifolium
16. Penstemon tubiflorus
17. Ptilimnium capillaceum
18. Ranunculus fascicularus
19. Rudbeckia hirta
20. Shrankia nuttallii
21. Solidago radula
22. Tradescantia ohiensis
23. Verbena canadensis

SPECIES IN UNCUT AREA NOT IN CUTOVER

1. Apocynum cannabium
2. Aster hemispherious
3. Baptisia leucophaea
4. Bidens trichosperma
5. Cirsium discolor
6. Helianthus angustifolius
7. Oenothera biennis
8. Penstemon arkansanus
9. Pluchea camphorata
10. Rhus copallina
11. Silphium integrifolium
12. Silphium laciniatum
13. Solidago altissima
14. Stillingia sylvatica
15. Vernonia missurica

SPECIES IN CUTOVER AREA NOT IN UNCUT

1. Arenaria patula
2. Camassia scilloides
3. Ceanothus americana
4. Neptunia lutea
5. Phacelia glabra
6. Rhus toxicodendron
7. Sabatia campestris
8. Spiranthes tuberosa
9. Spiranthes praecox

CLIMATIC: Although observations were made on temperature, rainfall, evaporation, and pH values of the soil, they will not be discussed fully in this paper. Temperatures and rainfall thruout the growing season of 1940 are listed in Table I, and evaporation data are omitted. pH values are given below. 1939 was a very dry summer with temperatures above average, while rainfall was below average, but 1940 was more nearly average in both areas. This resulted in a very representative show of blossoms for 1940. In 1939-40 the five drilled wells which range from 15 - 1330 feet deep, were dry for five months, but ponds impounded in Massard Creek maintained a good supply of water.

EDAPHIC: The soil of Massard Prairie is composed of shale and clay. In spring it is covered with water, which does not filter down. As a result the soil is more or less marshy. The soil is cold. In the summer months it becomes hard and compact as a result of evaporation and less precipitation. It is difficult to cultivate, because of the sticky texture in spring and hardness in summer. Hardpan is found throughout the prairie at a depth of 8 - 11 inches. The "pimple hills" showed no stratification or differences in physical make-up, but because of their elevation were better drained in wet weather.

The scarcity of ground water is due to compacted shales and sandstone of low porosity. (Lesquereux, 1866). The surface water cannot percolate because of the hardpan and as a result is lost by evaporation or run-off.

The pH of the soils was studied from twenty soil tests for an idea of acidity. The range was from 6.5 to 7.2. The result reveals that the pH could hardly account for the distribution of prairie vegetation. These texts showed that acidity of the "pimple hills" was not materially different from other parts of the prairie.

In order to show possible correlation between the temperature, rainfall, length of day and number of species observed in flower each week the following table has been prepared. These data may be compared with Fig. 1.

Weeks	Mean Temp.(F.)	Rainfall (Inches)	Day Hrs.	Length Mins.	Species in Bloom
Mar.					
1	49	.3	11	40	2
2	74	3.0	11	55	4
3	55	.4	12	7	4
4	51	.7	12	23	7
Apr.					
5	68	.3	12	37	9
6	51	3.2	12	53	12
7	58	.3	13	2	15
8	59	.3	13	17	20
May					
9	64	1.2	13	33	25
10	73	.2	13	43	30
11	69	.1	13	52	32
12	69	2.2	14	2	35
13	66	.2	14	10	37
June					
14	77	.2	14	14	40
15	88	2.2	14	17	45
16	78	1.2	14	20	53
17	78	.2	14	18	55
July					
18	74	1.5	14	15	58
19	79	.2	14	10	60
20	82	.2	14	2	63
21	81	1.0	13	57	67
22	89	.2	13	42	74
Aug.					
23	86	.1	13	32	70
24	78	2.0	13	22	70
25	73	2.0	13	8	62
26	78	.2	13	00	55
27	69	2.5	12	52	45
Sept.					
28	73	T	12	27	44
29	74	T	12	7	40
30	70	.1	12	00	38
31	66	.5	11	53	31
Oct.					
32	67	T			30
33	64	T			25
34	67	T			
35	65	1.0			
36		T			

Table I

FIRES: The ecological data concerning Massard Prairie cannot be concluded without some mention of the static vegetation and the effect of fires in this area. Diamond Grove and forests on the ridges have been periodically swept by fires, but these same areas continue to be forested. One farmer relates that the worst fire during his forty years of knowledge of Massard Prairie was August 10, 1936, when approximately 7680 acres of 10,360 acres were burned over, including seven hundred of the 1100 acres of Diamond Grove farm. The year 1936 was another period of drought and the day of the fire had the highest temperature, 114° F., ever recorder in Fort Smith. There were two separate fires at this time, but no further fires from 1937 through 1940. One burned portion was on the eastern side and swept up the ridge through forest to the south. As might be expected, most of the trees were killed by the fire, and remain as skeletons. The new vegetation developing on the burned forest area was not of the prairie type, but a form of woodland similar to what had been there. The area studied most closely had not been burned over for 22 years. The sumac is not so dense or tall as that found in other places. There are no large trees in this area. For instance, trees such as cottonwood, willow, persimmon, and sassafras are shrub-like after 22 years or less of growth. Some conditions other than fire must contribute to this scarcity of trees and the poor growth of those present. Fires are not common in this area, because Massard Prairie is not burned over to improve the grass; on the contrary, the farmers take every precaution to prevent grass fires. The great areas of dry grass and the wide open space for the wind to move produce ideal conditions for great fires. The prairie fires may be a result of such conditions rather than a cause of such areas

DISCUSSION

There are various opinions as to what constitutes a prairie. Sometimes it is considered as a type of vegetation; at other times the question is raised as to whether it is not rather a region with a peculiar complex of environmental factors, which foster a certain type of vegetation. In general a prairie is considered as a region covered by a type of vegetation, predominantly grasses, and notably lacking in ligneous flora. In North America the prairie is recognized as a climatic plant formation extending roughly from the Texas shore of the Gulf of Mexico northward into Canada and extending irregularly eastward into Oklahoma, Kansas, Missouri, Iowa, Illinois, and Indiana.

Prairies appear to be due in general to climatic conditions, with available moisture as one of the principal controlling factors. Lesquereux (1866) advanced such a theory. He explained that land covered by low stagnant water has for its vegetation rushes and sedges. These decompose and produce a hard, cold, impervious layer underlaid by clay or shales. Land continually covered with stagnant water cannot produce trees, because most trees, require atmospheric air for their roots and seed germination. Seeds of our common forest trees do not germinate and grow on a ground alternately covered with stagnant water and exposed to dryness for some months of the year. Massard Prairie is low and remains wet late in the spring. Rushes and sedges are found in all the lower areas. After the water has evaporated the soil is very hard and dry. It is a cold soil when wet, which is shown by the appearance of certain blooms at least two weeks later on this soil than in other nearby areas not prairie. Hardpan underlaid by a clay or shale causes the water to stand and in this way prevents the germination of seeds such as certain tree seeds. Thus Massard Prairie does have soil conditions which might interfere with favorable moisture and areation.

Climatic conditions play their part on Massard Prairie as well as on prairies in other areas. Sampson (1921) and Transeau (1927) have shown the nature of prairies in North America and explained them largely on the basis of the rainfall/evaporation ratio. Data on these factors for Massard Prairie were not adequate for definite conclusions, but did indicate not a great difference in these factors when compared with nearby woodland. Thus the theory of Lesquereux to explain the vegetation seems most logical for Massard Prairie.

The phenology may be explained as a result of combined conditions of temperature, moisture, and relative length of day and night as described by Garner and Allard, 1920.

A complete list of plants found on Massard prairie follows:

TAXONOMIC LIST OF PLANTS OF MASSARD PRAIRIE*

Typhaceae
- Typha latifolia L.

Gramineae
- Agrostis alba L.
- Agrostis elliottiana Schultes.
- Agrostis hyemalis (Walt.), BSP.
- Andropogon gerardi Vitman.
- Andropogon scoparius Michx.
- Andropogon ternarius Michx.
- Andropogon virginicus L.
- Aristida dichotoma Michx.
- Aristida longespica Poir.
- Aristida oligantha Michx.
- Aristida purpurascens Poir.
- Bouteloua curtipendula (Michx.), Torr.
- Bromus arvensis L.
- Danthonia spicata (L.) Beauv.
- Digitaria sanguinalis (L.) Scop.
- Echinochloa crusgalli (L.) Beauv.
- Elymus virginicus glabriflorus L.
- Eragrostis frankii (Fisch, May. & Lall.) Steud.
- Eragrostis hirsuta (Michx.) Nees.
- Eragrostis pectinacea (Michx.) Nees.
- Festuca octoflora Walt,
- Leptoloma cognatum (Schultes) Chase.
- Panicum agrostoides Spreng.
- Panicum capillare L.
- Panicum dichotomiflorum Michx.
- Panicum hians Hitchcock.
- Panicum muschucae Asche.
- Panicum pedicellatum, Vasey
- Panicum scoparium Lam,
- Panicum scribnerianum Nash.
- Panicum sphaerocarpon Ell.
- Panicum virgatum L.
- Paspalum circulare Nash.
- Paspalum floridanum Michx.
- Paspalum muhlenbergii Nash.
- Paspalum pubescens Muhl.
- Phalaris arundinacea L. (Reed C.)
- Phalaris caroliniana Walt.
- Setaria geniculata Lam.
- Setaria viridis (L.) Beauv.
- Sorghastrum nutans (L.) Nash.
- Sorghum halepense (L.) Pers.
- Sphenopholis intermedia Rydb.
- Sporobolus asper (Michx.) Kunth.
- Sporobolus heterolepis Gray.
- Sporobolus vaginiflorus (Torr.) Wood.
- Tridens strictus (Nutt.) Nash.

Cyperaceae
- Carex arkansana Bailey.
- Carex gravida Bailey
- Cyperus acuminatus Torr. and Hook.
- Cyperus ovularis (Michx.) Torr.
- Cyperus pseudovegetus Steud.
- Cyperus strigosus L.
- Eleocharis obtusa (Willd.) Schultes.
- Fimbristylis vahlii (Lam.) Link.
- Rynchospora corniculata (Lam.) Gray.
- Scirpus lineatus Michx.

Commelinaceae
- Tradescantia ohiensis Raf.

Juncaceae
- Juncus acuminatus Michx.
- Juncus biflorus Ell.
- Juncus brachycarpus Engelm.
- Juncus interior Wiegand.

Liliaceae
- Allium canadense L.
- Camassia scilloides (Raf.) Cory
- Nothoscordum bivalve (L.) Britton.
- Smilax bona-nox L.

Amaryllidaceae
- Agave virginica L.
- Hypoxis hirsuta (L.) Coville.

Iridaceae
- Nemastylis coelestina Nutt.
- Sisyrinchium albidum Raf.

Orchidaceae
- Calopogon pulchellus (Salisb.) R. Br.
- Spiranthes praecox (Walt.) Wats. & Coult.
- Spiranthes tuberosa Raf.

Salicaceae
- Populus deltoides Marsh.
- Salix nigra Marsh.

Polygonaceae
- Polygonum hydropiperoides (Michx.)
- Polygonum Persicaria L.
- Polygonum tenue Michx.
- Rumex Acetosella L.
- Rumex crispus L.

Amaranthaceae
- Amaranthus spinosus L.

Phytolaccaceae
- Phytolacca americana L.

Caryophyllaceae
- Arenaria patula Michx.
- Arenaria patula var. robusta (Stey.) Maguire.
- Cerastium brachypodum (Engelm.) Robinson.
- Cerastium viscosum L.
- Silene antirrhina L.

Portulacaceae
- Claytonia virginica L.
- Talinum parviflorum Nutt.

Ranunculaceae
- Anemone caroliniana Walt.
- Delphinium carolinianum Walt.
- Ranunculus fascicularis Muhl.
- Ranunculus pusillus Poir.

Menispermaceae
- Cocculus carolinus L.

Lauraceae
- Sassafras albidum (Nutt.) Nees.

Fumariaceae
- Corydalis crystallina Engelm.

Cruciferae
- Arabis virginica (L.) Trel.
- Capsella bursa-pastoris (L.) Medic.
- Draba brachycarpa Nutt.
- Draba reptans (Lam.) Fern.
- Lepidium virginicum L.
- Selenia aurea Nutt.
- Sisymbrium officinale (L.) Scop.

Rosaceae
- Potentilla canadensis L.
- Rosa carolina L.
- Rosa carolina var. villosa (Best) Rehd.
- Rosa setigera Michx.
- Rubus villosus, Ait.

Leguminosae
- Amorpha fruticosa L.
- Apios americana Medic.
- Astragalus distortus T. & G.
- Baptisia leucantha T. & G.
- Baptisia leucophaea Nutt.
- Baptisia sphaerocarpa Nutt
- Cassia chamaecrista L.
- Crotalaria sagittalis L.
- Desmanthus illinoensis (Michx.) MacM.
- Desmodium sessilifolium (Torr.) T. & G.
- Galactia volubilis (L.) BSP.
- Gleditsia triacanthos L.
- Lathyrus pusillus Ell.
- Lespedeza capitata Michx.
- Lespedeza intermedia Wats.
- Lespedeza procumbens Michx.
- Lespedeza repens (L.) Bart.
- Lespedeza stuvei Nutt.
- Lespedeza violacea (L.) Pers.
- Lespedeza virginica (L.) Britton.
- Neptunia lutea (Leavenw.) Benth.
- Psoralea psoralioides (Walt.) Cory.
- Schrankia nuttallii (DC.) Standl.
- Strophostyles helvola (L.) Ell.
- Strophostyles leiosperma (T. & G.) Piper.
- Stylosanthes biflora (L.) BSP.
- Tephrosia spicata (Walt.) T. & G.
- Tephrosia virginiana (L.) Pers.
- Trifolium dubium Sibth.
- Trifolium reflexum L.

Linaceae
- Linum sulcatum Riddell.
- Linum virginianum L.

Oxalidaceae
- Oxalis stricta L.
- Oxalis violacea L.

Geraniaceae
- Geranium carolinianum L.

*The nomenclature follows the eighth edition of Gray's Manual in the majority of the list; Hitchcock and Chase was used for the grasses, and other authors when necessary.

Polygalaceae
  Polygala sanguinea L.
Euphorbiaceae
  Acalypha virginica L.
  Croton capitatus Michx.
  Croton glandulosus L.
  Croton monanthogynus Michx.
  Crotonopsis elliptica Willd.
  Euphorbia corollata L.
  Euphorbia dentata Michx.
  Euphorbia maculata L.
  Euphorbia supina Raf.
  Stillingia sylvatica L.
  Tragia urticifolia Michx.
Anacardiaceae
  Rhus copallina L.
  Rhus glabra L.
  Rhus toxicodendron L.
Rhamnaceae
  Ceanothus americanus L.
Hypericaceae
  Hypericum drummondii (Grev. & Hook) T. & G.
Passifloraceae
  Passiflora incarnata L.
  Passiflora lutea L.
Lythraceae
  Lythrum alatum Pursh.
  Rotala ramosior (L.) Koehne.
Melastomaceae
  Rhexia virginica L.
Onagraceae
  Gaura biennis L.
  Jussiaea decurrens (Walt.) DC.
  Ludwigia alternifolia L.
  Ludwigia glandulosa Walt.
  Ludwigia palustris L.
  Oenothera biennis L.
  Oenothera laciniata Hill.
  Oenothera linifolia Nutt.
Umbelliferae
  Chaerophyllum procumbens (L.) Crantz.
  Cicuta maculata L.
  Cynosciadium pinnatum DC.
  Eryngium yuccifolium Michx.
  Polytaenia nuttallii DC
  Ptilimnium capillaceum (Michx.) Raf.
  Spermolepis inermis (Nutt.) Math. & Const.
  Torilis japonica (Houtt.) DC.
Primulaceae
  Dodecatheon meadia L.
Ebenaceae
  Diospyros virginiana L.
Oleaceae
  Fraxinus pennsylvanica var. subintegerrima (Vahl) Fern.
Gentianaceae
  Sabatia campestris Nutt.
Apocynaceae
  Apocynum cannabinum L.
Asclepiadaceae
  Asclepias longifolia Michx.
  Asclepias viridiflora Raf.
  Asclepias tuberosa L.
  Asclepias incarnata L.
  Asclepiodora viridis (Walt.) Gray.
Convolvulaceae
  Cuscuta cuspidata Engelm.
  Cuscuta gronovii Willd.
  Cuscuta indecora Chois.
Polemoniaceae
  Phlox pilosa L.
Hydrophyllaceae
  Hydrolea ovata Nutt.
  Phacelia glabra Nutt.
Boraginaceae
  Lithospermum arvense L.
  Lithospermum incisum Lehm.
  Myosotis verna Nutt.
Verbenaceae
  Verbena canadensis L.
  Verbena simplex Lehm.
Labiatae
  Isanthus brachiatus L., BSP
  Physostegia virginiana L. Benth.
  Pycnanthemum flexuosum Walt. BSP
  Salvia azurea var. grandiflora Lam. Benth.
  Teucrium canadense L.
Solanaceae
  Datura stramonium L.
  Physalis heterophylla Nees.
  Physalis pumila Nutt.
  Physalis virginiana Mill.
  Solanum carolinense L.
  Solanum rostratum Dunal.
Scrophulariaceae
  Bacopa acuminata (Walt.) Robinson.
  Castilleja coccinea (L.) Spreng.
  Gerardia fasciculata Ell.
  Linaria canadensis (L.) Dumont.
  Lindernia dubia (L.) Pennell.
  Pentstemon arkansana Pennell.
  Pentstemon digitalis (Sweet) Gray.
  Pentstemon tubaeflorus Nutt.
  Verbascum thapsus L.
Bignoniaceae
  Campsis radicans (L.) Seem.
Acanthaceae
  Justicia americana (L.) Seem.
  Ruellia caroliniensis (Walt.) Stend.
Plantaginaceae
  Plantago aristata Michx.
  Plantago virginica L.
Rubiaceae
  Cephalanthus occidentalis L.
  Diodia teres Walt.
Caprifoliaceae
  Symphoricarpos orbiculatus Moench.
Valerianaceae
  Valerianella radiata (L.) Dufr.
Campanulaceae
  Specularia leptocarpa (Nutt.) Gray.
  Specularia perfoliata (L.) A. DC.
Lobeliaceae
  Lobelia spicata var. leptostachys (A. DC.) Mackenz. & Bush.
Compositae
  Achillea millefolium L.
  Actinomeris alternifolia L. DC.
  Ambrosia artemisiifolia L.
  Ambrosia bidentata Michx.
  Ambrosia psilostachya DC.
  Anthemis cotula L.
  Aster ericoides L.
  Aster hemisphericus E. J. Alex.
  Aster patens Ait.
  Aster praealtus Poir.
  Astranthium integrifolium (Michx.) Nutt.
  Bidens beckii Torr.
  Boltonia diffusa Ell.
  Cacalia tuberosa Nutt.
  Centaurea americana Nutt.
  Chrysopsis pilosa Nutt.
  Cirsium discolor (Muhl.) Spreng.
  Coreopsis tinctoria Nutt.
  Coreopsis verticillata L.
  Echinacea pallida Nutt.
  Erigeron canadensis L.
  Erigeron philadelphicus L.
  Eupatorium perfoliatum L.
  Eupatorium serotinum Michx.
  Gaillardia lutea Greene.
  Grindelia squarrosa (Pursh) Dunal.
  Helenium nudiflorum Nutt.
  Helenium amara (Raf.) Rock.
  Helianthus angustifolius L.
  Helianthus hirsutus Raf.
  Helianthus mollis Lam.
  Heterotheca subaxillaris (Lam.) Brit & Rusby.
  Hieracium longipilum Torr.
  Iva angustifolia Nutt.
  Krigia dandelion (L.) Nutt.
  Kuhnia eupatorioides L.
  Lactuca scariola L.
  Liatris pycnostachya Michx.
  Liatris scabra (Green) K. Schum.
  Liatris squarrosa Willd.
  Parthenium integrifolium L.
  Pluchea camphorata (L.) DC.
  Prenanthes aspera Michx.
  Pyrrhopappus carolinianus (Walt.) DC.
  Rudbeckia grandiflora (D. Don) DC.
  Rudbeckia hirta L.
  Rudbeckia subtomentosa Pursh.
  Sericia oppositifolia (Raf.) Ktze.
  Silphium integrifolium Michx.
  Silphium laciniatum L.
  Solidago altissima L.
  Solidago gymnospermoides (Greene) Fernald.
  Solidago missouriensis Nutt.
  Solidago nemoralis Ait.
  Solidago radula Nutt.
  Solidago rigida L.
  Solidago gigantea Ait.
  Solidago speciosa Nutt
  Vernonia baldwini Torr.
  Vernonia missurica Raf.
  Xanthium chinense Mill.

This gives a total of 296 plants, including 61 composites, 47 grasses, and 30 legumes.

LITERATURE CITED

Fernald, M. L. 1950. Gray's Manual of botany. 8th ed. Amer. Book Co.

Garner, W. W. and H. A. Allard. 1920. Effect of the relative length of day and night and other factors of the environment on growth and reproduction in plants. Jour. Agri. Res. 18:553-606.

Gleason, Henry A. 1952. The new Britton & Brown Illustrated flora of the northeastern U. S. and adjacent Canada. Vols. I, II and III. New York Bot. Gard.

Hitchcock, A. S. and Agnes Chase. 1951. Manual of the grasses of the U.S. Dept. of Agri. Miscl. Publ. No. 200.

Lesquereux, Leo. 1860. Botanical and paleontological report of the geological state survey. Rep. 2nd Geol. Surv. of Ark., pp. 295-349.

Lesquereux, Leo. 1866. On the origin and formation of prairies. Geol. Surv. of Ill. 1:9-10 and 238-254.

Nuttall, Thomas. 1819. Travels into the Arkansas territory.

Nuttall, Thomas. 1834. Collections toward a flora of the territory of Arkansas. Proc. Amer. Phila. Soc. (New Ser.). 2:139-202. Phila. 1837.

Sampson, Homer C. 1921. An ecological survey of the prairie vegetation of Illinois. Bul. Ills. St. Natl. Hist. Sur. 13:523-577.

Sargent, Charles S. 1880. Forest trees of North Amer. Tenth Census of the U.S. Vol. IX. G.P.O. Wash.

Transeau, Edgar Nelson. 1927. General botany. World Book Co. Yonkers-on-Hudson, N. Y.