A TAXONOMIC STUDY OF THE NATIVE OR NATURALIZED PLANTS OF COWLEY COUNTY, KANSAS

By

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PREFACE

While serving as biology instructor at St. John's College, the author became interested in developing a series of learning experiences based upon field work. Detailed studies concerning the relationship of field work and biology instruction are not abundant, but some, notably that of Hibbs (reported in Hurd, 1961) indicate that outdoor laboratories have "unequaled learning opportunities." A quick perusal of recent high school biology curricular innovations (AIBS, 1964) and professional journals (NABT, 1966) indicate that considerable emphasis is placed upon field work. In particular, the adaptations and interrelationships of living things and their ecological and geographical distribution are aspects of the biology program which can be readily studied in the outdoor laboratory.

An immediate need was the determination of those plants which typically occurred in the local area. After making observations and periodic collections, it became evident that the flora was quite varied. A search of the literature failed to yield much information concerning the plants of Cowley County. Personal communication from the taxonomists at Kansas State University and the University of Kansas emphasized the need for further study of the local vegetation.

It was felt that a study of Cowley County flora would serve a dual purpose. Not only would such a study add to our knowledge of Kansas flora, and it would also provide for the subsequent development of field learning experiences which could be used in the class room.

Twelve collecting stations were selected which had different ecological conditions. These were visited at two week intervals during the growing season. In addition, collections were made at many other sites throughout the county to provide as complete a list of plants as possible.

Specimens were prepared in accordance with standard herbarium techniques. They were critically studied with the aid of monographs and similar treatments when these were available and pertinent. Voucher specimens of all taxa found within Cowley County were deposited in the herbarium of Oklahoma State University (OKLA). An incomplete second voucher specimens set was deposited with the herbarium of Kansas State University (KSC). Additional duplicates of the collections have been retained by the author and are in his personal herbarium and in the herbarium of St. John's College, Winfield. Some plants collected by earlier botanists have been utilized in the study. Where possible, these have been examined and verified by the author and are designated by the citation of the collector and collection number followed by the Lanjou and Steflau (1959) abbreviation of the herbarium holding the collection. Where the inclusion is based on published record only, the author and date of the publication is noted.

Most of the work connected with this study was carried out at Oklahoma State University where the library and herbarium were at the writer's disposal. He is very grateful for these and other privileges granted to him during the course of this study. He particularly appreciated the helpful suggestions of Drs. L. H. Bruneau and W. W. Marsden, the constant encouragement and help received from Dr. U. T. Waterfall during the course of the study, the assistance of Dr. K. E.

Wiggins in the selection and definition of the problem and his encouragement throughout the entire program, and the aid rendered by his wife who typed labels, mounted his own study specimens and collected in certain areas.

The writer also wishes to thank Dr. R. L. McGregor, Curator of the Herbarium at the University of Kansas, and Dr. T. M. Barkely, Curator of the Herbarium at Kansas State University, for graciously allowing him to study various collections.

TABLE OF CONTENTS

CHAPTER I

PHYSICAL FEATURES AND CLIMATE

This brief review of the physical features and climate of Cowley County will give a condensed view of some important factors which influence plant populations in the area under study.

LOCATION AND SIZE

Cowley County is in the southernmost tier of counties in Kansas. Located approximately 120 miles from the eastern border of Kansas, it is bounded on the east by Elk and Chautauqua Counties, on the north by Butler County, on the west by Sumner County, and on the south by Kay and Osage Counties, Oklahoma.

The County is in the Osage Plains and the Arkansas River Lowlands sections of the Central Lowland Physiographic Province. (Schoewe, 1949) It is drained by the Arkansas River and tributaries.

The fourth largest county in the state, Cowley County extends 35 miles from north to south and 34.5 miles from east to west. It has an area of 728,960 acres. (Schoewe, 1948)

TOPOGRAPHY

The surface features of Cowley County are directly related to the type of rocks that crop out. Except for the western one-sixth, limestone and shale alternate. The limestone, more resistant to weathering,

comprises the numerous benches found throughout the area. The softer shale beds, more easily eroded, form the many depressions and valleys typical of the eastern part of the county.

Although the actual delimitation of the Flint Hills of Kansas has not yet been completed to the satisfaction of all concerned, most botanists and agronomists accept a broad interpretation of this province in which the southern portion extends into or through Cowley County. (Mead, 1900; Schoewe, 1949; Bidwell, 1966) The Flint Hills form a broad inverted triangle through central Cowley County and are characterized by rolling surfaces with many deep cut valleys and narrow, steep-sloped divides which are often flat topped. In a small portion of extreme eastern Cowley County, the Osage Plains with their characteristic north-south ranges of hills and east-facing limestone escarpments are found. The plains of the Great Bend Prairie Province are found in western Cowley County. East of Arkansas City there is a relatively small area of sandy upland hills which border the Arkansas River. (Stevens, 1961)

Level or faintly undulating land areas occur in several parts of the county. These are found in higher situations, and in low areas bordered by higher undulating country. Some areas are encountered in which the surface seems to be perfectly level.

In elevation above sea level, Cowley County ranges from 900 feet in the southeast to about 1,500 feet in the northwest. The general elevation of the county is about 1,250 feet above sea level. (Schoewe, 1949)

The Arkansas River, crossing the county in the southwest, receives most of the surface drainage of the county. Principle tributaries flow in a southerly direction and include the Otter, Cedar, and Rock Creeks

in the east and the Walnut River, Spring and Grouse Creeks in the west. The streams in the eastern part of Cowley County tend to have wide, deep valleys with steep to precipitous sides.

GEOLOGY

Rocks that underlie the county but do not crop out within it vary in age from Precambrian to Late Pennsylvanian. Outcropping rocks are from the Late Pennsylvanian to Recent. (Bass, 1929) Pennsylvanian limestones and shales are exposed throughout the county, excepting the lowlands of the southwest and other stream beds. In the southwest are Pleistocene deposits of eolian silts and water deposition of sediments caused, in part, by runoff of glacial waters from the north. The flood plain of the Arkansas River represents alluvian deposits of the Recent Stage of the Pleistocene (Bayne, 1962)

SOILS

Although there are over twenty soil types found in Cowley County, five types are most commonly encountered. In the southeast one finds chiefly Summit silty clay loam. This soil type is extensively used as pasture and hayland, and is found in hilly areas. The Gerald silt loam which comprises much of the remaining upland area of the county is largely in cultivation, much of it in wheat. Bottom-land types which are important are the Canadian silt loam and Osage silty-clay and clay soils. These are found in the valleys of all streams except the Arkansas River where the Arkansas fine and very fine sands are found. These lowland soils are extensively cultivated. (Hall 1917; Bidwell, 1956)

CLIMATE
(Snow, 1949)

The climate of Cowley County is continental. Summer temperatures tend to be warm, if not actually hot. The average July humidity varies from 40 per cent during the afternoon and evening to 80 per cent during the cooler early morning hours. January humidity varies from 60 to 80 per cent. Warm, dry southerly winds may cause much evaporation, and if prolonged, may bring about plant damage. Winters are generally not severe. Winfield temperatures for a 45 year period average 33.2° Fahrenheit for January and 80.9° F. for July. The mean maximum temperature for July is 93.2° F., with the maximum recorded high reaching 115° F. In January the mean minimum temperature is 22.6° F. and the record low temperature is -20° F. The average temperatures for January during 1966 and 1967 were 30.5° F. and 36.7° F., respectively.[1] July average temperatures were 83.9° F. and 76.2° F., respectively.

Typical of grassland areas, precipitation is heaviest through late spring and early summer and lightest during the winter. Forty-five year records kept at Winfield indicate that the average annual precipitation is 32.90 inches. May and June are the months in which the precipitation is highest, averaging 4.71 and 4.88 inches, respectively. December and January are the months in which the precipitation is lowest, averaging 1.25 and 1.35 inches, respectively. Generally, Cowley County receives less than twelve inches of snow yearly.

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[1] The climatological data for the years 1966 and 1967 were made available through the courtesy of Carl Whitson, Winfield Cooperative Observer of the United States Weather Bureau.

During 1966 and 1967, considerable variation in precipitation over the average pattern occurred. In 1966, the annual rainfall was 24.14 inches, 27 per cent less than normal. The early months of 1967 were also marked with relatively low precipitation amounts. During June and July, however, 15.92 inches of rain fall, ending the dry conditions which had prevailed during the early part of this study.

The average date for the last killing frost in spring is 15 April, and the date for the first killing frost in fall is 20 October. The average length of the growing season is 188 days, but the season varies from 141 to 213 days. The last killing frost in spring for which records are available was 20 May (1894) and earliest killing fall frost was 26 September (1912).

The average annual number of clear days exceeds 162. Partly cloudy days number less than 112, and cloudy days exceed 90. Possible sunshine is approximately 75 per cent for summer and 60 per cent for winter.

The prevailing wind direction in the county is southerly, though northerly winds frequently occur through December, January, and February. Average hourly wind velocities are between ten and twelve miles per hour, depending upon the season.

CHAPTER II

EARLY TAXONOMIC HISTORY

EARLY BOTANICAL EXPLORERS

In the Nineteenth Century a number of botanists and naturalists were exploring the newly acquired Louisiana Purchase. Traveling chiefly by water, they explored many miles of this land along the important waterways, including the Arkansas River. However, there is no evidence that any passed through Cowley County. Some, such as Abert in 1848, traveled southwest from Kansas City to the great bend area of the Arkansas River and then on west. Others, such as Nuttall in 1819, traveled up the Arkansas River from Arkansas but turned west before reaching Cowley County. (McKelvey, 1955) Trecul, in 1848, collected on the Marias des Cygnes River in Eastern Kansas, but his exact route is not known. It is possible that he was in Cowley County, but since all of his collections and records were lost on the trip, one can not be certain. (McKelvey, 1955)

The first records of Cowley County plants are attributed to botanical workers associated with the colleges of the state. In 1872, J. H. Carruth, botanist at what is now the University of Kansas, published a catalog of Kansas flora which listed 1,082 plant species for the state. This list included no citations from Cowley County. Five years later, (Carruth, 1877) he reported additions to this list and specifically

thanked a Mr. James Wilson, amateur botanist from Arkansas City, for sending material to him from Cowley County. This material included nine state records and several other interesting plants.

Later, M. A. Carleton (reported by Holzinger, 1892) collected in Cowley County. He had made a collecting trip from Venita, Oklahoma, west to the Creek and Seminole Nations, and then across the southern tier of counties in Kansas to the northwest part of Texas. His return brought him to south central Kansas. In early September he collected fourteen species from the county, all near Arkansas City. These included four Compositae, two Euphorbiaceae, two Convolvulaceae, and one each of Leguminosae, Onagraceae, Acanthaceae, Urticaceae, Amaranthaceae, and Labiatae.

The most intensive early collecting in Cowley County was done under the direction of A. S. Hitchcock, botanist at what is now Kansas State University. He and several associates were involved in the preparation of a state flora. Consequently, there were many collecting trips throughout the state. Three collectors worked in the county at this time and their material is in the herbarium of Kansas State University (KSC)

Two publications of A. S. Hitchcock yield some insight into the early knowledge of Cowley County flora. Based upon his own collecting, the collections of students and associates, and upon specimens sent in by interested residents, he compiled a number of distribution maps of Kansas plants showing plant distribution by counties. In 1895, the Third Report of Kansas Weeds (Hitchcock and Norton, 1896) listed 209 species, none of which were cited from the county. Two years later, the Sixth Report (Hitchcock and Clothier, 1898) listed 208 species,

95 of which were documented with a Cowley County specimen.

In 1898, the Maps of Kansas Flora, a series of maps illustrating the distribution of the flowering plants by counties, was published in the Industrialist. (Hitchcock, 1898) Of the 1,318 maps, 308 showed specimens from Cowley County.

B. B. Smyth, curator of the State Museum of Natural History in Topeka, carried on the work of assembling a state flora after Professor Hitchcock left Kansas State University. He did not live to complete this list, though about a third of it was published. (Smith, 1911; 1912) Unfortunately, voucher specimens are not available for many of the plants in his list. Few additions were made to the flora of Cowley County during this time.

By 1940, Gates was able to report 403 species from Cowley County in his Flora of Kansas. Other collectors (McGregor and Horr, 1950; Horr and McGregor, 1951) have since added a few new species to the county flora, but there has been little botanical activity in Cowley County since the time of Mark White, G. L. Clothier, and W. S. Whitford. Never has there been any systematic collecting.

EARLY OBSERVATIONS OF THE VEGETATION

The first reported observations concerning Cowley County vegetation were made by the members of the surveying team which mapped out the southern boundary of Kansas in 1857. There have been three private journals of this survey published, two of which contain brief observations of the vegetation of the county before the white settlers arrived. Caldwell (1937) has edited the journals of Hugh Campbell, astronomical computer, who noted on 30 June,

> . . . passed highest ridge, between the waters flowing east and those running west in the Arkansas River, from thence we rapidly descended and encamped on Spr. Creek [Beaver Creek] . . . country . . . a high rolling plain covered with fine grass . . . In the timber of the creek I noticed a large walnut and mulberry trees.

On 1 July, he wrote that "Grazing in the vicinity is excellent." On the next day he recorded

> The Arkansas River at this point is about 300 yards wide, the waters are muddy, not quite as much so, as those of the Mississippi or Rio Brovo. Its valley is wooded and about two miles in width, the main bottom here, being on the east side. On the west it is a rolling prairie as far as the eye can see, affording excellent grass.

The journal of J. E. Johnston, Captain of the military escort, (edited by Miller, 1932) contains a few additional observations. In describing Beaver Creek, he writes, ". . . slope gentle, good deal of timber below [his crossing point]." Eight miles west, he notes that the party " . . . crossed a little stream; clear, cool water, skirted with wood." A mile further, he notes another little creek,

> lined with timber, in a very narrow valley, one and one-fourth mile from its mouth in the Arkansas. The soil passed over today is much like that east of the Verdigris. The grass knee high and very thick and fresh looking.

Reports of early pioneers add little to the above accounts. Mrs. M. S. Walker (1934) describes the use of native timber in the construction of the homestead, thus collaborating the presence of useful timber along the streams. Mrs. E. K. Moore (1967), in describing her early days in Cowley County, mentions a situation where her family was unable to find the home of a friend on the prairie because the tall grasses "hid it from our view."

Though the above descriptions are incomplete, it is not difficult to picture prairies of mixed and tall grasses bordering stream valleys with broad expanses of good timber. Today there are narrow scattered stands of timber along the Arkansas River, usually on poor soils not suited for cultivation. Timber along the streams has yielded to the need for cultivated land and stands are restricted to very narrow belts, though stands of timber are still found on steep and rocky hillsides which often border streams. In the west and northwest most of the prairie has been broken and now supports cultivated crops, chiefly wheat. In sections of eastern and central Cowley County there are extensive tracts of the original prairie, often heavily grazed.

CHAPTER III

ECOLOGY

Although Cowley County represents a transition from the Osage Plains on the east to the Arkansas River Lowlands to the west, the vegetation is typically prairie. Depending upon definition, the county lies in the more westward part of the tall-grass prairie or the more eastward part of the mixed-grass prairie. It is to be expected, then, that plant species of both prairie types will be found in the county's flora.

The present vegetation differs from that of the original vegetation due to the disturbance of ax, plow, and grazing. Since there is little information available concerning the early flora, it is difficult to estimate the extent of this difference. According to Weaver (1954), light grazing (or other light distrubance) involves only a shift in numbers, not in species composition of the native prairie. McGregor (1948) compared the flora of Douglas County with the early lists of Kansas plants prepared by Carruth (1877). He noted no important differences in species composition. It is probable that the prairies of Cowley County differ from those of one hundred years ago only in the extent of the area covered rather than in composition of the present flora.

There are several general plant groupings found in Cowley County. Of these, six types have been selected as representing the most common environments characteristic of the area.

UPLAND WOODS

Southeast of Arkansas City north of the Arkansas River there are sandy hills which support a fairly dense stand of timber. The dominant tree is Quercus marilandica. Toward the base of the hills in the Arkansas River valley, Quercus Muhlenbergii, Carya cordiformis, Ulmus americana, and Celtis occidentalis are common. Understory plants consist of shrubs such as Symphoricarpos orbiculatus, Rhus copallina, Rhus glabra, and Rubus occidentalis.

The vernal aspect of the upland woods includes such early flowering species as Hedyotis crassifolia, Claytonia virginica, Viola papilionacea, and Draba brachycarpa. Later flowering vernal plants include Erythronium album, Viola Kitaibaliana, var. Rafinesquii, Erysimum repandum, Descuraina pinnata, Corydalis micrantha, Geranium carolinianus, Nothoscordum bivalve, Galium Aparine, Achillea lanulosa, Oxalis violacea, var. violacea, and Pyrrhopappus scaposus.

Prominent among the estival species of the upland woods are Acalypha virginica, A. gracilens, var. monococca, Mollugo verticillata, Ceanothus americanus, Tephrosia virginica, Amorpha canescens, Desmodium illinoense, D. sessilifolium, Cassia fasciculata, Apocynum cannabinum, var. hypericifolium, Aster ericoides, Chrysopsis pilosa, Solidago ulmifolia, Asclepias tuberosa, Verbena canadensis, Plantago virginica, P. Purshii, Polytaenia Nuttallii, Talinum parviflorum, Cyperus ovularis, and Parietaria pensylvanica.

Autumnal species include Andropogon scoparius, Sporobolus asper, Panicum lanuginosum, var. fasciculatum, P. sphaerocarpon, P. oligosanthes, Lespedeza stipulacea, Vernonia Baldwinii, Eupatorium serotinum, Solidago ulmifolia, and Conyza canadensis.

LOWLAND WOODS

Along the streams and rivers of the county there are wooded areas which are more mesic than the upland woods. These extend over flood plains and adjacent hillsides. Dominant hillside trees in this association consist of Quercus Muhlenbergii, Q. Shumardii, Carya cordiformis, and Ulmus americana. Along the lowlands one finds Quercus macrocarpa, Juglans nigra, Fraxinus pennsylvanica, var. subintegerrima, Acer Negundo, var. Negundo, Gymnocladus dioica, Morus rubra, and M. nigra. Populus deltoides, Salix interior, S. nigra, and Platanus occidentalis are found along the stream margins.

Shrubs include Symphoricarpos orbiculatus, Euonymus atropurpureus, Cornus Drummondii, Cercis canadensis, Aesculus glabra, and occasionally Staphylea trifoliata and Asimina triloba. Woody vines include Smilax herbacea, var. lasioneuron, S. tamnoides, Celastrus scandens, Parthenocissus quinquefolia, Vitis vulpina, V. cinera, and V. riparia.

Spring herbaceous plants include Phlox divaricata, var Laphamii, Oxalis stricta, Carex Davissii, C. Meadii, Ruella strepens, Ellisia Nyctelea, Dicentra cucullaria, Viola papilionacea, Ranunculus abortivus, Galium Aparine, Parietaria pensylvanica, and Chaerophyllum procumbens.

Summer plants include Galium circaezans, var. hypomalacum, Elymus virginicus, Polygonum punctatum, Sanicula canadensis, Geum canadensis, var. camporum, Campanula americana, var. illinoensis, Urtica dioica, Laportea canadensis, Zizea aurea, Bromus purgans, Scrophularia marilandica, Leersia oryzoides, Muhlenbergia sobolifera, Silene stellata, Chenopodium hybridum, var. gigantospermum, C. Standleyanum, and Phryma leptostachya.

Serotinal species include Uniola latifolia, Thalictrum dasycarpum, var. hypoglaucum, Verbesina virginica, Verbena urticifolia, Eupatorium rugosa, Actinomeris alternifolia, Sicyos angulatus, Ambroisia trifida, var. texana, Tovara virginica, and Bidens bipinnata.

PRAIRIE WOODLANDS

In addition to these woodlands, there are areas in which trees, small stands to scattered individuals, are intermixed with the prairie. Species common to both can be found in these prairie woodlands.

HYDROPHYTIC ZONES

In Cowley County there are many farm ponds (usually with less than an acre of surface area), a few gravel pits, and Cowley County State Lake. The structure of vegetation around these bodies of water is clearly seen in zonation. The middle of these ponds and lakes, if about 20 feet deep, support a number of species which comprise the submerged aquatics. These include Potamogeton diversifolius, P. foliosus, var. foliosus, P. pusillus, var. minor, and Ceratophyllum demersum.

As the water depth decreases, various floating plants are found. These plants are rooted on the bottom but have long petioles or stems which allow the leaves to float on the water. These include Nuphar advena and Potamogeton diversifolius. Nearer the shores Jussiaea peploides, var. glabrescens and Bacopa rotundifolia are often found. In the shelter of these floating plants the free floaters such as Spirodela polyrhiza, Lemna minor and L. perpusilla are common.

Along the shore there are many plants which, though often rooted below the water, have their foliage raised above the water surface.

These include Scirpus validus, S. americanus, Typha latifolia, forma latifolia, and Typha angustifolia. Juncus Torreyii, Sagittaria brevirostra, S. latifolia, S. ambigua, S. calycina, Alisma Plantago-aquatica, Eleocharis Engelmania, E. macrostachya, and E. obtusa, var. obtusa grow around the margins where the water level often fluctuates.

The next zone, the land margin of the pond, usually has sedges, grasses, and a few forbs present with an occasional woody plant. These include Carex Meadii, C. vulpinoidea, Cyperus acuminatus, C. esculentus, C. setigerus, Tripsacum dactyloides, Leersia oryzoides, Cicuta maculata, and Eclipta alba. Cephlanthus occidentalis, Salix nigra, Cornus Drummondii, and Populus deltoides are the common woody species.

The final zone is characterized by the climax (or subclimax) association of the area, usually prairie or wooded lowland.

Although the vegetation of streams and rivers has been described along with the oak-hickory association of the lowland woods, some plants are found near or in the water which are not found elsewhere. In small spring fed streams, Nasturtium officinale and Veronica Anagallis-aquatica may be found rooted in the gravelly soil under the shallow water. Sagittaria latifolia is not uncommon and Scirpus americanus, S. lineatus, S. pallidus, S. validus, var. creber, and various species of Polygonum are often found along the margins of these streams. Duckweeds, Spirodela polyrhiza, Lemna minor and L. perspusilla, are often floating on the still waters.

Along the margin of the Arkansas River, vegetation includes Cyperus paludosis, Bidens cernua, Ammania coccinea, Ranunculus scleratus, Echinochloa crusgalli, Polygonum pennsylvanicum, Scirpus americanus, and S. validus, var. creber.

ARKANSAS RIVER VALLEY

The sandy valley of the Arkansas River has mixed plant associations. Along the sandy flood plain there are plants which are characteristic of a marginal hydrophytic zone. Periodic flooding completely changes the soil surface from time to time and no real climax vegetation pattern persists. In addition, areas of the valley are wooded and species composition is similar to that of the lowland woods previously described, though Maclura pomifera and Populus deltoides are more common.

However, there are a number of plants found in the sandy valley which have not been collected elsewhere in the county. These include Cycloloma atriplicifolium, Cristatella Jamesii, Oenothera heterophylla, var. rhombipetala in disturbed areas. Dalea villosa, D. lanata, and Cyperus Schweinitzii may be found in exposed sands. Eriogonum annuum and Argemone polyanthemos are fairly common in the sandy prairies of the valley.

PRAIRIES

The prairie which once covered most of Cowley County is presently found in hay fields, pastures, and railroad and highway right of ways. Much of the prairie sod has been broken and is currently cultivated. Through parts of eastern and central Cowley County, however, large expanses of land remain in native prairie pasture, untouched by cultivation. These lands comprise areas of shallow, rocky soils unsuitable for cultivation and deeper, more fertile soils. Bidwell (1966) citing publications of the Kansas Agricultural Experiment Station, estimated that there are some 387,000 to 400,000 acres of range land in Cowley County, most of which is native prairie. Of this, some 277,000 acres are

unsuitable for cultivation.

Due to the pressure of grazing, the vegetation of these prairies often is degenerate, but relict areas and lightly grazed pastures are not uncommon. These most closely approach the original prairie cover.

The dominant grasses in the prairie are Andropogon scoparius and A. Gerardi, var. Gerardi, though Sorghastrum nutans and Panicum virgatum are abundant, particularly in more moist areas. In shallow prairie soils, Bouteloua curtipendula, S. hirsuta, and B. gracilis are common. In prairie areas suffering from heavy grazing pressure, one finds Bromus japonicus, Chloris verticillata, Aristida oligantha, Paspalum ciliatifolium, and occasionally Buchloe dactyloides.

In relict prairies, forbs are not abundant. As grazing pressure increases, forbs become more noticeable. These include Baptisia australis, var. minor, B. leucophaea, var. leucophaea, Amorpha canescens, Echinacea pallida, A. angustifolia, Euphorbia corollata, Verbena stricta Solidago altissima, Salvia azurea, var. grandiflora, and Ruellia humilis, and Asclepias viridis. In degenerate prairies characterized by overgrazing, many weedy species are present. Some of these are Achillea lanulosa, Cirsium undulatum, Ambrosia psilostachya, var. Lindheimeriana, Gutierrezia dracunculoides, Solanum rostratum, Platago Purshii, Croton monanthogynus, and Vernonia Baldwinii.

In addition, characteristic species can be divided into seasonal aspects. The vernal aspect is perhaps most colorful, with the bright flowers of Anemone caroliniana, Cammassia angusta, Baptisia australis, var. minor, B. leucophaea, var. leucophaea, Tradescantia ohiensis, T. Tharpii, T. occidentalis, Senecio plattensis, Verbena canadensis, Oxalis violacea, var. violacea, Astragalus crassicarpus, Zygadenus Nuttallii,

Erigeron strigosus, Nothoscordum bivalve, Callirhoe alceoides, Nemastylis geminiflora, Sisyrinchium compestre, Allium canadense, and Androstephium coeruleum, forma coeruleum.

The aestival aspect includes such species as Teucrium canadense, Thelesperma ambiguum, Ratibida columnifera, var. columnifera, Asclepias verticillata, Rudbeckia hirta, var. pulcherrima, Silphium integrifolium, var. laeve, S. laciniatum, var. laciniatum, Echinacea angustifolia, Salvia azurea, var. grandiflora, Dalea purpurea, D. aurea, D. multiflora, D. candida, Schrankia uncinata, Callirhoe involucrata, Linum sulcatum, Oenothera serrulata, Polytaenia Nuttallii, Spermolepis inermis, Spiranthes vernalis, and Hieracium longipilum.

The autumnal aspect includes Aster oblongifolius, A. ericoides, Liatris punctata, L. asper, Kuhnia eupatorioides, var. corymbulosa, Eupatorium altissimum, Eryngium Leavenworthii, Solidago altissima, S. rigida, and Helianthus hirsuta.

Greater ecological definition of habitats and associated species seems possible by the use of range sites. (Anderson and Fly, 1955; Bidwell, 1966). These are areas of range land (prairie) which differ in their potential to produce a distinctive climax vegetation. Present vegetation reflects the range site and current grazing pressure.

The Lowland Site with deep and fertile soils froms the basis of the lowland prairie. Andropogon Gerardi, var. Gerardi, Sorghastrum nutans, and Panicum virgatum are the dominant grasses. Spartina pectinata, var. Suttiei may be found in wet areas of this range site. TheLoamy Upland Site borders the Lowland Site and extends up the lower slopes of the surrounding hills. Bouteloua curtipendula and Andropogon scoparius are more common in these sites, but Andropogon Gerardi, var.

Gerardi, Sorghastrum nutans, and Panicum virgatum are not uncommon. Farther up the slopes where the limestone outcrops occur are the limestone Breaks Sites. The soil of this site is rocky and shallow. Andropogon scoparius and Bouteloua curtipendula are the common grasses. Such forbs as Mentzelia oligosperma, Evolvulus Nuttalliannus, and Zygadenus Nuttallii are also common. The Clay-pan Site, the Clay-upland Site, and Shallow Clay-upland Site are found on the ridges. Buchloe dactyloides is the most common plant of the Clay-pan Site where the soil is shallow and tight. The Shallow Clay-upland Site has better soil conditions and grasses such as Andropogon scoparius, Bouteloua gracilis, and B. hirsuta are common. In the Clay-upland Site, Andropogon scoparius and A. Gerardi, var. Gerardi are common. In both Clay-upland Sites and Lowland Sites, the forbs present tend to reflect grazing pressure. Whereas Psoralea tenuiflora is common to all prairie sites (when not removed by grazing), Oenothera serrulata, Amorpha canescens, and Euphorbia corollata are more common on the Upland Sites.

CHAPTER IV

NEW STATE RECORDS AND DISTRIBUTIONAL NOTES

This chapter reports plants collected from Cowley County during the course of this study which are new to the state or which are note-worthy distribution records.

ADDITIONS TO THE STATE FLORA

During the course of this investigation some plants were collected which are believed to be new state records. Since Gates' Flora of Kansas (1940), a number of new taxa have been reported for Kansas by various botanists. The following, not reported in these publications (Gates, 1941, 1942, 1943, 1945, 1956, 1947, 1948, 1949, 1950, 1951, 1952, 1953, 1954, 1955; Gibson, 1963; Horr, 1946; Horr and McGregor, 1947, 1948, 1949, 1951, 1952; McGregor and Horr, 1950, 1953, 1955; McGregor and Lathrop, 1957; McGregor, 1956, 1960; McGregor, Harms and Poindexter, 1963; Harms, 1964; Harms, Kolstad, and McGregor, 1965), or in the Flora (Gates, 1940), are presented as new state records.

Tradescantia ohiensis Raf., forma pilosa Waterfall. This form differs from forma ohiensis by having long hairs present on the sheaths. Collections (Koch 3719) from a prairie along Cowley County State Lake and from a lowland prairie roadside southwest of Arkansas City (Koch 3438) show this characteristic.

Silene antirrhina L., forma Deaneana Fern. This taxon is not recorded by Gates (1940) or in subsequent lists. It is characterized by the absence of glutinous bands on the stem. The collection (Koch 3421) is from an upland prairie hay field south of Winfield.

Lepidium oblongum Small. A collection of Lepidium by Lorraine Koch (331 A) along the margin of a dirt parking area of Cowley County State Lake has hirtellous stems with some spreading hairs and bipinnate cauline leaves. It has been determined as L. oblongum Small, and represents a northward range extension from central Oklahoma. Since the plant was found along a public wayside, it is possible that the collection represents a local introduction. The area should be checked in subsequent seasons to see if the species persists.

Callirhoe involucrata (Nutt. ex Torr.) Gray, forma novomexicana (E. G. Baker) Waterfall. Dr. Waterfall (1951) made the above combination in his treatment of Texas Callirhoe. This form differs from forma involucrata in that the leaves are less dissected. A collection (Koch 3757) from shallow soil of an upland prairie south of Winfield can be referred to this form.

Chaerophyllum Tainturieri Hook., var. dasycarpum Wats. A collection by Lorraine Koch (262) from a low area along a roadside fence at Cowley County State Lake has the characteristic hairy fruits and ovaries of var. dasycarpum. This taxa is relatively rare, but has been recorded from Missouri (Steyermark, 1963) and Oklahoma (Waterfall, 1966).

Ipomoea Shumardiana (Torr.) Shinners. This concept of Shinners includes I. Carletonii Holz. and I. longifolia Holz. Two collections

(Koch 1707 and 1530) have the funnelform corollas, broad sepals and narrow leaves characteristic of this species. It is quite abundant in a weedy field disclimax and along railroad tracks north of Winfield. These collections extend the range of this species somewhat north from central Oklahoma.

Melothria pendula L. The collections of this taxon extends its range northward from Oklahoma and westward from Missouri. It was first collected (Koch 1989) from the shade of a thicket of Populus in the sandy Arkansas River valley northeast of Arkansas City. A later collection (Koch 4077) was from the banks of a small stream near Gueda Springs where it was rooted in the moist stream bank, growing on and partially shaded by Ambrosia trifida and Polygonum punctata.

DISTRIBUTION NOTES

Based upon the work of Gates (1940), a number of plants were collected in Cowley County which are interesting distribution records. These are reported below.

Selaginella rupestris (L.) Spreng. was not reported by Gates. First reported by Horr and McGregor (1949) from Chautauqua County, the collection (Koch 4045 B) adds another county to the Kansas distribution of that species.

Ophioglossum Engelmanni Prantl. was found in Douglas and Cherokee Counties (Horr and McGregor, 1947) and in the Chautauqua Hills (Lathrop, 1958). The collection (Koch 3648) from a lowland prairie is a westward extension of its known Kansas range.

Marsilea mucronata B. Br. Gates does not record this species from any part of south central Kansas. Thus the collection (Koch 4068) from a moist roadside ditch extends its range south and east of the previously reported stations in Kansas, although it is known from Oklahoma.

Typha angustifolia L. is recorded from only two stations, Barber and Reno Counties. The collections (Koch 1576 and 4086) from a gravel pit and along a small stream extend its known Kansas range south and west.

Potamogeton pusillus L., var. minor (Biv.) Fern. & Schub. was collected in a shallow gravel pit pool and in Cowley County State Lake (Koch 3876 and 4064). Gates reports it only from Ottowa County, about 160 miles north.

Lolium multiflorum Lam. was collected on the lawn of St. John's College (Koch, n.s.) in 1964. This plant is an introduction and was probably in some grass seed used by the grounds personnel. The collection extends its range some 150 miles southwest from Franklin County.

Panicum malacophyllum Nash was collected on sandy soils near the Arkansas River south of Arkansas City. (Koch 3773, 3611) Previously known only from Jackson County in northeast Kansas, this collection extends its range 160 miles south and west.

Allium sativum L. This plant was collected (Koch 3921) from a sparsely shaded lowland meadow and roadside in Cambridge where it was very abundant. Not listed by Gates, Gibson (1963) reported it from Crawford County. This collection extends it range some 120 miles west.

Allium vineale L., var. compactum (Thuill.) Aschers was collected (Koch 3655) from a lowland prairie along Highway 77 north of Winfield. This extends its range some 150 miles south from Saline County , and 120 miles east from Crawford County, the only other Kansas station.

Morus nigra L. was taken (Koch 3617) from the border of a small shaded stream northeast of Arkansas City and extends the range of this taxa some 150 miles south from Wabaunsee County.

Chenopodium glaucum L., var. salinum (Standley) Boivin was collected from the sandy flood plain of the Arkansas River west of Winfield. These collections (Koch 1817, 2117) extend the range of this species some 200 miles southeast.

Portulaca mundula Johnston. Although Gates (1940) lists P. parvula Gray from surrounding counties, the collection (Koch 1962) from very shallow soil over a limestone outcrop has the characteristic longer, reddish petals and larger capsules of P. mundula. It is probable that previous collections of P. mundula have passed as P. parvula. Johnston (1948) has previously reported P. mundula from Kansas.

Cerastium vulgatum L., forma glandulosum (Benn.) Druce is usually found less frequently than the typical form, but is probably as widespread. The collection (Koch 2845 B) from a cemetery lawn extends the range of this species in Kansas south from Ellsworth and Shawnee Counties, some 120 miles.

Clematis dioscoreifolia Levl. & Vaniot. Not reported by Gates, Gibson (1963) noted that it was fairly abundant in Crawford County. It is a native of Japan which occasionally escapes from cultivation. The

collections (Koch 2204, 2307) are from a roadside cut east of Winfield where the vines were growing over a small sapling. This extends its range some 120 miles west.

Ranunculus sceleratus L. is recorded from northcentral and southwest Kansas. The collection (Lorraine Koch 339, 282) from the margin of Cowley County State Lake and the Walnut River flood plain extend the range of this plant about 150 miles south. It is particularly abundant along the Arkansas River.

Hesperis matronalis L. is known in southeast Cowley County where it is spreading from cultivation (Koch 3732). This location extends its range some 150 miles south from Salina County.

Rorippa obtusa (Nutt.) Britt. was collected (Koch 2462) from the muddy soil along the Walnut River. This extends its range southwest from Wyandotte County, 190 miles.

Acacia angustissima (Mill.) Kuntze, var. hirta (Nutt.) Robinson was not reported by Gates. It is quite common in shallow soils of upland prairies and the collection (Koch 3837) adds another station in the state. It was previously reported from Chautauqua County by McGregor and Lathrop (1957).

Dalea lanata Spreng. was reported from Barber County. The collection (Koch 1825) from exposed sands along the Arkansas River extends its range 70 miles eastward.

Krameria secundiflora DC. was recorded from extreme southwest Kansas (Morton County) and northeast Kansas (Thomas County). The collections

(Koch 3670) from the shallow upland prairie northeast of Winfield extend the range of this taxon some 250 miles east.

Lathyrus latifolius L. is reported by Gates (1940) to have recently escaped along a fence row in Leavenworth County. It is quite common along fence rows and roadsides in Cowley County. The collection (Koch 3762) extends the range of this species some 225 miles southwest from the previous station.

Geranium pusillum L. was unreported by Gates in 1940, but later (Gates, 1942), noted its presence in Coffey County. The collection (Koch 1281) from the margin of a cemetery meadow is an additional station about 50 miles southwest of the original site.

Ditaxis mercurialina (Nutt.) Coult. was collected (Koch 1418, 3703) from shallow soils of upland prairies. Previously reported from Ellis and Morton Counties, these collections extend the range of this taxa some 175 miles south and southeast.

Passiflora incarnata L. was reported by Gates to be in cultivation in Crawford County. The collection (Koch 4071) is from a large group of plants along a fence row northeast of Arkansas City. Although it is possible that they were introduced, they are currently spreading and growing without benefit of cultivation. This extends the range of the plant some 150 miles west.

Ammoselinum Popei T. & G. is represented by a single specimen brought in with a grass collection (Koch 3970 B). It is an older plant with only a few fruits present. However, some of the mericarps have the characteristic serrations on the ribs which place it in this genus

(McCoy, 1962). This collections extends the range of the species somewhat farther east than reported by Gates. It may be more widespread than reports would indicate, since it is such a small plant with inconspicuous flowers.

Daucus pusillus Michx. was collected in an upland prairie along highway 166 east of Arkansas City (Koch 4109). Gates reports the species only from Cherokee County, 120 miles east.

Limnosciadum pinnatum (DC.) Math. & Const. was collected (Koch 3695) from a moist prairie northeast of Dexter. This collection extends the range of the taxon westward from Cherokee County, about 120 miles.

Lomatium foeniculaceum (Nutt.) C. & R. was not reported by Gates. Theobald (1966) in a recent revision of the group cites two Kansas collections (as subspecies), both from northeast Kansas. The collection (Koch 1081) from a newly graded road cut is a southward Kansas range extension.

Veronica polita Fries was collected (Koch 2848) from a cemetery meadow south of Winfield. It was reported from McPherson County. This collection extends its range some 80 miles south.

Erigeron annuus (L.) Pers. was recorded from Cherokee County, 120 miles east, and from Saline County, 100 miles north. Thus the collections (Koch 3669, 3761) from a moist prairie-woods ecotone and from a lowland prairie extend the range of this species somewhat south and west.

Carduus nutans L. is reported from Washington County, north central

Kansas. Since, the noxious thistle has been reported for Oklahoma (Waterfall, 1966) and is doubtlessly widespread in Kansas. The collection (Koch 3775) from an abandoned field northeast of Arkansas City extends the range of this plant some 200 miles south.

Verbesina enceloides (Cav.) R. & H. is reported from west and north central Kansas, the closest locality being Saline County. The collection (Koch 2161) from a sandy roadside south of Arkansas City extends its range some 100 miles south.

CHAPTER V

LIST OF SPECIES AND HABITATS

The taxa listed below are those which are known to occur within Cowley County. In all cases, verifying herbarium sheets are available. Unless otherwise stated, the collections were made by the author and deposited in the herbarium of Oklahoma State University (OKLA). In most instances, duplicate collections were made and deposited with the herbarium of Kansas State University (KSC). Additional collections have been deposited in the author's personal herbarium and in the herbarium of St. John's College, Winfield.

A number of taxa are cited for the county but not actually collected by the author. Unless otherwise noted, these collections were examined and verified by the author. The collector and herbarium where the specimen is located are included in the listing, using the standard abbreviations of Lanjouw and Stafleu (1959). In a few cases, the taxon is included on the basis of a published report. These are noted with the author and date of publication.

The listing of families follows that of Waterfall's Keys to the Flora of Oklahoma, third edition (1966). The genera and species are listed alphabetically within the family. The nomenclature follows that of Waterfall (1966) insofar as it applies to the area studied.

A brief description of the habitat of each taxon is included in the list. Taxa not listed by Gates (1940) for Cowley County are

preceded by an asterisk.

PTERIDOPHYTA

Equisetaceae

*Equisetum laevigatum A. Br.: Wet sandy roadside ditch.

Selaginellaceae

*Selaginella rupestris (L.) Spring.: On shallow sandy soil over sandstone outcrops.

Ophioglossaceae

*Botrychium virginianum (L.) Sw.: "Wooded hillside." Collection by W. H. Horr and R. L. McGregor n. s., KANU.

*Ophioglossum Engelmanni Prantl.: Sparse shade of sparsely wooded slopes and lowland prairies.

Polypodiaceae
McGregor, 1950 and Tyron, 1957

*Camptosorus rhizophyllus (L.) Link: "Limestone rocks." Collection by W. H. Horr and R. L. McGregor n. s., KANU.

*Cheilanthes Feei Moore: Uncommon in crevices of a limestone outcrop.

*Cystopteris fragilis (L.) Bernh., var. fragilis: Common on limestone outcrops.

*Cystopteris fragilis (L.) Bernh., var. tennesseensis (Shaver) McGregor: "Limestone rocks." Collection by W. H. Horr and R. L. McGregor n. s., KANU.

Notholaena dealbata (Pursh) Kunze: In crevices of limestone outcrops.

*Pellaea atropurpurea (L.) Link, var. atropurpurea: Crevices of limestone outcrops.

Pellaea atropurpurea (L.) Link, var. Bushii Mack.: Crevices of limestone outcrops.

*Woodsia obtusa (Spreng.) Torr.: Moist wooded hillside.

Marsileaceae

*Marsilea mucronata A. Br.: Wet roadside prairie ditch.

SPERMATOPHYTA

GYMNOSPERMAE

Pinaceae

*Juniperus virginiana L.: Sandy lowland along Arkansas River and upland woods.

ANGIOSPERMAE

MONOCOTYLEDONAE

Typhaceae
Hotchkiss and Dozier, 1949

*Typha angustifolia L.: Gravel pits and along shaded prairie stream.

*Typha latifolia L., forma latifolia: Moist margins of ponds, lakes, and streams.

Zosteraceae
Fernald, 1932, 1940

*Potamogeton diversifolius Raf.: Gravel pits.

*Potamogeton foliosus Raf., var. foliosus: Cowley County State Lake and small ponds.

*Potamogeton pusillus L., var. minor (Biv.) Fern. & Schub.: Cowley County State Lake and small ponds.

Alismataceae
Bogin, 1955; Fasset, 1955

*Alisma Plantago-aquatica L., var. parviflorum (Pursh) Torr.: Gravel pits and lake margins.

*Echinodorus Berteroi (Spreng.) Fasset, var. Berteroi: Not seen. Collection by White n. s., MO, US, cited by Fasset, 1955.

*Sagittaria ambigua J. G. Smith: Gravel pits.

Sagittaria brevirostra Mack. & Bush: Lake margins, stream banks.

*Sagittaria calycina Engelm.: Lake margins.

*Sagittaria latifolia Willd., var. latifolia: Margin of small stream.

Gramineae
Gates, 1936; Hitchcock and Chase, 1951; Gould, 1957; Rominger, 1962; Banks 1966

*Aegilops cylindrica Host., var. cylindrica: Lowland field margins and sparse shade of abandoned yard.

Agropyron Smithii Rydb., var. Smithii: Waste places, roadside ditches.

*Agrostis alba L. Edge of road through upland prairie.

Agrostis hyemalis (Walt.) BSP.: Sandy prairie, sparse shade. Arkansas River lowlands.

*Alopecurus carolinianus Walt.: Uncommon, wet ditch along field.

*Andropogon Gerardi Vitman, var. chrysocomus (Nash) Fern.: Lowland prairies.

Andropogon Gerardi Vitman, var. Gerardi: Lowland prairies, lower prairie slopes, and deep soils of upland prairies.

Andropogon saccharoides Sw.: Upland prairies.

Andropogon scoparius Michx.: Upland prairies.

*Andropogon virginicus L.: Sparse shade of sandy hillside.

Aristida oligantha Michx. Shallow upland prairies, overgrazed pastures.

*Aristida purpurascens Poir. Sparse shade of hillside woods.

*Arundo Donax L.: Persisting along roadside, escape.

*Avena sativa L.: Occasional roadside escape.

Bouteloua curtipendula (Michx.) Torr.: Upland prairies, limestone outcrops.

Bouteloua gracilis (Willd. ex HBK.) Lag. ex Griffiths: Upland prairie.

Bouteloua hirsuta Lag., var. hirsuta: Upland prairie.

*Bromus catharticus Vahl.: Waste places, Lawns.

*Bromus inermis Leyss.: Fields, overgrazed pastures.

*Bromus japonicus Thunb.: Fields, overgrazed pastures.

*Bromus tectorum L.: Upland prairie roadside, lowland prairies.

Bromus secalinus L.: Lowland prairie.

*Bromus purgans L.: Wooded hillsides, moist woods.

Buchloe dactyloides (Nutt.) Engelm.: Tight soils of upland prairie.

Cenchrus pauciflorus Benth.: Along roadsides, rocky upland prairies, sandy meadows.

*Chloris verticillata Nutt.: Shallow upland prairies, overgrazed pastures.

*Chloris virgata Swartz.: Disturbed area around a gravel pile.

*Cynodon dactylon (L.) Pers.: Sandy flood plain of Arkansas River.

*Diarrhena americana Beauv., var. obovata Gleason: Rich lowland woods.

*Digitaria Ischaemum Schreber: Along margin of abandoned field.

Digitaria sanguinalis (L.) Scop.: Waste palces, abandoned fields. disturbed lowland pastures.

Diplachne fascicularis (Lam.) Beauv.: Moist sands along Arkansas River.

*Distichlis stricta (Torr.) Rydb.: Along margin of brackish spring.

Echinochloa crusgalli (L.) Beauv.: Stream banks, wet lowland areas, roadside ditches.

Eleusine indica (L.) Gaertn.: Waste places, fields, pastures.

Elymus canadensis L.: Prairie hayfields and pastures.

*Elymus virginicus L., var. jejunus (Ramaley) Bush: Wooded hillsides.

*Elymus virginicus L., var. submuticus Hook.: Sparse shade of upland woods.

Elymus virginicus L., var. virginicus, forma virginicus: Sparse shade along prairie stream, woods.

*Eragrostis curtipedicillata Buckl.: Upland prairie pasture and fields.

*Eragrostis hypnoides (Lam.) BSP.: On Arkansas River sandbar.

Eragrostis megastachya (Loel.) Link.: Sandy pastures and fields.

*Eragrostis oxylepis (Torr.) Torr.: Sandy prairie roadside.

*Eragrostis pectinacea (Michx.) Nees.: Sandy waste places.

*Eragrostis pilosa (L.) Beauv.: Sandy roadside along Arkansas River.

Eragrostis spectabilis (Pursh) Steud.: Upland prairie fields and pastures.

*Eragrostis trichodes (Nutt.) Nash, var. pilifera (Scheele) Fern.: Sandy lowland prairies, fields, and roadsides.

*Eragrostis trichodes (Nutt.) Nash, var. trichodes.: Sandy prairies, roadsides, and pastures.

Eriochloa contracta Hitchc.: Shaded sandy lowland woods near the Arkansas River.

*Festuca octoflora Walt.: "Scattered in short upland grass prairie." Collection by Steve Stevens 3010, KANU.

*Festuca obtusa Biehler: Wooded lowland.

*Hordeum jubatum L.: Along small streams and moist roadside ditches.

Hordeum pusillum Nutt.: Roadside ditches, upland prairie pastures.

Koeleria macrantha (Lebed.) Spreng.: Upland and lowland prairie.

*Leersia oryzoides (L.) Sw.: Moist soils along small streams.

*Leersia virginica Willd.: Rich lowland woods.

*Leptoloma cognatum (Schultes) Chase: Prairie pastures.

*Lolium multiflorum Lam.: Waste places around lawn.

*Lolium perenne L.: Waste places around lawns.

*Muhlenbergia cuspidata (Torr.) Nash: Shallow soil of upland prairie.

*Muhlenbergia Schreberi Gmel.: Upland woods.

*Muhlenbergia sobolifera (Muhl.) Irin.: Wooded valleys and hillsides.

Panicum capillare L., var. capillare: Waste places, roadsides, and shallow upland prairies.

Panicum dichotomiflorum Michx.: Wet areas along streams.

*Panicum lanuginosum Ell., var. fasciculatum (Torr.) Fern.: Sandy lowland woods.

*Panicum lanuginosum Ell., var. Lindheimeri (Nash) Fern.: Sandy lowland prairie over sandstone outcrops.

*Panicum malacophyllum Nash: Sandy prairies.

Panicum oligosanthes Schultes, var. oligosanthes: Lowland prairies, overgrazed pastures.

*Panicum oligosanthes Schultes, var. Scribneriana (Nash) Fern.: Upland prairie roadside.

*Panicum praecocius Hitchc. & Chase: Sandy pastures and prairies.

*Panicum spherocarpon Ell.: Sandy wooded upland.

Panicum virgatum L.: Prairie fields and pastures.

*Paspalum pubiflorum Rupr., var. glabrum Vasey: Lowland prairies.

*Paspalum setaceum Michx., var. ciliatifolium (Michx.) Vasey: Low sandy areas along Arkansas River.

*Paspalum setaceum Michx., var. stramineum (Nash) D. Banks: Sandy prairies.

*Phalaris canariensis L.: "Gravelly clay roadside." Collection by L. C. Hulbert 3851, KSC.

*Phalaris caroliniana Walt.: Shallow soil near gravel pits.

Phleum pratense L.: Collection by Clothier and Whitford n. s., KSC.

*Poa annua L.: Cemetery roadside.

*Poa arachnifera Torr.: Sandy roadside ditch near Arkansas River.

Poa pratensis L.: Prairie roadsides and meadows.

*Polypogon monspeliansis (L.) Desf.: Sandy soil along Arkansas River.

Schedonnardus paniculatus (Nutt.) Trel.: Upland prairie pastures, fields and roadsides.

Setaria glauca (L.) Beauv.: Waste places, fields, pastures, and roadsides.

Setaria Italica R. & S.: Collection by Clothier and Whitford n. s., KSC.

*Setaria viridis (L.) Beauv.: Sparse woods, pastures, and roadsides.

Sorghastrum nutans (L.) Nash: Lowland prairie fields, pastures, and moist areas of upland prairies.

Sorghum halepense (L.) Pers.: Roadsides, waste places, fields.

Spartina pectinata Link., var. Suttiei (Farw.) Fern.: Wet lowlands.

*Sphenopholis obtusata (Michx.) Scribn., var. obtusata: Sandy flood plain along Arkansas River.

Sporobolus asper (Michx.) Kunth., var. asper.: Sandy prairie, upland prairies.

Sporobolus asper (Michx.) Kunth., var. Hookeri (Trin.) vasey: Upland prairie fields and pastures.

Sporobolus cryptandrus (Torr.) Gray: Prairies, pastures, and fields.

Sporobolus heterolepis Gray: A collection by the Cowley County Farm Bureau, near Winfield, KSC.

*Sporobolus pyramidatus (Lam.) Hitchcock: Sandy flood plain of Arkansas River.

Sporpbolus vaginiflorus (Torr.) Wood, var. neglectus (Nash) Shinners: Collected by Clothier and Whitford n. s., KSC.

*Stipa spartea Trin.: Upland prairie hay fields.

Tridens flavus (L.) Hitchc.: Roadsides, pastures, waste places.

*Triplasis purpurea (Walt.) Chapm.: Sandy areas along the Arkansas River.

Tripsacum dactyloides (L.) L.: Lowland prairies and roadsides, moist ravines of upland prairies.

Uniola latifolia Michx.: Sandy lowland woods and wooded hillsides.

Cyperaceae
MacKenzie, 1931, 1935; Core, 1936, Hermann, 1936;
Beetle, 1947; Svenson, 1957

*Bulbostylis capillaris (L.) Clarke, var. crebra Fern.: Grass meadow along small prairie stream.

*Carex amphibola Steud., var. turgida Fern.: Lowland woods and prairies.

*Carex annectens Bickn.: Drainage ditch in old field.

*Carex Blanda Dewey: Sparse shade of prairie-woods ecotone, sandy lowlands.

*Carex cephalophora Muhl.: Sandy prairie.

*Carex Crawei Dewey: "Bottom of slough in pasture." Collection by S. Stevens 4300, KANU.

*Carex Davisii Schwein & Torr.: Lowland woods.

*Carex Emoryi Dewey: Wet areas along streams and ditches.

*Carex festucacea Schkuhr (including C. brevior (Dewey) MacKenzie): Sandy lowland.

*Carex Frankii Kunth: Along small stream.

*Carex gravida Bailey, var. Lunelliana (Mack) Gleason: Lowland prairies.

*Carex hyalinolepis Steud.: Sandy lowland prairies.

*Carex lanuginosa Michx.: Lowland prairie.

*Carex Meadii Dewey: Upland prairies.

*Carex vulpinoidea Michx.: Gravel pit pool margins, shaded ditches.

*Cyperus acuminatus Torr. & Hook.: Gravel pit areas and wet places of the prairie.

*Cyperus esculentus L.: Uncultivated wheat fields.

Cyperus filiculmis Vahl.: Gravel pit areas, stream margins.

*Cyperus ovularis (Michx.) Torr., var. sphaericus Boeckl.: Gravel pits and sandy lowlands.

*Cyperus Schweinitzii Torr.: Disturbed sandy areas.

Cyperus setigerus Torr. & Hook.: Roadside ditches, moist areas in priarie fields and pastures, gravel pits.

*Cyperus strigosus L.: Wet prairie ravine.

*Eleocharis compressa Sulliv.: Margin of prairie pasture pond.

*Eleocharis Engelmanii Steud.: Gravel pits, terrace pools.

*Eleocharis macrostachya Britt.: Gravel pits, roadside ditches.

*Eleocharis obtusa (Willd.) Schultes, var. obtusa: Along margin of small stream.

*Fimbristylis spadica (L.) Vahl.: Gravel pits and upland prairie.

*Scleria pauciflora Muhl., var. pauciflora: Upland prairie.

*Scirpus americanus Pers., var. americanus: Sandy soil along Arkansas River.

*Scirpus americanus Pers., var. polyphyllus (Boeckle.) Beetle: Gravelly soil along small stream.

*Scirpus atrovirens Willd.: Moist prairie areas.

*Scirpus lineatus Michx.: Roadside ditches and wet prairie depressions.

*Scirpus paludosis A. Nels: Sandy margin of Arkansas River.

Scirpus validus Muhl., var. creber Fern.: Along prairie streams.

Araceae

Arisaema Draconitum (L.) Schott.: Rich lowland woods.

Lemnaceae
Daubs, 1965

*Lemna minor L.: Flood pools along Walnut River.

*Lemna perpusilla Torr.: Floating on small pools, streams.

*Spirodela polyrhiza (L.) Schleid.: Cowley County State Lake, still streams.

Commelinaceae
Fernald, 1940; Anderson and Woodson, 1935

*Commelina erecta L., var. angustifolium (Michx.) Fern.: Waste places, abandoned fields, gravelly areas.

*Commelina erecta L., var. Deamiana Fern.: Sandy lowland along Arkansas River.

*Commelina erecta L., var. erecta: Fence rows, gravel bars along small streams, woods margins.

Commelina virginica L.: Not seen. Cited by Gates (1940).

Tradescantia bracteata (Britt.) Smyth: Prairies.

*Tradescantia occidentalis (Britt.) Smyth: Upland prairies, roadsides, railroad ballast, sandy lowlands.

*Tradescantia ohiensis Raf., forma ohiensis: Prairies, railroad ballast.

*Tradescantia ohiensis Raf., forma pilosa Waterfall: Prairies.

Tradescantia Tharpii Anders. & Woods.: Shallow soil of upland prairies.

Juncaceae
Hermann, 1934

Juncus interior Wieg.: Gravel pits, prairie depressions.

*Juncus marginatus Rostk.: Gravel pits.

*Juncus tenuis Willd., var. Dudleyi (Wieg.) Hermann: Wet prairie depression.

Juncus Torreyi Coville: Gravel pits, pond margins, wet prairie depression.

*Luzula bulbosa (Wood) Rydb.: Low wooded valley.

Liliaceae
McKelvey, 1938; M. Ownbey, 1955; Steyermark, 1961, 1963

*Allium canadense L., var. canadense: Wooded valleys, lowland prairies, roadsides.

*Allium canadense L., var. Fraseri Ownbey: Lowland woods, prairies.

Allium canadense L., var. lavendulare (Bates) Ownbey: Prairies.

*Allium sativum L.: Lowland meadow.

*Allium vineale L., var. compactum (Thuill.) Aschers: Lowland prairie.

Androstephium coeruleum (Scheele) Greene, forma coeruleum: Shallow upland prairies.

Asparagus officinalis L.: Prairies, roadsides, fence rows.

*Cammassia angusta (Engelm. & Gray) Blankenship: Shallow soil of upland prairies.

*Erythronium albidum Nutt., var. albidum: Wooded hillside.

Erythronium albidum Nutt., var. coloratum Sterns: Upland prairies and meadows.

Nothoscordum bivalve (L.) Britton: Common in prairies throughout.

Polygonatum canaliculatum (Muhl.) Pursh: Rich lowland woods.

*Smilax herbacea L., var. lasioneuron (Hook) A. DC.: Wooded hillsides.

Smilax taminoides L., var. hispida (Muhl.) Fern.: Wooded hillsides, lowlands.

*Yucca arkansana Trel., var. arkansana: Lowland and low hillside prairires.

*Yucca arkansas Trel., var paniculata McKelvey: Lowland prairires.

Yucca glauca Nutt., var. glauca: Sandy lowland in Arkansas River valley

*Yucca glauca Nutt., var. Gurneyi McKelv.: Sandy lowland in Arkansas River valley.

*Yucca Smalliana Fern.: Persisting escape, not spreading.

Zygadenus Nuttallii Gray: Shallow soil of upland prairies.

Amaryllidaceae

*Hypoxis hirsuta (L.) Coville: Prairies.

Iridaceae

Belamcanda chienensis (L.) DC.: "Garden escape." Collection by Clothier and Whitford n. s., KSC.

Nemastylis geminiflora Nutt.: Upland prairies.

Sisyrinchium campestre Bickn., forma campestra: Prairies throughout

*Sisyrinchium campestre Bickn., forma kansanum (Bickn.) Steyerm.: Prairies throughout.

Orchidaceae

*Spiranthes cernua (L.) L. C. Rich.: "Moist prairie." Collection by A. L. Metcalf 72, KSC.

Spiranthes vernalis Engelm. & Gray: Prairies.

DICOTYLEDONEAE

Salicaceae

Populus deltoides Marsh.: Along streams, flood plains, and wet areas.

Salix caroliniana Michx.: Along small lowland stream.

*Salix humilis Marsh, var. hyporhysa Fern.: Low areas along small streams.

Salix interior Rowles, forma interior: Lowlands along streams.

Salix nigra Marsh: Along streams.

*Salix rigida Muhl.: Along streams.

Juglandaceae
Sargent, 1961

Carya laciniosa (Michx. f.) Laud.: Collection by Clothier and Whitford n. s., KSC.

Carya X Brownii: (C. cordiformis x C. illinoense): Collection by Mark White n. s., KSC.

*Carya cordiformis (Wang.) K. Koch: Wooded hillsides.

*Carya illinoensis (Wang) K. Koch: Sandy lowlands, hillsides.

Juglans niger L.: Lowland woods.

Fagaceae
Sargent, 1961

Quercus macrocarpa Michx.: Lowland woods and along streams.

*Quercus marilandica Muenclt.: Sandy upland woods, wooded hillsides.

Quercus Muehlenbergii Engelm., var. Alexanderi (Britt.) Trel.: wooded hillsides.

Quercus Muehlenbergii Engelm., var. Muehlenbergia: Wooded hillsides.

Quercus palustris Muenchh.: Not seen. Cited by Gates, 1940.

Quercus prinoides Willd.: Wooded hillsides, field margins, roadsides.

*Quercus rubra L., var. rubra: Wooded hillsides.

Quercus Shumardii Buckl., var. Schneckii (Britton) Sarg.: Margin of woods.

Quercus Shumardii Buckl., var. Shumardii: Wooded lowlands.

*Quercus stellata Wang.: Uncommon on sandy uplands.

*Quercus velutina Lam.: Wooded hillsides.

Ulmaceae

Celtis tenuifolia Nutt. (including C. pumila): Not seen. Cited (as C. pumila) by Gates, 1940.

Celtis laevigata Willd.: Wooded valley and lowlands.

Celtis occidentalis Pursh: Wooded hillsides, limestone outcrops, stream margins.

Ulmus americana L.: Low wooded hillsides, wooded valleys.

Ulmus rubra Muhl.: Limestone outcrops, lowlands.

Moraceae

*Maclura pomifera (Raf.) Schneider: Prairie fence rows, roadsides and openings.

*Morus alba L.: Sandy lowlands woods, wooded valleys.

*Morus nigra L.: Wooded lowlands.

Morus rubra L.: Wooded lowlands.

Cannabinaceae

*Cannabis sativa L.: Lowland roadsides.

*Humulus Lupulus L.: Escaping from around abandoned farmyard.

Urticaceae
Hermann, 1946

*Boehmeria cylindrica (L.) Sw.: Wooded valleys, stream banks, wet lowlands.

*Laportia canadensis (L.) Wedd.: Rich lowland woods.

Parieteria pensylvanica Muhl.: Moist wooded hillsides and lowlands.

Pilea pumila Gray: Collection by M. A. Carleton n. s., KSC

Urtica dioica L., var. procera (Muhl.) Wedd.: Lowland woods and stream banks.

Polygonaceae

*Eriogonum annuum Nutt.: Sandy dikes along Arkansas River, sandy priaries.

Polygonum aviculare L.: Roadsides, waste places, pastures, and walks.

*Polygonum bicorne Raf.: Along streams, prairie and roadside ditches.

Polygonum coccinium Muhl., var. pratincola (Greene) Stanford: Not seen. Cited by Gates, 1940

Polygonum Convolvulus L.: Weedy fields, low prairies.

Polygonum densiflorum Meisn.: Not seen. Cited by Gates, 1940.

*Polygonum hydropiperoides Michx., var. hydropiperoides: Gravel pits, stream margins.

Polygonum lapathifolium L.: Gravel pits, waste places, river, lake and pond margins.

Polygonum pennsylvanicum L.: Flood plains of the Arkansas River and the Walnut River.

Polygonum punctatum Ell.: Wet prairie depressions, stream sides,

roadside ditches.

Polygonum ramosissimum Michx.: Prairies and sparsely shaded hillsides.

Polygonum scandens L.: Waste places, weedy fields, flood plains.

*Rumex acetosella L.: Flood plain of Arkansas River.

Rumex altissimus Wood: Sparse shade of lowlands, wet prairie ravines.

*Rumex obtusifolius L.: Sandy margins of Arkansas River.

Tovara virginiana (L.) Raf.: Rich wooded lowlands.

Chenopodiaceae
Standley, 1916; Aellen and Just, 1934

Chenopodium album L.: Waste places, fields, roadsides.

*Chenopodium glaucum L., var. salinum (Standley) Boivin: Sandy flood plain of the Arkansas River.

Chenopodium hybridum L., var. gigantospermum (Aellen) Rouleau: Wooded lowlands.

*Chenopodium leptophyllum Nutt.: Roadsides, fields margins, flood plains.

Chenopodium Standleyanum Aellen: Wooded lowlands.

Cycloloma atriplicifolium (Spreng.) Coult.: Sandy soils along Arkansas River.

*Kochia scoparia (L.) Schrad.: Waste places, flood plains of Arkansas River.

*Monolepis Nuttalliana (R. & S.) Greene: Flood plain of the Arkansas River, waste places, feed lots.

*Salsola Kali L., var. tenuifolia Tausch: Sandy flood plain of the Arkansas River.

Amaranthaceae
Sauer, 1955

*Amaranthus albus L., var. albus: Highway fill area.

Ameranthus graecizans L.: "Upland prairie roadway." Collection by S. Stevens 6595, KANU.

Amaranthus hybridus L.: Waste places, roadsides.

*Amaranthus Palmeri S. Wats.: Flood plain of Arkansas River.

Amaranthus retroflexus L.: Waste places, fields.

Amaranthus tamarascinus Nutt.: Waste places, fields, roadsides.

Froelichia floridana (Nutt.) Moq.: Sandy prairies and sparse woods.

*Froelichia gracilis (Hook.) Moq.: Railroad ballast.

Nyctaginaceae

Mirabilis albida (Walt.) MacM.: Upland prairies.

Mirabilis linearis (Pursh.) Heimerl., var. linearis: Prairies.

Mirabilis Nyctaginea (Michx.) MacM.: Roadsides, field margins.

Phytolaccaceae

Phytolacca americana L.: Stream margins, moist fields, woods.

Aizoaceae

*Mollugo verticillata L.: Distrubed sandy prairies, flood plains, fields, pastures.

Portulacaceae

Claytonia virginica L.: Prairies.

*Portulaca mundula Johnston: Shallow soil in depressions of limestone

outcrops.

Portulaca oleracea L.: Waste places, roadsides and sidewalk margins.

*Talinum parviflorum Nutt.: Sandy soil over sandstone outcrops.

Caryophyllaceae

*Arenaria serpyllifolia L.: Roadside meadows, lawns.

Arenaria stricta Michx., var. texana Robinson: Collection by C. W. Gould (as A. texana) n. s., KSC.

*Cerastium bracypodum (Engelm.) Robinson: Stream margin.

*Cerastium vulgatum L., forma glandulosum (Benn.) Druce: Prairie meadow.

*Dianthus deltoides L.: Persisting garden escape.

*Saponaria officinalis L.: Roadsides.

*Silene antirrhina L., forma antirrhina: Prairies and prairie margins.

*Silene antirrhina L., forma Deaneana Fern.: Upland prairie.

Silene stellata (L.) Ait. f.: Moist wooded hillsides and lowlands.

Stellaria media (L.) Cyrill: Prairie meadow.

Ceratophyllaceae

*Ceratophyllum demersum L.: Cowley County State Lake.

Nymphaceae

Nuphar advena (Ait.) Ait.: Collection by Clothier and Whitford n. s., KSC.

Ranunculaceae
Benson, 1948

*Anemone caroliniana Walt., forma caroliniana: Upland prairies.

*Anemone caroliniana Walt., forma violacea Clute: Uncommon, upland prairies.

Anemone decapetala Ard.: Not seen. Cited by Gates (1940).

Aquilegia canadensis L., var. latiuscula (Greene) Munz: Limestone outcrops.

Clematis Pitcheri T. & G.: Fence rows, woods.

*Clematis dioscoreifolia Levl. & Vaniot: On saplings of roadside cut.

*Delphinium Ajacis L.: Railroad ballast, margin of abandoned yard.

Delphinium tricorne Michx., forma tricorne: Sparse shade of lowland woods.

Delphinium virescens Nutt.: Upland prairie fields, pastures, and roadsides.

*Myosurus minimus L.: Sparse shade of Walnut River flood plain.

Ranunculus abortivus L.: Wooded lowlands.

*Ranunculus sceleratus L.: Sandy margin of rivers, flood plains, and roadside ditches.

Thalictrum dasycarpum Fisch. & Lall., var. dasycarpum: Not seen. Cited by Gates, 1940.

*Thalictrum dasycarpum Fisch. & Lall., var. hypoglaucum (Rydb.) Boivin: Wooded hillsides and lowlands.

Anonaceae

Asimina triloba (L.) Dunal: Rich lowland woods.

Menispermaceae

Cocculus carolinus (L.) DC.: Wooded hillsides and valleys.

Menispermum canadense L.: Wooded hillsides and valleys.

Papaveraceae

*Argemone polyanthemos (Fedde) G. B. Ownb.: Distrubed sandy prairies and dikes.

Fumariaceae
G. L. Ownbey, 1947

*Corydalis aurea Willd., var. occidentalis Engelm.: Roadside.

*Corydalis curvisiliqua Engelm., var. grandibracteata Fedde: Sandy roadsides, waste places, and fields.

Corydalis micrantha (Engelm.) Gray: Sandy roadsides, waste places.

*Dicentra Cucullaria (L.) Torr.: Moist wooded hillside.

Capparidaceae
Iltis, 1958

*Cristatella Jamesii T. & G.: Sandy prairie and waste places.

Polanisia dodecandra (L.) DC.: Gravelly stream beds and railroad ballast.

Cruciferae
C. Hitchcock, 1936; Fernald, 1934

*Arabis canadensis L.: Along fence row.

*Brassica Kaber (DC.) Wheeler, var. pinnatifida (Stokes) Wheeler: Roadsides, waste places.

*Camelina microcarpa Andrz.: Waste places, roadsides.

Capsella bursa-pastoris (L.) Medic.: Roadsides, waste places.

Cardaria Draba (L.) Desv.: Overgrazed pasture.

Descurainia pinnata (Walt.) Britt.: Roadsides, waste places, fields.

Descurainea Sophia (L.) Webb.: "Railroad ballast." Collection by A. L. Metcalf n. s., KSC.

*Draba brachycarpa Nutt.: Prairie meadows.

Draba cuneifolia Nutt., var. cuneifolia: Upland prairie, depressions of limestone outcrops.

Draba cuneifolia Nutt., var. leiocarpa O. E. Schulz: Not seen. Cited by Gates, 1940.

Draba reptans (Lam.) Fern., var. reptans: "Prairie near Winfield." Collection by Hazel Land n. s., KSC.

*Erysimum repandum L.: Waste places, roadsides, fields, pastures.

*Hesperis matronalis L.: Spreading from an abandoned yard.

Lepidium densiflorum Schrad.: Prairie roadsides, waste places.

*Lepidium oblongum Small: Collection by Lorraine Koch 331 A. Prairie roadsides.

*Lepidium virginianum L.: Waste places, prairie fields and pastures.

Nasturtium officinals R. Br.: Shaded streams.

*Rorippa obtusa (Nutt.) Britt. Moist soil at margin of lakes and rivers.

Rorippa sessiliflora (Nutt.) Hitchc.: Wet margin of Arkansas River and lakes.

Rorippa sinuata (Nutt.) Hitchc.: Wet lowlands.

*Sibara virginica (L.) Rollins: Moist lowland areas, stream sides.

*Thalaspi arvense L.: Uncommon, roadsides and waste places.

Crassulaceae

*Sedum pulchellum Michx.: Shallow sandy soil over sandstone outcrops.

Saxifragaceae

*Penthorum sedoides L.: Moist prairie areas.

Ribes missouriense Nutt.: Collection by Clothier and Whitford n. s., KSC.

Ribes odoratum Dougl.: Roadsides, fence rows, limestone outcrops.

Platanaceae

*Platonus occidentalis L.: Along lowland streams.

Rosaceae
Rydberg, 1913; Fernald, 1931; Bailey, 1945
Hogdon and Steel, 1966

*Agrimonia pubescens Wellr.: Wooded hillsides.

*Amelanchier canadensis (L.) Medic.: Scattered on prairie lowlands.

*Crataegus crus-galli L.: Lowland prairies, scattered.

*Crataegus viridus L.: Lowland clearing.

Fragaria virginica Duchesne: Collection by Mark White n. s., KSC.

Geum canadense Jacq., var. camporum (Rydb.) Fern.: Wooded hillsides and valleys.

*Potentilla arguta Pursh: Upland prairie.

*Potentilla simplex Michx.: Rocky outcrops.

Prunus angustifolia Marsh: Fence rows and prairie ditches.

Prunus gracilis Engelm. & Gray: Along margin of small prairie stream.

Prunus hortulana Bailey: Collection by Clothier and Whitford n. s. KSC.

*Prunus mexicana S. Wats.: Wooded lowlands.

Prunus Munsoniana Wright and Hedrick: Sandy valley of Arkansas River.

*Prunus Reverchonii Sarg.: Upland prairie.

Prunus X Slavini Palmer (P. gracilis X P. angustifolia): Cited by Gates, 1940.

Rosa arkansana Porter, var. suffulta (Greene) Cockerell: Lowland prairie roadside.

*Rosa carolina L.: Prairie roadsides, fields and pastures.

*Rosa multiflorus Thunb.: Persisting and spreading escape along roadsides and fence rows.

*Rubus allegheniensis Porter: Sandy lowlands and gulleys.

Rubus flagellaris Willd.: Collection by Clothier and Whitford n. s., KSC.

*Rubus mollior Bailey: Lowland prairie thickets.

Rubus occidentalis L.: Wooded hillsides, limestone outcrops.

*Rubus ozarkensus Bailey: Wooded hillsides, sandy lowlands.

Leguminosae
Shinners, 1949; Isely, 1953, 1955, 1962; Welsh, 1960; Clewell, 1966

*Acacia angustissima (Mill.) Kuntze., var. hirta (Nutt.) Robinson: Upland prairies.

Amorpha canescens Pursh, forma canescens: Prairie pastures and fields.

Amorpha fruticosa L.: Margins of small streams, ponds, lakes, and low sandy areas.

Amphicarpa bracteata (L.) Fern., var. comosa (L.) Fern.: Moist wooded stream bank.

Apios americana Medic.: Collection by A. R. Elrod n. s., KSC.

Astragalus canadensis L.: Wooded lowland.

Astragalus crassicarpus Nutt., var. crassicarpus: Upland prairies.

*Astragalus plattensis Nutt.: Upland prairie.

Baptisia australis (L.) R. Br., var. minor (Lehm.) Fern.: Prairies.

Baptisia leucophaea Nutt., var. leucophaea: Upland prairies.

Cassia fasiculata Michx.: Upland prairie fields, roadsides, and pastures.

*Cassia marilandica L.: Sandy lowland along Arkansas River.

Cercis canadensis L., forma canadensis: Wooded hillsides and valleys.

Cercis canadensis L., forma glabrifolia Fern.: Wooded hillsides.

*Crotalaria sagittalis L.: Sandy, sparsely shaded lowland.

Dalea aurea Nutt.: Shallow soils of upland prairies.

Dalea candida Willd., var. candida: Upland and lowland prairies.

Dalea candida Willd., var. oligophylla (Torr.) Shinners: Not seen. cited by Gates, 1940 /as Petalostemum occidentale (Gray) Fern./. KSC.

*Dalea lanata Spreng.: Sandy open places in Arkansas River valley.

Dalea laxiflora Pursh: Rocky prairie hillsides.

Dalea multiflora (Nutt.) Shinners: Upland prairies.

Dalea purpurea Vent.: Limestone outcrops, upland prairies.

*Dalea villosa (Nutt.) Spreng.: Sandy waste places along the Arkansas River.

Desmanthus illinoensis (Michx.) MacM.: Roadsides, prairies, fields.

*Desmodium canescens (L.) DC.: Wooded hillsides and valleys.

*Desmodium glutinosum (Muhl.) Wood: Wooded hillsides and valleys.

*Desmodium illinoensis Gray: Prairies.

*Desmodium paniculatum (L.) DC., var. Dillenii (Darl.) Isley: Open woods.

*Desmodium paniculatum (L.) DC., var. paniculatum: Open woods.

*Desmodium sessilifolium (Torr.) T. & G.: Shallow soils of upland prairies.

Gleditsia triacanthos L.: Upland prairie thickets.

Glycyrrhiza lepidota (Nutt.) Pursh: Abandoned fields.

Gymnocladus dioica (L.) K. Koch: Lowland woods.

*Krameria secundiflora DC.: Shallow soil of upland prairies.

*Lathyrus latifolius L.: Prairie fence rows and roadsides.

Lespedeza capitata Michx.: Rocky soil of limestone prairie outcrops.

*Lespedeza stipulacea Maxim: Gravel pits, roadsides, railroad ballast.

Lespedeza striata (Thunb.) H. & A.: Collection by E. H. Aicher n. s., KSC.

*Lespedeza violacea (L.) Pers.: Upland prairies.

Lespedeza virginica (L.) Britt.: Collection by Clothier and Whitford n. s., KSC.

Medicago lupulina L.: Waste places, roadsides, and lawns.

Medicago sativa L.: Roadsides, abandoned fields, river dikes.

Melilotus alba Desv.: Roadsides, waste places.

Melilotus officinalis (L.) Lam.: Roadsides and waste places.

Psoralea argyrophylla Pursh: Upland prairies.

*Psoralea digitata Nutt.: Sandy areas along Arkansas River.

Psoralea esculenta Pursh: Upland prairies.

Psoralea tenuiflora Pursh: Roadsides, prairie pastures and fields.

Robinia Pseudo-Acacia L.: Prairie thickets, sparsely wooded areas.

Schrankia uncinata Willd.: Disturbed prairie roadsides.

*Strophostyles helvola (L.) Ell.: Sandy flood plain along Arkansas River.

Strophostyles leiosperma (T. & G.) Piper: Sandy flood plain along Arkansas River.

*Stylosanthes biflora (L.) BSP.: Sandy lowland, sparse shade.

*Tephrosia virginiana (L.) Pers., var. holosericea (Nutt.) T. & G.:

Sandy upland woods and prairie.

Trifolium hybridum L.: Collection from Winfield, no collector indicated, KSC.

Trifolium pratense L.: Prairie meadow and abandoned lawn.

Trifolium procumbens L.: Collection with no name, KSC.

*Trifolium repens L.: Roadsides, waste places, prairie fields.

*Vicia angustifolia Reichard.: Margin of wheat field and renovated pasture.

Vicia sparsifolia Nutt.: Lowland prairie.

*Vicia villosa Roth: Prairie fields, pastures, roadsides, and waste places.

Linaceae
Rogers, 1963

*Linum Lewisii Pursh, var. pratense Norton: Upland prairie.

Linum sulcatum Riddell: Upland prairies.

Linum usitatissimum L.: Collection by M. White n. s., KSC.

Oxalidaceae

Oxalis Dillenii Jacq.: Prairies, waste places.

Oxalis stricta L.: Abandoned fields, waste places.

Oxalis violacea L., var. violacea: Shaded lowlands, waste places, railroad ballast, roadsides.

Geraniaceae
Jones and Jones, 1943

Geranium carolinianum L.: Waste places, sandy flood plain of Arkansas River.

*Geranium maculatum L.: Moist, wooded area.

*Geranium pusillum L.: Prairie roadsides and meadows.

Zygophyllaceae

*Kallstroemia hirsutissima Vail.: "Roadside." Collection by L. C. Hulbert 3652, KSC.

*Tribulus terrestris L.: Roadsides, waste places.

Rutaceae
Bailey, 1962

*Ptelea trifoliata L.: Upland wooded hillside.

*Xanthoxylum americanum Mill.: Moist wooded hillsides and valleys.

Polygalaceae

*Polygala incarnata L.: Upland prairie fields.

*Polygala verticillata L., var. sphenostachya Pennell: Sandy prairie pasture.

Euphorbiaceae
Wheeler, 1941; Richardson, 1967

Acalypha gracilens Gray: Not seen. Cited by Gates, 1940.

Acalypha ostryaefolia Riddell: Waste places, rocky flood plains.

Acalypha virginica L.: Gravel creek bed.

Croton capitatus Michx., var. capitatus: Gravelly prairies, uncultivated fields.

Croton glandulosa L., var. septentrionalis Muell. Arg.: Gravel pits, river flood plains.

*Croton Lindheimerianus Scheele: Rocky prairie hillside.

Croton monanthogynus Michx.: Gravel pits, waste areas, fields.

*Croton texensis (Kltozsch.) Muell. Arg.) Sandy loam lowland.

*Crotonopsis elliptica Willd.: Sparse shade of gravelly stream bed.

*Ditaxis mercurialina (Nutt.) Coult.: Shallow soil of upland prairie.

Euphorbia corollata L., var. corollata: Upland prairies.

*Euphorbia corollata L., var. mollis Millsp.: Collection by Rydberg and Imler 514, KANU.

*Euphorbia corollata L., var. paniculata (Ell.) Boiss: Sparse shade.

*Euphorbia dentata Michx., var. cuphosperma (Engelm.) Fern.: Sandy lowland along Arkansas River, waste places.

Euphorbia dentata Michx., var. dentata: Gravel pits, uncultivated fields and waste places.

*Euphorbia glyptosperma Engelm.: Weedy flood plain, gravel areas.

Euphorbia heterophylla L., var. heterophylla: Sandy, shaded lowlands.

Euphorbia hexagona Nutt.: Sandy flood plain of Arkansas River.

Euphorbia marginata Pursh: Gravel prairie areas, waste places.

Euphorbia missurica Raf.: Roadsides, waste places.

Euphorbia nutans Lag.: Sparse shade of flood plains, fields.

Euphorbia serpens H. B. K.: Roadsides, waste places.

Euphrobia spathulata Lam.: Shallow soil of upland prairies.

Euphorbia strictospora Engelm.: Collection by McGregor 16022, KANU. Cited by Richardson, 1967. Not seen.

*Euphorbia supina Raf.: Waste places, gravel pits, roadsides.

Stillingia sylvatica L.: Upland prairies.

Tragia ramosa Torr.: Sandy prairies, shallow upland prairies.

*Tragia urticifolia Michx.: Sandy prairie pastures.

Anacardiaceae

Rhus aromatica Ait., var. serotina (Greene) Rehd.: Wooded hillsides and limestone outcrops.

*Rhus copallina L., var. latifolia Engler: Sandy soil, upland thickets, gravel pits.

Rhus glabra L.: Sandy lowlands, limestone outcrops, roadsides.

*Rhus radicans L., var. radicans: Wooded hillsides and valleys.

*Rhus radicans L., var. Rydbergii (Small) Rehd.: Wooded hillsides, and valleys.

Celastraceae

Celastrus scandens L.: Wooded hillsides and valleys.

*Euonymus atropurpureus Jacq.: Wooded hillsides and valleys.

Staphyleaceae

*Staphylea trifolia L.: Wooded hillside.

Aceraceae

Acer Negundo L., var. Negundo: Rich lowland woods.

*Acer saccharinum L.: Lowland woods and streams.

Hippocastanaceae

*Aesculus glabra Willd.: Moist wooded hillsides and lowlands.

Sapindaceae

Sapindus Drummondii H. & A.: Moist prairie ravine and ditch.

Ceanothus herbaceus Raf., var. herbaceus: Not seen. Cited by Gates, 1940 (as C. ovatus Desf., var. ovatus.).

Ceanothus herbaceus Raf., var. pubescens (T. & G.) Shinners: Shallow soil of upland prairies and limestone outcrops.

*Ceanothus americanus L., var. Pitcheri T. & G.: Sandy upland woods.

Vitaceae

Ampelopsis cordata Michx.: Collection by Clothier and Whitford n. s., KSC.

Parthenocissus quinquefolia (L.) Planch, var. hirsuta (Donn) Fern.: Wooded hillsides and valleys.

*Parthenocissus quinquafolia (L.) Planch, var. quinquefolia: Wooded hillsides and valleys.

Vitis cinerea Engelm.: Lowland woods, sandy gulleys and woods.

Vitis riparia Michx.: Wooded hillsides and valleys, sandy fence rows.

*Vitis vulpina L.: Brush areas along small streams, lakes.

Malvaceae
Waterfall, 1951

Abutilon Theophrasti Medic.: Waste places, uncultivated lowland fields.

Callirhoe alcaeoides (Michx.) Gray: Prairies throughout.

Callirhoe involucrata (Nutt. ex Torr. Gray, var. involucrata: Upland prairies.

*Callirhoe involucrata (Nutt. ex Torr.) Gray, var. novomexicana (E. G. Baker) Waterfall: Upland prairie.

Hibiscus Trioneum L.: Waste places, gravel pits, uncultivated fields.

Malva neglecta Wallr.: Gravel flood plain of small stream.

Sida spinosa L.: Sandy valley of Arkansas River.

*Sidopsis hispida (Pursh) Rydb. emend. Kearny: Uncultivated fields.

Sphaeralcea coccinea (Pursh) Rydb.: Collection by Mark White n. s., KSC.

Elatinaceae

Bergia texana (Hook.) Seub.: Not seen. Cited by Gates, 1940.

Tamaricaceae

*Tamarix gallica L.: Wet areas of drainage ditches and along brackish streams.

Violaceae

*Hybanthus verticillatus (Ortega) Bail.: Prairie roadsides.

Viola Kitaibeliana R. & S., var. Rafinesquii (Greene) Fern.: Upland prairies, meadows, and woodland clearings.

Viola papilionacea Pursh.: Wooded lowlands.

Viola pedatifida G. Don: Ricky hillside prairie.

Viola pensylvanica Michx.: Collection (as V. eriocarpa Schw.) by Mark White n. s., KSC.

Passifloraceae

*Passiflora incarnata L., forma incarnata: Shaded fence row.

Loasaceae

Mentzelia oligosperma Nutt.: Rocky limestone outcrops of upland prairies.

Cactaceae

*Mamillaria missouriensis Sweet.: Shallow upland prairie soil.

Opuntia humifusa Raf.: "Top of limerock ledge." Collection by S. Stevens 3253, KANU.

*Opuntia macrorhiza Engelm.: Shallow upland prairie soils.

Lythraceae

*Ammannia auriculata Willd., var. arenaria (HBK.) Koehne: Gravel pits and roadside ditches.

Ammannia coccinea Rottb.: Sandy flood plain of Arkansas River.

Lythrum alatum Pursh, var. elatum.: Gravel pits, prairie fields.

*Lythrum alatum Pursh, var. lanceolatum (Ell.) T. & G.: Prairie fields and pastures.

Onagraceae
Munz, 1965

Gaura biennis L., var. Pitcheri Pickering: Roadside prairies.

Gaura parviflora Dougl., forma glabra Munz: Prairies.

*Jussiaea peploides (HBK.) Raven, var. glabrescens (Ktze.) Shinners: Pond, lake and river margins.

*Ludwigia alternifolia L., var. alternifolia: Muddy roadside ditch.

Ludwigia natans Ell., var. stipitata Fern.: Not seen. Cited by Gates. 1940.

Ludwigia palustris (L.) Ell., var. americana (DC.) Fern.: Not seen. Cited by Gates, 1940.

Oenothera biennis L., var. biennis: Not seen. Cited by Gates, 1940.

*Oenothera biennis L., var. canescens T. & G.: Abandoned fields.

Oenothera biennis L., var. hirsutissima Gray: Not seen. Cited by Gates, 1940 [as O. strigosus (Rydb.) MacKenz. and Bush].

*Oenothera heterophylla Spach., var. rhombipetala (Nutt.) Fosberg: Sandy soils in the Arkansas River valley.

*Oenothera laciniata Hill., var. laciniata: Waste places, prairie fields and pastures.

Oenothera missouriensis Sims, var. incana Gray: Shallow upland prairies.

*Oenothera missouriensis Sims, var. missouriensis: Roadsides, limestone outcrops.

Oenothera serrulata Nutt.: Upland prairies.

*Oenothera triloba Nutt.: Gravel flood plain of small prairie stream.

Stenosiphon virgatum Spach.: Upland prairie.

Umbelliferae
Mathias and Constance, 1945; McCoy, 1962; Theobald, 1966

*Ammoselinum Popei T. & G.: Roadside ditch.

*Chaerophyllum procumbens (L.) Crantz.: Wooded lowlands and hillsides, moist roadside ditches.

*Chaerophyllum Tainturieri Hook., var. dasycarpum Wats.: Upland prairie roadside. (Collection by Lorraine Koch 262)

*Chaerophyllum Tainturieri Hook., var. Tainturieri: Wooded valleys and moist waste places.

*Chaerophyllum texanum Coult. & Rose: Disturbed prairies.

*Circuta maculata L., var. maculata: Moist areas along streams and ponds.

*Conium maculatum L.: Margins of prairie streams.

*Cryptotaenia canadensis (L.) DC.: Wooded hillsides and valleys.

*Daucus pusillus Michx.: Occasional along prairie roadsides.

Eryngium Leavenworthii T. & G.: Shallow soil of upland prairies, limestone outcrops.

*Eryngium yuccaefolium Michx.: Upland prairie.

*Limnosciadum pinnatum (DC.) Math. & Const.: Lowland prairie.

Lomatium daucifolium (Nutt.) Coult. & Rose.: Upland prairies, waste places.

*Lomatium foeniculaceum (Nutt.) C. & R.: Waste area along new roadside grade.

Osmorhiza longistylis (Torr.) DC., var. villicaulis Fern.: Not seen. Cited by Gates, 1940.

Polytaenia Nuttallii DC., var. Nuttallii: Common throughout, prairies.

Sanicula canadensis L.: Wooded hillsides and valleys.

Spermolepis inermis (Nutt.) Math. & Const.: Upland prairies.

*Thaspium barbinode (Michx.) Nutt.: Wooded hillsides.

*Torilis arvensis (Ituds.) Link.: Waste places.

Zizea aurea (L.) Koch: Lowland woods.

Cornaceae

Cornus obliqua Raf.: Collection by Clothier and Whitford n. s., KSC.

Cornus Drummondii Meyer: Wooded hillsides, limestone outcrops.

Primulaceae

Androsace occidentalis Pursh: Collection by C. N. Gould n. s., KSC.

Samolus parviflorus Raf.: Collection by G. L. Clothier n. s., KSC.

Sapotaceae

Bumelia lanuginosa (Michx.) Pers.: Dry sandy woods, hillsides.

Ebenaceae

*Diospyros virginiana L.: Wooded hillside.

Oleaceae

Fraxinus pennsylvanica Marsh, var. subintegerrima (Vahl.) Fern.: Lowland woods and margins of lowland streams.

Gentianaceae

*Sabatia campestris Nutt., forma campestris: Lowland prairie.

Apocynaceae

Apocynum cannabinum L., var. glaberrimum A. DC.: Waste places, abandoned fields.

Apocynum cannabinum L., var. pubescens (Mitchell) A. DC.: Not seen. Cited by Gates, 1940.

*Apocynum cannabinum L., var. hypericifolium Gray: Lowland prairie, waste places.

Asclepiadaceae
Woodson, 1954

Asclepias asperula (Dcne.) Woodson, var. decumbens (Nutt.) Shinners: Upland prairies.

Asclepias incarnata L.: Collection by Clothier and Whitford n. s., KSC.

Asclepias stenophylla Gray: Upland prairies.

Asclepias Sullivantii Engelm.: Abandoned fields, prairies.

Asclepias Syriaca L.: Lowland woods, stream banks.

Asclepias tuberosa L.: Prairies and waste places, sandy, lowlands.

Asclepias verticillata L.: Prairies and prairie roadsides.

Asclepias viridiflora Raf., var. lanceolata (Ives) Torr.: Upland prairies.

*Asclepias viridiflora Raf., var. linearis (Gray) Fern.: Upland prairies.

Asclepias viridiflora Raf., var. viridiflora: Upland prairies.

Asclepias viridis L.: Abandoned fields, prairie pastures and fields.

Cynachum laeve (Michx.) Pers.: Collection by Sidney Shields n. s., KCS.

Convolvulaceae
House, 1908; Yunckers, 1932

Convolvulus arvensis L.: Roadsides, waste places, fields.

*Convolvulus sepium L., var. fraterniflorus MacKenzie and Bush: Prairie roadside.

Convolvulus sepium L., var. sepium: Abandoned fields and waste places.

Cuscuta glomerata Choisy: Parasitic on Helianthus sp.

*Cuscuta Gronovii Willd.: Parasitic on Iva sp., abandoned field.

Cuscuta pentagona Engelm.: Not seen. Cited by Gates, 1940.

Evolvulus Nuttallianus R. & S.: Shallow soil over limestone outcrops.

Ipomoea hederacea (L.) Jacq., var. hederacea: Railroad ballast, waste places, fields.

*Ipomoea hederacea (L.) Jacq., var. integriuscula Gray: Railroad ballast, waste places, fields.

Ipomoea lacunosa L.: Fields, waste places.

Ipomoea pandurata (L.) G. F. W. Mey.: Mixed lowland woods, lowlands.

Ipomoea purpurea (L.) Roth: Shaded lowlands.

*Ipomoea Shumardiana (Torr.) Shinners: Railroad ballast, prairie Rhus thickets.

Polemoniaceae
Wherry, 1955; Marsh, 1960

Phlox bifida Beck, var. glandifera Wherry: Not seen. Cited by Gates, 1940.

Phlox divaricata L., var. Laphamii Wood.: Lowland woods.

*Phlox oklahomensis Wherry: Upland prairie.

Hydrophyllaceae

Ellisia Nyctelea L.: Wooded lowlands.

*Phacelia hirsuta Nutt.: Sparse shade of roadside bank.

Boraginaceae

*Cynoglossum officinale L.: Sparse shade of woods pasture.

*Hackelia virginiana (L.) I. M. Jtn.: Shaded stream banks.

Heliotropum tenellum (Nutt.) Torr.: Depressions of limestone outcrops, gravel outwash of small streams.

*Lithospermum arvense L.: Prairie meadows, flood plains, waste places.

Lithospermum incisum Lehm.: Prairies throughout.

*Mysotis verna Nutt.: Prairie pasture.

Onosmodium molle Michx., var. occidentale (Mack.) I. M. Jtn.: Upland prairies, sandy prairies.

Verbenaceae

Lippia lanceolata Michx.: Moist areas along streams.

Verbena bipinnatifida Nutt.: Not seen. Cited by Gates, 1940.

Verbena bracteata Lag. & Rodr.: Waste places, roadsides.

Verbena canadensis (L.) Britt.: Waste places, disturbed prairies.

*Verbena hastata L.: Moist prairie ravines.

Verbena simplex Vent.: Sparse shade, prairie roadsides.

Verbena stricta V nt., forma stricta: Waste places, fields, and disturbed prairies.

Verbena urticifolia L.: Rich lowland woods and clearings.

Labiatae
McClintock and Epling, 1942

Agastache nepetoides (L.) Kuntze.: Wooded valleys and stream banks.

*Glecoma Hederacea L.: Shaded lowland.

Hedeoma hispida Pursh: Upland short grass prairies.

Isanthus brachiatus (L.) B. S. P.: Collection by Clothier n. s., KSC.

Lamium amplexicaule L., forma amplexicaule: Waste places, lawns, and fields.

*Leomurus Cardiaca L.: Sparse shade, lowland.

Lycopus americanus L., var. scabrifolius Fern.: Prairie ravines and stream margins.

Marubium vulgare L.: Sparse shade along small stream.

Mentha arvensis L.: Low prairie ravine.

*Mentha piperita L.: Collection by M. Froman n. s., KSC.

Monarda citriodora Cerv. ex Lagasca: Prairie pastures, railroad ballast, roadside ditches.

Monarda fistulosa L., var. fistulosa: Lowland prairies.

Nepeta cataria L.: Collection by M. Froman n. s., KSC.

Prunella vulgaris L., var. lanceolata (Bart.) Fern.: Shaded creek bed.

Salvia azurea Lam., var. grandiflora Benth.: Upland prairies.

Scutellaria parvula Michx., var. parvula: Wooded hillsides

*Scutellaria parvula Michx., var. Leonardi (Epl.) Fern.: Wooded hillside.

*Teucrium canadense L., var. canadense: Waste places, fields, and pastures.

Teucrium canadense L., var. virginica (L.) Eat.: Roadside ditches and lowlands.

Solanaceae
Waterfall, 1958

*Datura meteloides DC.: Abandoned pig sty.

Datura Stramonium L.: Waste places, abandoned pig sty, flood plains.

*Lycium halimifolium Mill.: Roadside prairie thicket.

*Physalis angulata L., var. pendula (Rydb.) Waterfall: Waste places, sandy roadsides.

Physalis heterophylla Nees, var. heterophylla: Sparse sandy lowland woods.

*Physalis pumila Nutt.: Abandoned fields, disturbed prairies.

Physalis virginiana Mill., var. sonorae (Torr.) Waterfall: Disturbed prairies, flood plains.

Physalis virginiana Mill., var. subglabrata (Mack. and Bush) Waterfall, forma macrophysa (Rydb.) Waterfall. Not seen. Cited by Gates, 1940.

*Solanum carolinensis L., forma albiflorum (O. Ktze.) Benke: Abandoned farmstead, disturbed sandy prairies.

Solanum carolinense L., forma carolinensis: Wooded upland.

Solanum elaeagnifolium Cav., forma elaeagnifolium: Waste places, disturbed prairie roadsides and pastures.

Solanum nigrum L., var. americanum (Mill.) Schulz.: Sandy thickets, wooded hillsides and valleys.

Solanum rostratrum Dunal: Waste places, fields, and pastures.

Solanum Torreyi Gray, forma Torreyi: Waste places, fields, gravel pits, and pastures.

Scrophulariaceae
Pennell, 1935

*Buchneria americana L.: Scarce, moist prairie areas.

*Bacopa rotundifolia (Michx.) Pennell: Gravel pit pools.

Castilleja sessiliflora Pursh: Not seen. Cited by Gates, 1940.

Conobea multifida Benth: Lowland woods.

Gerardia densiflora Benth.: Collection by Clothier and Whitford n.s., KSC.

*Linaria canadensis (L.) Dumont, var. texana (Scheele) Pennell: Upland prairies.

*Linaria vulgaris Hill: Persisting along roadside.

Lindernia anagallides (Michx.) Pennell: Dry gravel pit pools.

Lindernia dubia (L.) Pennel: Not seen. Cited by Gates, 1940.

Penstemon Cobaea Nutt.: Limestone outcrops, shallow upland prairies.

Penstemon grandiflorus Nutt.: Hillside prairies.

*Penstemon tubaeflorus Nutt.: Lowland prairies and fields.

*Scrophularia marilandica L.: Lowland stream banks.

*Verbascum Blattaria L., forma albiflora (Don) House: Margin of small woods.

*Verbascum Blattaria L., forma Blattaria: Prairie pastures.

*Verbascum Thapsus L.: Roadsides, prairie pastures.

Veronica Anagallis-aquatica L.: Shaded lowland streams.

*Veronica arvensis L.: Lawns, meadows and waste areas.

Veronica peregrina L., var. xalapensis (HBK.) St. John and Warren: Stream, lake, and pond margins.

*Veronica polita Fries: Lawns, meadows, and waste areas.

Bignoniaceae

*Campsis radicans (L.) Seem.: Vine, on trees, fences.

*Catalpa speciosa Warder: Wooded lowlands and stream margins.

Orobanchaceae

*Orobanche uniflora L.: Parasitic on prairie roots.

Acanthaceae

Dicliptera brachiata (Pursh) Spreng.: Lowland woods.

*Justicia americana (L.) Vahl.: Stream margins and pond seepages.

Ruellia humilis Nutt.: Scattered throughout the prairie.

Ruellia strepens L., forma strepens: Wooded hillsides and lowlands.

Phrymaceae

*Phryma leptostachya L.: Wooded hillsides and valleys.

Plantaginaceae

*Plantago aristata Michx.: Gravel pits.

*Plantago lanceolata L., var. lanceolata: Waste areas.

Plantago Purshii R. & S., var. Purshii: Waste areas, sandy disturbed prairies.

Plantago rhodosperma Dcne.: Disturbed upland prairie.

Plantago Rugelii Dcne.: Stream margins, shaded.

*Plantago virginica L.: Waste places, disturbed prairie fields and pastures.

Rubiaceae

Cephalanthus occidentalis L., var. occidentalis: Margin of streams, ponds, and lakes.

*Diodia teres Walt., var. setifera Fern. & Grisc.: Sandy prairies.

*Galium Aparine L.: Wooded lowlands and waste places.

*Galium circaezans Michx., var. hypomalacum: Wooded hillsides and uplands.

*Galium virgatum Nutt.: Overgrazed prairie pastures.

Hedyotis crassifolia Raf.: Prairie meadows and lawns.

Hedyotis nigricans (Lam.) Fosb.: Shallow prairie soil over limestone outcrops.

Caprifoliaceae

*Lonicera japonica Thunb.: Spreading over fence row in a lowland.

Sambucus canadensis L., var. canadensis: Lowlands, stream margins.

Symphoricarpos orbiculatus Moench: Wooded hillsides and occasional on shallow prairie outcrop.

Triosteum perfoliatum L.: Wooded hillsides.

Viburnum prunifolium L., var. ferrugineum T. & G.: Hillside prairie.

Cucurbitaceae

Cucurbita foetidissima HBK.: Limestone outcrops and shallow prairie soils.

*Melothria pendula L.: Sparse shade along lowland streams.

Sicyos angulatus L.: Wooded valleys.

Campanulaceae
McVaugh, 1943

Campanula americana L., var. illinoensis (Fresn.) Farw.: Wooded hillsides and valleys.

*Lobelia cardinalis L., forma cardinalis: Shaded stream margins.

*Specularia Holzingeri (McVaugh) Fern.: Distrubed sandy prairies.

*Specularia leptocarpa (Nutt.) Gray: Prairie fields and pastures.

Specularia perfoliata (L.) A. DC.: Sandy prairies.

Compositae
Gleason, 1947: Shinners, 1946, 1947; Cronquist, 1947; Sherff and Alexander, 1955; Gaiser, 1946, Perdue, 1957

Achillea lanulosa Nutt., var. lanulosa: Upland prairies.

Actinomeris alternifolia (L.) DC.: Wooded valleys.

Agoseris cuspidata (Pursh) RAf.: Upland prairie.

Ambrosia artemisiifolia L., var. elatior (L.) Descourtils: Wasteplaces, upland prairies.

Ambrosia psilostachya DC., var. Lindheimeriana (Scheele) Blankenship: Abandoned fields, waste places, roadsides.

Ambrosia trifida L., var. texana Scheele: Lowland woods and fields.

*Antennaria neglecta Greene: Upland prairies.

*Antennaria plantaginifolia (L.) Richards: Sandy prairie pasture.

Artemesia ludoviciana Nutt., var. mexicana (Willd.) Fern.: Limestone outcrops.

Aster ericoides L.: Upland prairies, abandoned fields.

Aster oblongifolius Nutt.: Shallow prairie soils, stoney.

*Aster prealtus Poir.: Sandy flood plain of Arkansas River.

Aster sagittifolius Wedemeyer: Wooded hillsides and valleys.

Aster sericeus Vent.: Upland prairies.

*Aster subulatus Michx., var. ligulatus Shinners: Arkansas River flood plain.

Bidens bipinnata L.: Sandy margin of lowland woods.

*Bidens cernua L.: Back water pool of Arkansas River.

*Bidens frondosa L.: Margin of prairie streams and lakes.

*Bidens tripartita L.: Along margin of small stream.

*Bidens vulgata Greene: Moist sandy stream bed.

Bidens asteroides (L.) L'Her. Not seen. Cited by Gates, 1940.

*Boltonia latisquama Gray: Abandoned field.

Cacalia atriplicifolia L.: Collection by Clothier and Whitford n. s., KSC.

Cacalia plantaginea (Raf.) Shinners: Upland prairies.

*Cardwus nutans L.: Abandoned field.

*Centaurea Cyanus L.: Persisting along roadsides and abandoned yards.

Centaurea repens L.: Not seen. Cited by Gates, 1940, (as C. picris Pall.).

Chrysanthemum leucanthemum L., var. pinnatifidum Lecoq. & Lamotte: Lowland prairies and roadsides.

*Chrysopsis pilosa Nutt.: Sandy lowland prairie.

*Chrysopsis villosa (Pursh) Nutt., var. canescens Gray: Upland prairie.

*Cichorium Intybus L., forma Intybus: Roadside prairies, fields.

Cirsium altissimum (L.) Spreng.: Abandoned fields, sandy lowlands.

Cirsium undulatum (Nutt.) Spreng.: Waste places, prairie pastures and fields.

Conyza canadense (L.) Cronq., var. canadense: Abandoned fields, fence rows.

Conyza ramosissimum Cronq.: Flood plains.

*Coreopsis grandiflora Hogg.: Upland prairie.

Coreopsis tinctoria Nutt.: Shallow prairies, gravel pits.

Dyssodia papposa (Vent.) Hitchc.: Gravel prairie roadway.

Eclipta alba (L.) Hassk.: Stream and lake margins.

Echinaceae angustifolia DC.: Upland prairies.

*Echinacea atrorubens Nutt.: Collection by R. L. McGregor 10396, KANU.

Echinacea pallida Nutt.: Upland prairies.

*Erigeron annuus (L.) Pers.: Margin of woods.

Erigeron philadelphicus L.: Prairie ravines, lowland prairies.

*Erigeron strigosus Muhl. ex Willd.: Upland prairies.

Eupatorium altissimum L.: Sandy lowland prairie.

*Eupatorium perfoliatum L.: Upland woods.

*Eupatorium rugosum Nutt.: Lowland woods.

*Eupatorium serotinum Michx.: Wooded valleys and sandy woods.

Evax prolifera Nutt. ex DC.: Over-grazed prairie pasture.

*Gaillardia pulchella Foug.: Railroad ballast.

*Gnaphalium obtusifolium L.: Abandoned fields and sandy prairies.

*Grindelia lanceolata Nutt.: Upland prairie.

Gutierrezia dracunculoides (DC.) Blake: Abandoned fields, prairie pastures.

Haplopappus ciliatus (Nutt.) DC.: Fields, pastures, disturbed areas.

*Helenium autumnale L.: Moist prairie along small stream.

Helianthus annuus L.: Waste places, fields.

Helianthus grosseserratus Martens: Along prairie stream margin.

*Helianthus hirsutus Raf., var. hirsutus: Upland prairies.

*Helianthus hirsutus Raf., var. trachyphyllus T. & G.: Waste places, flood plains.

*Helianthus laetiflorus Pursh: Lowland fields, disturbed areas.

Helianthus Maximiliani Schrad.: Waste places, roadside ditches.

Helianthus petiolaris Nutt.: Waste places, flood plains, roadsides, and pastures.

Helianthus salicifolius A. Dietr.: Shallow prairies of limestone outcrops.

Helianthus tuberosa L.: Along lowland streams and ditches.

Heliopsis helianthoides (L.) Sweet, var. scabra (Dunal) Fern.: Prairies.

Heterotheca latifolia Buckl.: Flood plains, disturbed sandy prairies.

*Hieracium longipilum Torr.: Prairies.

*Hymenopappus scabiosaeus L'Her, var. corymbosus (T. & G.) Turner: Upland prairies.

Iva ciliata Willd.: Abandoned fields.

*Krigia occidentalis Nutt.: Cemetery meadow.

Kuhnia eupatorioides L., var. corymbulosa T. & G.: Abandoned fields. prairies, flood plains.

Lactuca canadensis L.: Wooded hillsides.

*Lactuca floridana (L.) Gaertn.: Wooded hillsides.

Lactuca ludoviciana (Nutt.) DC., var. ludoviciana: Waste places,

abandoned fields.

*Lactuca Scariola L., forma Scariola: Waste places, flood plains.

*Liatris aspera Michx., var. aspera: Upland prairies.

Liatris punctata Hook, var. nebraskensis: Upland prairies.

Liatris pycnostachya Michx.: Upland prairies.

Parthenium integrifolium L.: Shallow upland prairie.

*Pyrrhopappus carolinianus DC.: Sandy lowland prairies.

Pyrrhopappus scaposus DC.: Sandy prairie pastures and fields.

Ratibida columnifera (Nutt.) W. & S., forma columnifera: Upland prairies, roadsides.

*Ratibida columnifera (Nutt.) W. & S., forma pulcherrima (DC.) Fern.: Upland prairie hay field.

*Rudbeckia amplexicaulis Vahl.: Lowland prairies and moist ditches.

*Redbeckia hirta L., var. pulcherrima Farwell: Lowland prairies.

Senecio plattensis Nutt.: Prairie ravines and roadsides.

Silphium integrifolium Michx., var. laeve T. & G.: Prairies.

Silphium laciniatum Torr., var. laciniatum: Abandoned fields, prairie pastures.

Solidago canadensis L., var. gilvocanescens Rydb.: Abandoned fields, prairie pastures and fields.

Solidago delicatula Small: Wooded hillsides.

Solidago gigantea Ait., var. leiophylla Fern.: Sandy flood plain of Arkansas River.

*Solidago gymnospermoides (Greene) Fern.: Abandoned fields.

Solidago missouriensis Nutt., var. fasciculata Holz.: Upland prairie and abandoned fields.

Solidago rigida L.: Prairie pastures and fields.

*Solidago speciosa Nutt., var. angustata T. & G.: Rocky prairie outcrops.

*Solidago ulmifolia Muhl.: Shaded bluff of limestone outcrops.

*Sonchus asper (L.) Hill, forma gladularis Beckh.: Railroad ballast.

*Taraxacum erythrospermum Andrz.: Wasteplaces, prairie fields and pastures, roadsides.

Taraxacum officinale Wiggers: Waste places, prairie fields and pastures.

Thelesperma ambiguum Gray: Rocky prairie outcrops.

*Tragopogon major Jacq.: Prairie fields, pastures, and roadsides.

Tragopogon porrifolius L.: Lowland prairie pastures and roadsides.

*Tragopogon pratensis L.: Upland prairie fields and pastures.

*Verbesina encelioides (Cav.) R. & H.: Disturbed roadside.

*Verbesina helianthoides Michx.: Wooded hillside.

Verbesina virginica L.: Wooded hillside.

*Vernonia Baldwinii Torr., var. Baldwinii: Prairie pastures.

Vernonia Baldwinii Torr., var. interior (Small) Schub.: Lowland pastures.

*Xanthium strumarium L.: Waste places, gravelly roadsides and flood plains.

EXCLUDED SPECIES

Two plant species credited to the county by Gates (1940) have been excluded from the preceding list for the reasons indicated.

Cammassia scillioides (Raf.) Cory: The collection upon which Gates based his record, A. R. Elrod n. s., KSC, is more properly referred to C. angusta (Engelm. & Gray) Blankenship. (Steyermark, 1961).

Polygonum leptocarpum B. L. Robinson: White's collection upon which this record is based is too fragmentary to make any positive identification. Since there is no other record of this plant in Kansas or Oklahoma, it seems best to exclude it.

Other species listed by Gates (1940) but not appearing in the preceding list have been combined with other taxa. An example is *Convolvulus interior* House, here referred to *C. sepium* L.

CHAPTER VI

TABULAR VIEW OF THE FAMILIES

Families	Genera	Species	Subordinate taxa
Equisetaceae	1	1	
Selaginellaceae	1	1	
Ophioglossaceae	2	2	
Polypodiaceae	6	6	4
Marsiliaceae	1	1	
Pinaceae	1	1	
Typhaceae	1	2	1
Zosteraceae	1	3	2
Alismataceae	3	6	3
Gramineae	48	94	25
Cyperaceae	7	33	9
Araceae	1	1	
Lemnaceae	2	3	
Commelinaceae	2	6	5
Juncaceae	2	5	1
Liliaceae	10	15	13
Amaryllidaceae	1	1	
Iridaceae	3	3	2
Orchidaceae	1	2	

Salicaceae	2	6	2
Juglandaceae	2	5	
Fagaceae	1	9	5
Ulmaceae	2	5	
Moraceae	2	4	
Cannabinaceae	2	2	
Urticaceae	5	5	1
Polygonaceae	4	17	2
Chenopodiaceae	5	9	3
Amaranthaceae	2	8	1
Nyctaginaceae	1	3	1
Phytolaccaceae	1	1	
Aizoaceae	1	1	
Portulacaceae	3	4	
Caryophyllaceae	6	9	4
Ceratophyllaceae	1	1	
Nymphaceae	1	1	
Ranunculaceae	7	12	5
Anonaceae	1	1	
Menispermaceae	2	2	
Papaveraceae	1	1	
Fumariaceae	2	4	2
Capparidaceae	2	2	
Cruciferae	14	21	4
Crassulaceae	1	1	
Saxifragaceae	2	3	
Platanaceae	1	1	

Rosaceae	9	23	2
Leguminosae	27	58	14
Linaceae	1	3	
Oxalidaceae	1	3	
Geraniaceae	1	3	
Zygophyllaceae	2	2	
Rutaceae	2	2	
Polygalaceae	1	2	1
Euphorbiaceae	7	25	8
Anacardiaceae	1	4	4
Celastraceae	2	2	
Staphyleaceae	1	1	
Aceraceae	1	2	1
Hippocastanaceae	1	1	
Sapindaceae	1	1	
Rhamnaceae	1	2	2
Vitaceae	3	5	2
Malvaceae	7	8	2
Elatinaceae	1	1	
Tamaricaceae	1	1	
Violaceae	2	5	1
Passifloraceae	1	1	1
Loasaceae	1	1	
Cactaceae	2	3	
Lythraceae	2	3	3
Onagraceae	5	14	12
Umbelliferae	16	20	5

Cornaceae	1	2	
Primulaceae	2	2	
Sapotaceae	1	1	
Ebenaceae	1	1	
Oleaceae	1	1	1
Gentianaceae	1	1	1
Apocynaceae	1	1	3
Asclepiadaceae	2	10	4
Convolvulaceae	4	11	4
Polemoniaceae	1	3	1
Hydrophyllaceae	2	2	
Boraginaceae	6	7	1
Verbenaceae	2	8	
Labiatae	15	18	9
Solanaceae	4	12	8
Scrophylariaceae	11	19	4
Bignoniaceae	2	2	
Orobanchaceae	1	1	
Acanthaceae	3	4	1
Phrymaceae	1	1	
Plantaginaceae	1	6	2
Rubiaceae	4	7	3
Caprifoliaceae	5	5	1
Cucurbitaceae	3	3	
Campanulaceae	3	5	2
Compositae	53	108	30

TOTALS:	
FAMILIES	99
GENERA	399
SPECIES	759
SUBORDINATE TAXA	214
TOTAL TAXA	810

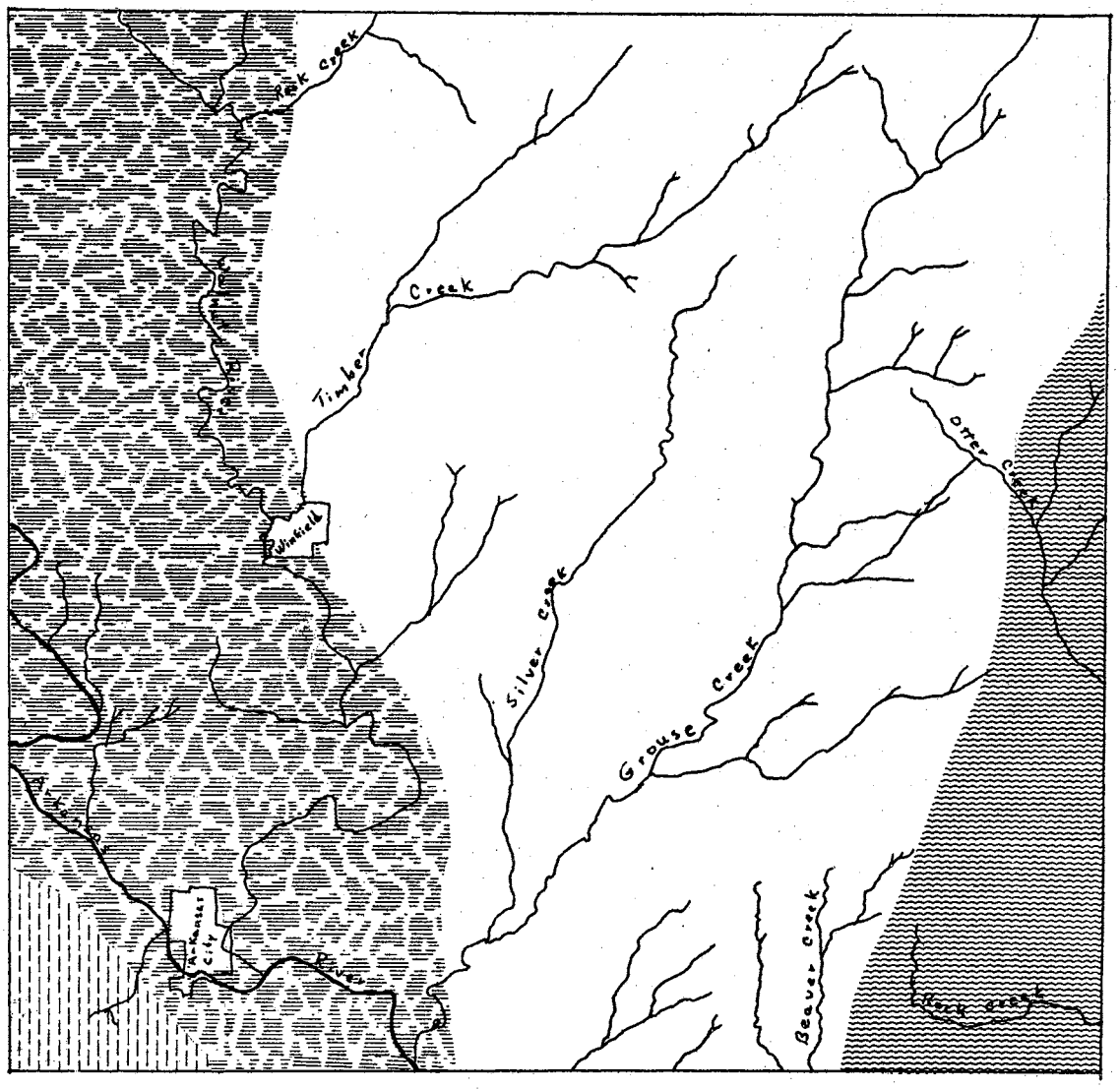
CHAPTER VII

SUMMARY

The problem of studying the flora of Cowley County was undertaken to establish a sound basis for the development of field laboratory learning experiences and to aid in the understanding of the composition and distribution of Kansas plants. During the course of this investigation, carried on in 1966 and 1967, intensive collections were made in selected sites within the county. In addition, other areas of the county were visited more or less regularly in an effort to locate as many species as possible.

Specimens were prepared and mounted in accordance with standard herbarium techniques. They were studied critically with the aid of monographs and similar treatments, when these were available, and deposited in the herbarium of Oklahoma State University. Where possible, the author examined the collections of others at the herbaria of Kansas State University and the University of Kansas.

A total of 810 taxa represented by 99 families, 399 genera, 759 species, and 214 subordinate taxa, native to, or naturalized in Cowley County, were accounted for in this study. The six largest families, with the number of species in each, were: Compositae 108, Gramineae 94, Leguminosae 58, Cyperaceae 33, Euphorbiaceae 25, and Rosaceae 23. These families contain 45 per cent of the total flora of the county.



Physiographic Map of Cowley County

Wellington Lowland

Great Bend Lowland

Flint Hills Upland

Osage Cuestas

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