

Vascular Plants of the Oklahoma Ozarks

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After the completion of a floristic study of Cherokee County, the author saw the need for such a study of the entire Oklahoma Ozarks. Therefore, his original collection of about 1,400 sheets was expanded to about 7,000 sheets between the years of 1953 and 1958. All of these are deposited in the Herbarium of Oklahoma State University. Duplicates of many of these are in the author's private museum at Fort Gibson, Oklahoma. Also, triplicates of collections made during the last two years are deposited in the Herbarium of Southern Methodist University at Dallas, Texas.

The author has supplemented data obtained from his own collections with those derived from 497 sheets which have been deposited in the Herbarium of Oklahoma State University by earlier collectors.

A few stations were established for repeated collecting in order to study the seasonal changes of plant societies. These are discussed in Chapter IV. Prairie, hill, and valley habitats were the basis for the selection of these stations, but most of the collecting was for general distribution throughout the Ozarks.

Monographs, revisions, and other recent taxonomic literature in the Oklahoma State University Library were used whenever possible in identifying the specimens. The order of listing of the families conventionally follows the Engler-Prantl system as delineated in the eighth edition of Gray's Manual of Botany (43). Each species in the list is followed with the general habitats and counties in which one or more specimens were collected. Those specimens which were found to be new to the state and which have been reported within the last six years are relisted in Chapter V.

The author wishes to express his appreciation to each of the members of his committee for their guidance and suggestions. He is especially grateful to Dr. U.T. Waterfall for acting as chairman of his committee, for his example as a teacher of taxonomy, and for the use of his personal card index of monographic and research literature.

Editor's notes:

This is Wallis' original thesis including his chapter, "Ecology: General Distribution" that lists species in each of his study sites by seasons. However, it does not include his "List of Species and Habitats". To avoid redundancy and to make that list more useable for current biologists, its nomenclature has been updated and included in Bruce Hoagland's "A Checklist for the Vascular Flora of Ozark Plateau in Oklahoma" that immediately follows. That Checklist is marked to indicate which species Wallis listed, as well as non-native species listed in the Oklahoma Vascular Plant Database for the Oklahoma Ozarks.

Charles Sparkman Wallis' private library is currently housed in the Bebb Herbarium (OKL) at the University of Oklahoma, Norman, OK. (SS)

PHYSICAL FEATURES**Location and Area**

The name Ozarks or Ozarks was taken from the contraction of the French words aux arcs and has been applied to an uplift area occupying some 40,000 square miles of Arkansas, Missouri, and Oklahoma (79:234). This Ozark region of Oklahoma is in the northeastern corner of the state with natural boundaries formed by the Grand (Neosho) River on the west and the Arkansas River on the south.

There are approximately 3,351 square miles of land and 52 square miles of lakes in the Oklahoma Ozarks. Computation by counties in square miles from General Highway County Maps prepared by the Oklahoma Department of Highways is as follows:

<u>County</u>	<u>Land Area</u>	<u>Lake Area</u>
Adair	569	0
Cherokee	760	11
Delaware	657	15
Mayes	261	10
Muskogee	114	3
Ottawa	296	10
Sequoyah	694	3

All of the lakes, except Horseshoe Lake, are of the reservoir type. They are Fort Gibson Reservoir and Lake of the Cherokees on the Grand River; Tenkiller Ferry Reservoir on the Illinois River; Greenleaf Lake on Greenleaf Creek; and Upper and Lower Spavinaw Lakes on Spavinaw Creek.

Geology

The Ozark Uplift is a broad asymmetrical cone which consists of three physiological provinces (57). Two of these extend into northeastern Oklahoma as the Springfield Structural Plain in the northern two-thirds of the

Oklahoma Ozarks and the Boston Mountain Province in the southern one-third. The Salem Platform is entirely in Arkansas and Missouri.

The topography of the Springfield Plain is that of a deeply dissected plateau with surface cherts and limestones of the Mississippian Boone formation. In the Boston Province is a narrow belt of rugged topography formed by the northeast trending faults. The resulting fault blocks have steep escarpment faces and gentle dip slopes capped by the resistant Atoka sandstones. Deep valleys have been cut through the ridges by stream erosion, and the major drainage pattern is developed in the softer shales and limestone paralleling the faulting.

The highest elevation in the Oklahoma Ozarks is a 1,750 foot contour line three miles east of Muskrat Mountain (48). The contrasting low area, a 400 foot contour line, is found where the Arkansas River leaves Oklahoma at the southeast corner of Sequoyah County (49). Thus a 30-mile line along the Oklahoma-Arkansas border will intersect at the high and low points of the Oklahoma Ozarks.

Topography by Counties (113)

Adair County is quite hilly, but many of the hills and ridges have flat tops wide enough to produce considerable level areas. Some of the deeper valleys cut into the Chester formation and lowermost Pennsylvanian formation. Baron Fork drains the northern part of the county into the Illinois River, and Sallisaw Creek drains the southern part into the Arkansas River.

Cherokee County is well dissected into the lower Pennsylvanian formations by streams, with the largest valleys less than one mile in width. Flat-topped ridges produce the principle farming areas. Maynard Bayou, Flowers, Clear, and Ranger creeks are some of the western

streams draining into Grand River which forms part of the western boundary. The Illinois River enters the county from the northeast and flows south through the eastern half of the county.

Delaware County's surface is quite rough with many of the broad, flat-top hills having small prairies on them. Generally, the valleys are narrow and steep-sided. Grand River in the northern part of the county with its tributaries drains most of the area. The southern part is drained into the Grand River by way of Spavinaw Creek.

The eastern part of Mayes County is in the Ozarks and the western part in the Prairie Plains region. The Ozark area is quite hilly and is drained by Spavinaw Creek.

The small northeastern part of Muskogee County in the Ozarks drains into the Arkansas River. The best farming land in the Ozarks is located in the flood plains of the Grand and Arkansas rivers.

Ottawa County is also in both the Ozark and Prairie Plains regions. The southeastern part is hilly, but the northeastern part has extensive prairies east of the Grand River; a.k.a. Neosho River, the name often applied to the portion of Grand River above the junction with Spring River. Drainage is into the Grand River by way of Spring and Neosho rivers.

Soils (112)

The only formation of the region which has sufficient area of rock outcrop to greatly influence the soil is the Boone formation. Along the western edge of the uplift, the Chester formation produces a prairie of considerable extent from the town of Pryor to the northeast.

Slopes are so steep on the hillsides of the uplift that there is little or no surface soil

except that remaining between the rock crevices. However, this soil is fertile enough to support a good growth of trees. The level uplands have soils that reach a depth of ten or more feet, and where they are free from chert they are dark red sandy-loams.

The soils of the narrow valleys are generally very cherty but quite productive. The larger river valleys have the most productive soils of all. They are basically the sediments from the higher Boone areas.

CLIMATE (126)

The Oklahoma Ozarks have a continental type of weather which is characterized by a pronounced seasonal range in temperatures. Almost invariably the high summer temperature occurs with clear skies and is attended by dry, moderate winds. Severe droughts are produced when hot winds accompany these high temperatures. The summer nights are nearly always cool because the clear skies and dry atmosphere permit rapid radiation of the heat. Rain is general and most abundant in the spring to early summer and sometimes may be abundant during September and October. The prevailing wind direction is southerly, although in December, January, and February northerly winds predominate.

Prior to 1941, the available records give for the state's Ozark counties the average maximum and minimum temperatures in degrees Fahrenheit as follows:

<u>County</u>	<u>Maximum Temperature</u>	<u>Minimum Temperature</u>
Adair	114	-27
Cherokee	118	-23
Delaware	114	-25
Mayes	117	-21
Muskogee	118	-14
Ottawa	114	-25
Sequoyah	115	-10

The dates of killing frosts of last and first average appearance with number of days in growing season as follows:

County	Appearance		Growing Season
	First	Last	
Adair	April 10	October 27	200
Cherokee	April 6	October 30	207
Delaware	March 31	October 31	214
Mayes	April 3	October 31	211
Muskogee	March 26	November 4	223
Ottawa	April 21	October 28	207
Sequoyah	March 31	November 3	217

The average annual precipitation, in inches is given as follows:

County	Precipitation
Adair	46.84
Cherokee	41.17
Delaware	44.39
Mayes	43.54
Muskogee	39.50
Ottawa	41.93
Sequoyah	41.79

In late spring eastern Oklahoma and the adjoining states receive, on the average, more rainfall than any other part of the country east of the Rocky Mountains.

Some of the lowest annual precipitations ever recorded in the weather history of the state occurred during the eight-year period of the author's plant collecting experience. The following United States Weather Bureau (127) annual precipitation records start with 1951 as wet to about average, through dry to very dry years, and end with 1958 as another average to wet year. These records in inches per year by county are as follows:

County	1951	1952	1953	1954
	1955	1956	1957	1958
Adair	43.5	37.6	36.2	30.3
	39.1	36.3	62.7	51.6
Cherokee	46.8	30.8	37.4	25.1
	36.9	33.7	58.6	46.6
Delaware	47.8	26.0	30.6	34.2
	32.8	36.7	57.4	43.1

Mayes	47.8	28.3	40.3	28.5
	33.2	33.5	60.4	35.4
Muskogee	48.4	32.5	34.1	22.8
	29.2	26.8	56.3	45.5
Ottawa	----	30.4	27.6	32.8
	36.9	32.2	49.6	52.6
Sequoyah	52.7	35.2	40.3	33.5
	30.2	32.0	68.4	57.9

TAXONOMIC HISTORY

One of the earliest botanists to visit the Oklahoma and Arkansas Ozarks was Thomas Nuttall. On July 11, 1819 he passed the mouth of the Illinois River and encountered a three to four foot cascade in the Arkansas River about four miles above its confluence with the Illinois. Nuttall (83:233) records:

The variety of trees which commonly form the North American forest here begin very sensibly to diminish. We now scarcely see any other than the smooth-barked cottonwood, the elm, box-elder (*Acer Negundo*), curled maple (*Acer dasycarpon*), and ash, all of them reduced in stature. From hence the forest begins to disappear before the pervading plain.

Nuttall (83:234) reached the mouth of the Verdigris River by July 14 On the alluvial lands between the Grand and Verdigris rivers he saw "... larger trees than ... since leaving Port Smith. Among them were lofty scarlet oaks, ash, and hackberry, and whole areas of nettles (*Urtica divaricata*)... ."

By July 17, with two companions, Nuttall (83:241) started a two day trip by canoe up the Grand River to visit the Osage Saltworks on some cliffs, on the 18th, he ...recognized as new, a large shrub... a simple leaved *Rhus*, scarcely distinct from *R. cotinus* of the south of Europe and our gardens... The gravel bars were almost covered with *Amsonia salicifolia*, with which grew the *Sesbania macrocarpa* of Florida.

That evening, two miles below the Osage Saltworks (50 miles above the Arkansas River), Nuttall (83 :242) notes that ...

"In this elevated alluvion I still observed the coffee-bean tree (*Gymnocladus canadensis*), the over-cup white oak (*Quercus macrocarpa*), the pecan (*Carya olivaeformis*), the common hickory, ash, elm, and below, in places near the margin of the river, the poplar-leaved birch (*Betula populifolia*)."

Nuttall (83:244) had his first attack of an intermittent fever, so he left the nearly deserted Osage Saltworks on July 20, "...and proceeded, by compass, across the Great Osage Plain, towards the mouth of the Verdigris."

The saltworks were nearly deserted due to the murder of Mr. Campbell by Erhart, his late partner, and two accomplices. Nuttall (83:242) comments, "I could not but congratulate myself on having escaped, perhaps a similar fate. At the Cadron, I had made application to Childer's, one of these remorseless villains, as a woodsman and hunter, to accompany me for hire, only about a month before he had shot and barbarously scalped Mr. Campbell, ..."

In Nuttall's *Collections Towards a Flora the Territory of Arkansas* (84:165-168), are recorded *Amaranthus tamariscinus* and *Betula populifolia* as collected from the banks of Grand River. *Euphorbia heterantha* was listed as being found "on the sandy banks of the Arkansas from Fort Smith to Salt River." Other specimens from areas outside the Ozarks but in close proximity are: *Alisina rostrata* (84:159) "in the ponds of the Verdigris River of Arkansas," *Rivina portulacoides* (84 :167) "on the alluvial lands of the Verdigris River near its confluence with the Arkansas," and *Euphorbia obtusata* (8:172) "on the banks of the Arkansas from the Verdigris to Salt River."

Edward James was the second botanist to enter the Oklahoma Ozarks when his party crossed the Arkansas River between Muskogee and Sequoyah counties. The day (September 10, 1820) was spent in trying to work their way through "a dense and almost impenetrable cane-brake," where no vestige of a path could be found. On September 11 they resumed their trip to Fort Smith (79:236).

Fort Gibson was established by General Arbuckle in 1824, the same year that Fort Smith was abandoned by the Army (79:444). Zina Pitcher, surgeon in the United States Army, was stationed at Fort Gibson from 1831 to 1834. When his duties permitted, he collected plants for John Torrey (79:286).

Another botanist to visit Fort Gibson was Charles Joseph Latrobe in company with Washington Irving and Count Albert Pourtales (67). Neither Latrobe nor any other member of the party displayed much interest in collecting plants during their one month of hunting in the Indian Territory (79:386)

The German botanist, Heinrich Karl Beyrich, made use of army protection during his journey from St. Louis to Fort Gibson and thence to the cross timbers in 1834. Lasigue in his *Musee' botanique de M. Benjamin Delessert* (page 466) stated that, on the return trip, "Beyrich was attacked by Cholera and died at Fort Gibson in September 1834" (79:386, 583).

In 1845 J. W. Albert and party followed the Arkansas River on their way to St. Louis. On October 20th Albert observed on the way that they

"...found some of the fruit of the pawpaw, (*Ammona triloba*), and black walnuts ... had been seen... among the sylvia, the elm, and various species of the oak and hickory, among the latter, the bitternut hickory (*Juglans aurata*)... as well as the buttonwood and spicewood (79:939).

During the Civil War, Fort Gibson was reactivated and given the temporary name of Fort Blunt. Dr. Edward Palmer was stationed there during July and August of 1863. The Battle of Honey Springs was fought on July 17th some 15 miles south of Muskogee. In spite of military duties, Palmer found time to collect a few plants, one of which, (*Clitoria mariana*), is in the United States National Herbarium (82:208). Palmer again visited "Fort Gibson, Arkansas" with General Leavenworth's party in late January of 1868. They left soon after the first of February (82:35-36).

Butler (9) reported on a collection from the Oklahoma Ozarks. It included *Monarda Bradburiana* Beck from the Cherokee Nation.

The Cherokee and Creek Nations were visited by M. A. Carleton (11) early in the spring of 1891. Some of the plants which he located simply as "Muscogee" or "Muscogee, Arkansas River" may have been collected north of the Arkansas River (which is only about one and one-half miles to the northeast).

Species identified and listed by Holzinger (63) are: *Ranunculus abortivus* L., var. *micranthus* Gray, *Ilex decidua* Walt., *Lathyrus pusillus* Eli., *Crataegus arborescens* Ell., *Oenothera linifolia* Nutt., *O. speciosa* Nutt., *Polytaenia Nuttallii* DC., *Viburnum prunifolium* L., *Bellis integrifolia* Michx., *Erigeron philadeiphicus* L., *Myosotis verna* Nutt., *Gratiola virginiana* L., *Veronica arvensis* L., *Pedicularis canadensis* L., *Plantago pusilla* Nutt., *Sisyrinchium bellum* Watson, *Hypoxis erecta* L., *Carex granularis* Muhl., *C. grisea* Wahl. var. *globosa* Bailey, *Q. Muhlenbergii* Schkuhr var. *australis* Olney, *C. riparia* W. Curtis, *C. tetanica* Schkuhr var. *Meadii* Bailey, *C. triceps* Michx., and *C. varia* Muhl.

C. H. Fitch (47) in 1900 reported on woodland of the Indian Territory by township and range. The timber was simply listed as oak, ash, elm, hickory, pecan, walnut, cottonwood, etc.

C. N. Gould (55) in 1903 made a list of trees, shrubs, and vines of the Cherokee Nation.

Other collections from the Oklahoma Ozarks, now deposited in the Oklahoma State University Herbarium, are those of R. Bebb, G. W. Stevens, and U. T. Waterfall.

ECOLOGY

General Distribution

Bruner (8) recognizes two main forest areas in Oklahoma. These are the deciduous forest formation with oak-hickory associations occupying the Oklahoma Ozarks in the northeast part of the state and the Ouachita Mountains in the southeast with the oak-hickory savannah of the Arkansas valley region separating the two. An extreme northeast tip of the Andropogon associates of the prairie plains extends from the Neosho to Spring rivers in the vicinity of Miami, Pitcher, and Quapaw of Ottawa County.

The most common oak-hickory association is *Quercus velutina*, *Carya tomentosa* and *C. ovalis*. Where the tops of the hills become more xeric, *Quercus marylandica* and *stellata* replace *Q. velutina* with *Ulmus alata* as another common tree. Considerable stands of *Pinus echinacea* are occasionally found on the sides and tops of the cherty hills, especially near Salina in Mayes County, Tahlequah in Cherokee County, and Jay in Delaware County. Further down the sides of the larger hills and into the narrow valleys will be found *Quercus rubra* and *Q. Muhlenbergii* with occasional *Carya cordiformis* plus *C. ovata* and some *C. tomentosa*. The larger valleys of creeks and rivers have *Quercus*

Muhlenbergii and *Q. macrocarpa* with *Carya cordiformis* and *C. Illinoensis*. Considerable numbers of scattered *Castanea ozarkensis* are found in the wooded hills from northern Cherokee and Adair counties northward. Several *Quercus nigra* trees are found in the valleys southeast and east of Sallisaw in Sequoyah County. In the Marble City area of Sallisaw Creek in Sequoyah County are several specimens of *Carya ovalis*.

The forests in the larger valleys have many species of trees as well as undershrubs and herbs. Some of the more common trees other than those listed above are: *Populus deltoides*, *Salix nigra*, *Juglans nigra*, *Ulmus americana*, *U. rubra*, *Celtis laevigata*, *Morus rubra*, *Platanus occidentalis*, *Prunus serotina*, *Gymnocladus dioica*, *Acer saccharinum*, *A. Negundo*, *Diospyros virginiana*, and *Fraxinus pennsylvanica*. Some of the more prominent undershrubs are: *Lindera Benzoin*, *Cercis canadensis*, *Prunus mexicana*, *Ilex decidua*, *Cornus Drummondii*, and *Viburnum rufidulum*. The lianas include: *Smilax Bona-nox*, *Rhus radicans*, *Ampelopsis cordata*, *Parthenocissus quinquefolia*, and *Vitis vulpina*.

Many small prairies are located on some of the broader flat-top hills and along the southern and western borders of the forests where they meet the Arkansas valley and the prairie region. The best areas of these have been put under cultivation, and only the more irregular steep-sloped, or low portions have been left in native grasses. Even these are not suited for complete study from mid-summer through fall because they are mowed for hay. In fact, every portion of the Oklahoma Ozarks has had disturbances by man in some form or other such as: fire, cutting of timber, livestock grazing, or cultivation. The common prairie

species are listed later on in this chapter.

Where the oak-hickory woods of the hills border on the larger prairie areas, the woods are of a more open type and have such trees as: *Quercus marilandica*, *Q. stellata*, *Ulmus alata*, *U. Americana*, *Celtis tenuifolia*, *Sassafras albidum* var. *molle*, *Gleditsia triacanthos*, *Bumelia lanuginosa* var. *oblongifolia*, and *Diospyros virginiana*. The smaller trees and undershrubs are represented by: *Crataegus crus-galli*, *C. viridis*, *Prunus hortulana*, *Rosa setigera* var. *tomentosa*, *Rubus aboriginum*, *R. mollior*, *R. ozarkensis*, *Cercis canadensis*, *Rhus copallina* var. *latifolia*, *R. glabra*, *Cornus Drummondii*, and *Symphoricarpos orbiculatus*.

Several stations were selected for study, and intensive collecting was done at each one in order to show the seasonal aspect. From these seventeen stations the following were selected: a prairie station three miles east of Fort Gibson on U. S. Highway 62 in Muskogee County because of its southwest position in the Arkansas valley and its oak-hickory savannah; a prairie station one-half mile northeast of Quapaw on U.S. Highway 66 in Ottawa County because of its prairie plains location; a double station at Dripping Springs five and one-half miles west of Siloam Springs, Arkansas, on U.S. Highway 59 in Delaware County because of its canyon-like valley and hill combination; a pond station one-half mile southeast of Blackgum on State Highway 100 in Sequoyah County because of its protection from livestock for one and one-half years; and a general hill station in the Brushy Mountains twelve miles northeast of Sallisaw on U.S. Highway 59 in Sequoyah County.

Fort Gibson Prairie Station

The common vernal species are: *Vulpia octoflora*, *Carex Crawei*, *Fimbristylis Drummondii*, *Tradescantia ohiensis*, *Nothoscordum bivalve*, *Zigadenus Nuttallii*, *Hypoxis hirsuta*, *Sisyrinchium varians*, *Claytonia virginica*, *Arenaria patula* forma *media*, *Stellaria Nuttallii*, *Delphinium carolinianum* var. *Nortonianum*, *Rosa carolina* var. *villosa*, *Baptisia leucophaea* var. *leucophaea*, *Psoralea tenuiflora* var. *floribunda*, *Asclepias viridis*, *Penstemon tubaefflorus*, *Plantago aristata*, *P. virginica*, *Achillea lanulosa*, *Echinacea pallida*, *Erigeron strigosus*, *Krigia Dandelion*, *K. occidentalis*, and *Serinia oppositifolia*.

The common aestival species are: *Andropogon Gerardi* var. *Gerardi*, *A. saccharoides*, *Eragrostis capillaris*, *Manisuris cylindrica*, *Panicum virgatum*, *Paspalum ciliatifolium* var. *Muhlenbergii*, *Sporobolus asper* var. *Hookeri*, *Triodia flava*, *T. stricta*, *Cyperus filiculmis*, *Potentilla simplex* var. *simplex*, *Dalea candida*, *Desmodium sessilifolium*, *Schrankia Nuttallii*, *Croton mona anthogynus*, *Euphorbia corollata* var. *paniculata*, *Gaura biennis* var. *Pitcheri*, *Ptilimnium Nuttallii*, *Physostegia angustifolia*, *Ruellia humilis* var. *longiflora*, *Gaillardia fastigiata*, *Rudbeckia hirta* var. *pulcherrima*, and *Silphium laciniatum* var. *laciniatum*.

The common serotinal species are: *Salvia azurea* var. *grandiflora*, *Aster ericoides*, *A. praealtus*, *Solidago altissima*, and *S. missouriensis* var. *fasciculata*.

Quapaw Prairie Station

The common vernal species are: *Vulpia octoflora*, *Carex Crawei*, *Allium canadense* var. *mobile*, *Camassia scilloides*, *Erythronium albidum* var. *mesochoreum*, *Hypoxis hirsuta*,

Claytonia virginica, *Anemone caroliniana* forma *caroliniana*, *Delphinium carolinianum* var. *crispum*, *Ranunculus fascicularis* var. *apricus*, *Psoralea tenuiflora* var. *floribunda*, *Viola sagittata*, *Polytaenia Nuttallii*, *Dodecatheon Meadia* formas *album* and *Meadia*, *Asclepias hirtella*, *A. viridis*, *Castilleja coccinea coccinea*, *Penstemon tubaefflorus*, *Plantago aristata*, *Houstonia patens*, *Lobelia appendiculata*, *Antennaria campestris*, *Erigeron strigosus*, *Krigia Dandelion*, and *K. occidentalis*.

The common aestival species are: *Andropogon Gerardi* var. *Gerardi*, *Panicum capillare* var. *capillare*, *P. praecocius*, *Sorghastrum nutans*, *Triodia flava*, *T. stricta*, *Strophostyles leiosperma*, *Gaura biennis* var. *Pitcheri*, *Eryngium yuccifolium* var. *synchaetum*, *Physostegia angustifolia*, *Ruellia humilis* var. *longiflora*, *Achillea lanulosa*, *Boltonia latisquama*, *Coreopsis grandiflora* var. *grandiflora*, *Liatris pycnostachya*, and *Rudbeckia hirta* var. *pulcherrima*.

The common serotinal species are: *Salvia azurea* var. *grandiflora*, *Aster ericoides*, *A. hemisphericus*, *A. pilosus*, and *Solidago canadensis* var. *gilvocanescens*.

Dripping Springs Valley Station

The common trees and undershrubs are: *Juglans nigra*, *Ostrya virginiana* var. *lasia*, *Quercus alba*, *Ulmus americana*, *Morus rubra*, *Lindera Benzoin* var. *Benzoin*, *Hydrangea arborescens* var. *arborescens*, *Platanus occidentalis*, *Prunus serotina*, *Cercis canadensis*, *Rhus radicans*, *Cornus florida*, *Rhododendron canescens*, *Diospyros virginiana*, *Fraxinus americana* var. *americana*, and *Viburnum rufidulum*.

The common vernal species are: *Panicum Boscii*, *Carex Frankii*, *C. lurida*, *Arisaema*

atrorubens formas *viride* and *zebrinum*, *Saururus cernuus*, *Claytonia virginica*, *Dianthus Armeria*, *Stellaria media*, *Anemone virginiana*, *Anemonella thalictroides*, *Aquilegia canadensis* var. *latiuscula*, *Ranunculus recurvatus*, *Cardamine bulbosa*, *Saxifraga virginiana* var. *subintegra*, *Cercis canadensis*, *Vicia minutiflora*, *Geranium maculatum*, *Viola pensylvanica* var. *pensylvanica*, *V. triloba* var. *dilatata*, *Chaerophyllum tainturieri* var. *tainturieri*, *Cornus florida*, *Rhododendron canescens*, *Glechoma hederacea* var. *micrantha*, *Houstonia purpurea*, *Viburnum rufidulum*, *Neclo aureus*, and *S. obovatus* var. *rotundus*.

The common aestival species are: *Adiantum Capillus-Veneris*, *Asplenium platyneuron*, *Polystichum acrostichoides*, *Parietaria pensylvanica*, *Hydrangea arboreacens* var. *arborescens*, *Impatiens capensis*, and *Scutellaria ovata* var. *ovata*.

The common serotinal species are: *Boehmeria cylindrica* var. *cylindrica*, *Pilea pumila*, *Polygonum pensylvanicum* var. *laevigata*, *P. punctatum* var. *leptostachyum*, *Chenopodium Standlevanum*, *Acalypha rhomboidea*, *Perilla frutescens*, and *Erechtites hieracifolia* var. *praealta*.

Dripping Springs Hill Station

The common trees and undershrubs are: *Juniperus virginiana*, *Carya ovalis*, *C. tomentosa*, *Quercus alba*, *Q. stellata*, *Q. velutina*, *Celtis tenuifolia* var. *georgiana*, *Amelanchier arborea*, *Rubus frutifer*, *Rhus aromatica* var. *serotina*, *R. copallina* var. *latifolia*, *R. glabra*, *Vaccinium stamineum*, and *Symphoricarpos orbiculatus*.

The common vernal species are: *Danthonia spicata* var. *longipila*, *Luzula bulbosa*, *Hypoxis hirsuta*, *Comandra Richardsiana*,

Dianthus Ameria, *Anemonella thalictroides*, *Arabis missouriensis*, *Cardamine parviflora* var. *arenicola*, *Amelanchier arboea*, *Oxalis violaceae*, var. *trichophora*, *Kitabeliana* var. *Rafinesquii*, *V. pedata* var. *lineariloba*, *Vaccinium stamineum*, *Houstonia patens*, *Atennaria plantaginifolia*, *Erigeron strigosus*, *Gnaphallum purpureum*, and *Krigia virginica*.

The common aestival species are: *Panicum malacophyllum*, *P. praecocius*, *Bulbostylis capillaris*, *Carex Bushii*, *Cyperus ovularis* var. *sphaericus*, *Rhynchosia latifolia*, *Schrankia Nuttallii*, *Stylosanthes biflora* var. *hispidissima*, *Tephrosia virginiana*, *Crotonopsis elliptica*, *Ascyrum hypericoides*, *Torilis japonica*, *Asclepias verticillata*, *Monarda fistulosa* var. *fistulosa*, *Pycnanthemum tenuifolium*, *Solarium carolinense* var. *albiflorum*, *Verbascum thapsus*, *Ruellia humilis* var. *longiflora*, *Dipsacus sylvestris*, *Lobelia spicata* var. *leptostachys*, *Erigeron annuus*, *Hieracium Gronovii*, *Lactuca canadensis* var. *latifolia*, and *Rudbeckia hirta* var. *pulcherrima*.

The common serotinal species are: *Andropogon scoparius*, *Gerardia Gattingeri*, *Aster anomalus*, and *A. turbinellus*.

Blackgum Pond Station

Trees and undershrubs are: *Salix nigra* and *Cephalanthus occidentalis*.

The common vernal species are: *Potamogeton diversifolius*, *Cyperus virens*, *Scirpus koilolepis*, *Juncus brachycarpus*, *J. diffusissimus*, *J. interior*, *J. marginatus*, *J. validus*, *Ranunculus laxicaulis*, *Gratiola neglecta*, and *Lindernia anagallidea*.

The common aestival species are: *Sagittaria ambigua*, *Echinochloa crusgalli*, *Rotala ramosior* var. *interior*, *Rhexia interor*, *Ludwigia alternifolia*

var. *alternifolia*, *L. glandulosa*
var. *glandulosa*, *Hydrolea ovata*,
Verbena hastata, *Gratiola*
virginiana, *Cephalanthus*
occidentalis, and *Helenium*
flexuosum.

The common serotinal species are: *Eleocharis lanceolata*, *Polygonum hydropiperoides* var. *Bushianum*, *P. pennsylvanicum* var. *laevigatum*, *P. punctatum* var. *leptostachyum*, *Gerardia fasciculata*, *G. heterophylla*, *Bidena polylepis*, *Boltonia diffusa* var. *interior*, and *B. latisquama*.

Brushy Mountains Station

The common trees and undershrubs are: *Carya tomentosa*, *Quercus marilandica*, *Q. stellata*, *Ulmus alata*, *Amelanchier arborea*, *Prunus americana*, *Rhus aromatica*, *R. copallina* var. *latifolia*, and *Symphoricarpos orbiculatus*.

The common vernal species are: *Vulpia octoflora*, *Hypoxis hirsuta*, *Claytonia virginica*, *Arenaria patula* forma *media*, *Anemonella thalictroides*, *Ranunculus fascicularis* var. *apricus*, *R. Harveyi*, *Viola pedata* var. *lineariloba*, *V. Kitaibeliana* var. *Rafinesguil*, *Oenothera linifolia*, *Dodecatheon Meadia* forma *album*, *Collinsia violacea*, *Ruellia humilis* var. *longiflora*, *Plantago aristata*, *Hustonia patens*, *Valerianella longiflora*, *Antennaria plantaginifolia*, *Astranthium integrifolium*, and *Erigeron strigosus*.

The common aestival species are: *Andropogon scoparius*, *Danthonia spicata* var. *longipila*, *Eragrostis capillaris*, *Manisuras cylindrica*, *Dalea candida*, *Crotonopsis elliptica*, *Hypericum Drummondii*, *H. pseudomaculatum*, *Daucus pusillus*, *Ptilimnium Nuttallii*, *Spermolepis divaricata*, *Diodi teres* var. *setifera*, *Ambrosia bidentata*, *Helenium amara*, *Heterotheca pilosa*, and *Rudbeckia hirta* var. *pulcherrima*.

The common serotinal species

are: *Desmodium paniculatum*, *Aster azureus* var. *azureus*, *A. patens*, *A. pilosus*, *A. turbinellus*, *Liatris squarrosa* var. *hirsuta*, and *Solidago petriolaria* var. *Wardii*.

Two other stations were of special interest because a few of the species found were near the extreme limit of their range. These are the Arkansas River sands three and one-half miles south of Fort Gibson in Muskogee County, because of some western species, and the Keyough Bluff station three miles north of Fort Gibson, because of some eastern and southeastern species.

Western species of the Arkansas River sands include: *Cenchrus pauciflorus*, *Cycloloma atriplicifolium*, *Dalea lanata*, *Euphorbia hexagona*, *Heliotropium convolvulaceum*, and *Lippia incisa*.

Eastern species of the Keyough Bluffs are: *Camptosorus rhizophyllus*, *Asarum canadense* var. *acuminatum*, *Rivina humilis*, *Rubus occidentalis*, *Cladrastis lutea*, *Cotinus obovatus*, and *Acer saccharum*.

ADDITIONS TO THE STATE FLORA

Those taxa preceded by an asterisk have not been reported previously as additions to the state flora. All of the others have been reported in the *Proceedings of the Oklahoma Academy of Science* (128, 135) as additions to the state flora from the Oklahoma Ozarks.

Elodea Nuttallii (Planch.) St. John; shallow pools of Illinois River and Flint Creek; Cherokee and Delaware counties.

**Arisaema atrorubens* (Ait.) Blume, forma *viride* (Engler) Fern. The following specimens are so identified because of the "spathe green, without or with only faint stripes" (43): Wallis 6595-1 from wooded base of bluffs

- on Ballard Creek, 1 mile south of Watts in Adair County, Wallis 3626 from wooded base of a hill, 14½ miles northeast of Tahlequah in Cherokee County and Wallis 3658 from Dripping Springs valley, 5½ miles west of the state line in Delaware County. Both forma *zebrinum* and forma *viride* were found growing together in Cherokee and Delaware counties.
- **Tradescantia Ernestiana* Anders. & Woodson, forma *alba* Waterfall; flint bluffs; type specimen is Walls 395 from Cherokee County (132), also collected later from Delaware and Muskogee counties.
- Aletris farinosa* L.; low areas in a prairie; Delaware County.
- Allium vineale* L., forma *compactum* (Thuill.). Aschers.; along roadsides; Adair, Delaware, Ottawa, and Sequoyah counties.
- Allium vineale* L., forma *vineale*; along roadside; Delaware County.
- Iris virginica* L., var. *Shrevei* (Small) E. Andera.; *Shallows of spring-fed creeks*; Cherokee and Ottawa counties.
- Urtica dioica* L.; wooded bank of Lost Creek; Ottawa County.
- Paronychia canadensis* (L.) Wood; in a wooded valley; Cherokee County.
- Clematis ligusticifolia* Nutt.; woods of a creek; Cherokee County.
- Clematis virginiana* L.; fence row in a creek valley; Cherokee County.
- Delphinium tricorne* Michx., forma *albiflora* Millsp.; woods of Flint Creek; Delaware County.
- Draba aprica* Beadle; woods of Falls Branch; Cherokee County.
- Rorippa islandica* (Oeder) Borbas, var. *hispida* (Desv.) Butt. & Abbe; valleys of Flint and Sallisaw creeks; Delaware and Sequoyah counties.
- Desmodium rigidum* (Ell.) DC.; woods of hills; Delaware, Mayes, and Sequoyah counties.
- Rhamnus lanceolata* Pursh, var. *glabrata* Gleason; woods of a small creek; Cherokee County.
- Hypericum gentianoides* (L.) BSP.; oak-hickory woods of a hill; Delaware County.
- Lamium amplexicaule* L., forma *albiflorum* D. M. Moore; road-side; Cherokee County.
- **Leonurus sibiricus* L. is represented by Wallis 7673 from oak-hickory woods and roadside, 23 miles northeast of Tahlequah in Adair County, and Wallis 792 and 933 from open roadsides, 8.7 miles northeast of Tahlequah in Cherokee County. The "10-nerved, scarcely angled" calyx and conspicuous bracts "half to fully as long as the calyx" (53) as well as leaves "deeply 3-7 cleft and incised" (43) separate this species from the less common *L. Cardica*.
- Melissa officinalis* L.; in valley of a spring-fed creek; Mayes County.
- **Castilleja coccinea* (L.) Spreng., forma *lutescens* Farw. was collected as Wallis 6652, 6684, and 6840. They are hairy annuals with yellow floral bracts (43) as compared to the red bracts of the abundant forma *coccinea*. Both formas were found growing together in prairie areas, ½ mile northeast of Quapaw in Ottawa County and ½ mile north and 1 mile west of Peggs in Cherokee and Mayes counties.
- Dipsacus sylvestris* Huds.; wooded hillsides; Cherokee and Delaware counties.
- Cacalia Muhlenbergii* (Sch. Bip.); wooded valleys; Adair, Delaware, and Ottawa counties.
- Liatris aspera* Michx., var. *aspera*, forma *Benkii* (Macbr.) Fern.; prairie; Cherokee County.

SUMMARY

A floristic study of Cherokee County from 1950 to 1953 encouraged the author to undertake a similar study covering the entire Oklahoma Ozarks. The Cherokee County collection of 1,400 sheets was expanded to some 7,000 sheets between the years of 1953 and 1958. In addition to these, the author reevaluated 497 sheets of plants collected by others in the Oklahoma Ozarks.

The identification of the plants involved the use of 130 monographic studies and other taxonomic literature. All of the plant collections studied by the author are deposited in the Herbarium of the Oklahoma State University, and many duplicates of these are in the author's private museum at Fort Gibson, Oklahoma.

Intensive collecting was done at 17 stations in order to study the seasonal changes of herbaceous plant societies, and extensive collecting was done throughout the Oklahoma Ozarks for a general distribution study. The order of listing of the families follows that of the Engler-Prantl system. Each species is accompanied with general habitats and locations in which one or more specimens have been collected. Whenever a citation of a collection other than that of the author's was used, notation was made as to the collector and collection number.

A total of 123 families represented by 534 genera and 1,377 species and subordinate taxa are listed. The families having the greatest numbers of species and subordinate taxa were: Compositae 192, Gramineae 150, Leguminosae 93, Cyperaceae 84, Rosaceae 46, Labiatae 43, Scrophulariaceae 34, Cruciferae 3, Euphorbiaceae 33, Ranunculaceae 32, and Liliaceae 30. These eleven families contain 56 percent of the total species and subordinate taxa.

Twenty four additions to the Oklahoma Flora were made by the author from this collection. These are listed separately as additions to the state flora and also are incorporated in the general listing without any special references.

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