

## *Flora and Vegetation*

### DESCRIPTION OF THE AREA

Missouri lies in the middle Mississippi Valley somewhat east and a little north of the geographical center of the United States. The northern boundary of the state is along 40°30' north latitude; most of the southern boundary is along 36°30' north latitude, while a small section in the southeastern corner extends south to 36° north latitude. In longitude it lies between 89° on the east to 95°46' on the west with about two-thirds of the western boundary in 94°38' west longitude. The irregular course of the Mississippi River bounds the eastern border, except for a short distance near the northeastern corner, where the Des Moines River separates it from Iowa. The Missouri River bounds the northwestern border of the state. Missouri is bounded altogether by eight states—on the east by Illinois, Kentucky, and Tennessee, on the north by Iowa, on the south by Arkansas, and on the west by Nebraska, Kansas, and Oklahoma.

The land area occupies 69,674 square miles, of which 448 are water surface. It is about 390 miles from the most easterly to the most westerly point in the state, but nowhere is the distance in a direct line so great, the average width being 255 miles. Over most of the state the direct distance from north to south is about 285 miles, but the southeastern corner extends 35 miles farther south. In size it ranks eighteenth in the United States.

Physiographically the state may be broadly described as an undulating plain which rises gradually, or abruptly in places, from the Mississippi River towards the west and northwest, where it merges with the Great Plains. Three principal physiographic regions, (1) the Southeastern Lowlands, (2) the Ozark

Plateau, and (3) the Prairie region, may be recognized in the state. (1) The unglaciated Southeastern Lowlands is a small area of low relief between 230 and 350 feet, lying in the southeastern corner of the state as a northern part of the Mississippi Embayment extension of the Coastal Plain Province. It is a generally level surface of alluvial plain, the relief of which is diversified only by Crowley Ridge, running mainly through Dunklin, Stoddard, New Madrid, and Scott counties and reaching a maximum elevation of about 450 feet. Sikeston and Malden Ridge are narrow ridges lying east of the main mass of Crowley Ridge. (2) The unglaciated Ozark Plateau, which occupies the greater part of southern Missouri and a strip just north of the Missouri River, is the most conspicuous and extensive relief feature between the Appalachians to the east and the Cordilleras to the west. Tom Sauk Mountain, near the boundary of Iron and Reynolds counties in the southeastern Ozarks, is 1,772 feet above sea level, the highest point in the state. Most of the area of the Ozark Plateau farther west has an elevation varying between 1,000 and 1,300, reaching a maximum of slightly over 1,700 feet in Wright County. On the northern, northwestern, and eastern sides there is a gradual reduction in elevation towards the valleys of the Missouri, Osage, and Mississippi rivers, diminishing to 400 feet on the east. Near the southwestern corner of the state, in Barry County, an elevation of over 1,500 feet is attained. (3) The Prairie region, occupying the remainder of the state is part of the Central Lowland Province and embraces (a) a glaciated dissected till plain lying mainly north of the Missouri River, except for small areas in St. Louis, Saline, Cooper, Lafayette, and Jackson counties,

varying in altitude from 600 feet in St. Charles County to slightly over 1,200 feet at the northwestern corner of the state, and (b) an unglaciated Osage Plains section, a wedge-shaped area of nearly flat to gently rolling relief in west-central and southwestern Missouri south of the Missouri River, including various escarpments of the Bethany Falls Escarpment, the Henrietta Escarpment, Nevada Lowland, and the Cherokee Lowland.

The drainage of the state is into the Mississippi-Missouri River system. The direction of flow of the streams varies according to the elevation and topography, hardness and strike of the underlying rocks, and past geological history. In the northern part of the state the streams generally flow southward into the Missouri River, except along the eastern quarter where they flow mainly southeast into the Mississippi. South of the Missouri River nearly all the streams have their sources in the Ozark Plateau and flow in various directions. Many of them originate from large springs, and the majority are fed by springs along their courses. Most of them in the southeastern part have a generally southerly course, but along the northern side of the plateau the Meramec, Gasconade, and Osage rivers flow in mainly northerly and easterly directions. White River, with its sources in the Boston Mountains of Arkansas, is one of the larger tributaries of the Mississippi River. It flows through southwestern Missouri, eventually joining the Mississippi far to the south in Arkansas. In the southwestern corner of the state the drainage is westward through Spring River, Shoal Creek, and Elk River, which join the Neosho River farther west, the latter stream emptying into the Arkansas and eventually the Mississippi River.

Like that of all the central Mississippi Valley, the climate of Missouri is marked by great extremes and subject to sudden changes in temperature. The average annual precipitation varies from 40-45 inches over the southern part of the state, diminishing to 30-35 inches in the northwestern portion, with most of it occurring during the spring and early summer months. The southeastern section of the state receives the heaviest amount, with an annual average of about 48 inches. The maximum amount of precipitation recorded is 55.06 inches in 1927, the minimum amount recorded is 25.28 inches in 1901. Snowfall varies from an average of 16 inches in the southeastern section to about 21 inches in the northern section, but the snow rarely remains on the ground for more than a few days. Some winters pass with only a few light snows totalling not more than two or three inches. The average annual temperature in the northwestern

portion of the state is 50 degrees, that in the southeastern section is 60 degrees. The hottest month is July, with an average temperature of 77 degrees Fahrenheit; the coldest month is January, with an average of 30 degrees Fahrenheit. The highest temperature ever recorded was 118 degrees Fahrenheit at Lamar, on July 18, 1936, the lowest recorded was 40 degrees below zero at Warsaw, on February 13, 1905. The average length of the growing season is 188 days, with the earliest killing frost of autumn recorded on September 18, and the latest killing frost of spring recorded on May 9. Northwest winds prevail through the autumn and winter, while south and southwest winds prevail during spring and summer. The west and northwest winds in summer are often hot and dry or at other times are storm-laden, while the south winds in summer, originating in the Gulf-Caribbean cyclone center, are usually cool. The east winds of spring and early summer are often damp and chilly.

All of the state of Missouri, with the exception of the Southeastern Lowlands of the Mississippi Embayment, has been above sea level since late Paleozoic time. Parts of the Ozark region are among the oldest lands on the continent, the pre-Cambrian igneous rocks of the St. Francois Mountain area having been part of the original land axis of North America. Sedimentary beds of sandstones, limestones, dolomites, and shales were deposited around the igneous core of the St. Francois Mountains from Cambrian to late Pennsylvanian time. Since the close of the Paleozoic Era the Ozark region has been a continuous land area. On at least two occasions (once at the end of the Cretaceous Period and another at the close of the Tertiary Period) this area was uplifted. Following the Cretaceous uplift and during the succeeding Tertiary Period, the Ozark region was worn down to a low and comparatively level plain with sluggish streams and probably large areas of swamps, covered with a forest in many respects similar to that which now occupies the Southeastern Lowlands. Subsequently a second uplift in late Tertiary time began. The probably slow and long-continued movement that elevated the region resulted in a rejuvenation of the streams, which, because of the steep grades, initiated the cutting of new valleys and produced the rough topography now found especially along the steep slopes of the Ozark dome. The extent of the peneplaned surface is reflected at the present time in the mostly accordant levels of the summits of the hills occupying the landscape.

During the late Cretaceous Period the waters of the Gulf of Mexico reached the southeastern border of the

present Ozark region and deposits made along the shores appear at the surface in Scott and Stoddard counties in parts of Crowley Ridge. The Mississippi Embayment remained until a much later time, until towards the close of the Tertiary Period. The Southeastern Lowlands now occupy the area of this old embayment.

The Ozark region has never been glaciated and thus has remained a land surface continuously available for occupation by plant life since the end of the Paleozoic Era. During the Pleistocene Period of the Cenozoic Era several southward movements of the polar ice sheets moved toward Missouri, but only the early advances (Kansan and Nebraskan) penetrated the state, covering a large area north of the Missouri River in what is now designated as the Glaciated Prairie or Dissected Till Plains region. It is estimated that the Kansas ice sheet (the last to withdraw from Missouri) left the state at the earliest date about 600,000 years ago.

#### PLANT REGIONS

The principal plant regions of the state correspond in general to the location of the physiographic regions previously described, but their boundaries are not quite identical. It will be noted that wedgelike extensions of the prairie flora penetrate the Ozark region, and colonies of prairie plants occupy glades and openings in the forest of the Ozark region, while the flora of the Southeastern Lowlands pushes for short distances up the river valleys into the Ozark Plateau, and the flora of the latter extends westward into the Unglaciated Prairie region to occupy the river bluffs and rocky uplands.

##### *Southeastern Lowlands Region*

The flora over most of this region is rather uniform with the dominant species consisting of characteristic plants of the Gulf Coastal Plain. The region as a whole is Lower Austral with the southern phase of the Carolinian flora. Most of the region was originally forested with a dense and luxuriant growth of deciduous trees. In the swampy or more frequently inundated areas dominant trees and shrubs are *Taxodium distichum*, *Populus heterophylla*, *Leitneria floridana*, *Carya aquatica*, *Planera aquatica*, *Quercus lyrata*, *Q. Phellos*, and *Q. nigra*, *Ilex virginica*, *Gleditsia aquatica*, *Acer rubrum* var. *Drummondii*, *Nyssa aquatica*, *Styrax americana*, *Fraxinus tomentosa*, and *Cephalanthus occidentalis* var. *pubescens*, while *Wisteria macrostachya*, *Vitis palmata*, *Trachelospermum difforme*, and *Mikania scandens* are dominant vines.

Some characteristic herbaceous and aquatic plants of this region are *Arundinaria gigantea*, *Rhynchospora macrostachya*, *Carex louisianica*, *Wolfiella floridana*, *Hyme-*

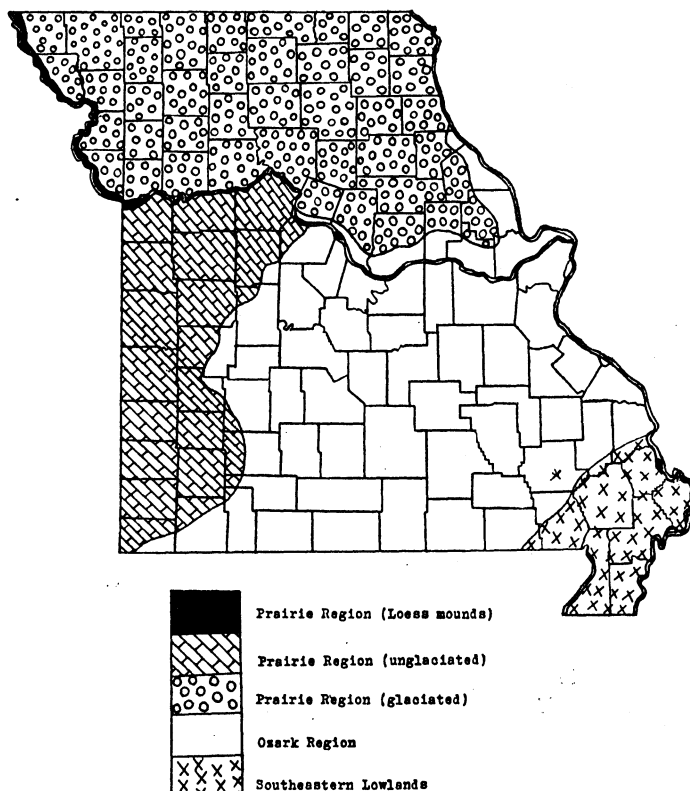
*nocallis occidentalis*, *Iris fulva*, *Thalia dealbata*, *Cabomba caroliniana*, *Viola lanceolata*, *Ludwigia glandulosa*, *Eryngium prostratum*, *Cynosciadium digitatum*, *Lysimachia radicans*, *Asclepias perennis*, *Hydrolea uniflora*, *Justicia ovata*, *Diodia virginiana*, *Oldenlandia uniflora*, *Cayaponia grandifolia*, *Spilanthes americana* var. *repens*, and *Pluchea camphorata*.

The elevated strip of territory, known as Crowley Ridge, traverses sections of the Southeastern Lowlands. It consists mainly of sandy and gravelly terrain with some clay deposits, the soil generally being of an acid type. Geological evidence indicates that Crowley Ridge lay to the east of the Mississippi River until comparatively recently, when the channel of the river changed, and the flora would appear to lend support to this. Some of the species restricted to Crowley Ridge are of distinctly eastern or northeastern distribution and near or at their western limits, at least in this latitude. Among these, including others restricted to the Ridge, are *Aristida lanosa*, *Trisetum pensylvanicum*, *Fagus grandifolia*, *Polygonella americana*, *Liriodendron Tulipifera*, *Pyrus melanocarpa*, *Ilex opaca*, *Trichostema setaceum*, *Bartonia paniculata*, *Obolaria virginica*, *Epifagus virginiana*, and *Helianthus microcephalus*.

Some of the species found in the Southeastern Lowlands region reappear along the White River and its tributaries in the Ozarks, indicating a former connection geologically and floristically between the two regions. The flora of the Southeastern Lowlands is probably a very ancient one which may have changed only slightly since early or middle Tertiary time, when it extended far beyond its present limits. In Missouri it probably occupied the lowlands to the north and west before the last elevation of the Ozark Plateau, where traces of it are still found, and it may have covered most of the state before the advance of the Pleistocene ice sheets.

##### *The Ozark Region*

This region possesses the most diversified flora, including the greatest number of species, of any part of the state. Most of the endemic species occur in the Ozark region. The wealth and diversity of the flora can be attributed to the present topography, drainage, and surface geology, and to the geologic history of the region. A great variety of habitats has been provided by the varied edaphic environments and is further elaborated in the following brief account. Rock outcrops are frequent over the entire area and comprise chert or flint, sandstone, limestone, and such igneous rocks as granite, syenite, and porphyritic trachyte. These rocks range from the pre-Cambrian igneous rocks to the sedimentary ones of Cambrian through Pennsylvanian age. The magnesian limestones



or dolomites produce an alkaline soil, characterized by the occurrence of various species, while the cherts, sandstones, and granites generally produce an acid soil frequented by particular species. Such types of rocks often come to the surface and form areas of small or large extent of open glades with little or no soil, devoid of trees and shrubs. These glades are common throughout the Ozarks and may occur on open slopes, tops of bluff escarpments, and eroded upland ridges and hilltop. They possess a characteristic herbaceous flora, with various species limited to particular types of rocks.

The limestone and dolomite glades harbor such species as *Ophioglossum Engelmanni*, *Juniperus Ashei*, *Carex Crawei*, *Eriogonum longifolium*, *Clematis Fremontii* var. *Riehlii*, *Delphinium Treleasei*, *Sedum pulchellum*, *Leavenworthia uniflora*, *Lesquerella filiformis*, *Acacia angustissima* var. *hirta*, *Baptisia australis* var. *minor*, *Psoralea esculenta*, *Euphorbia missurica*, *Phyllanthus polygonoides*, *Andrachne phyllanthoides*, *Callirhoe digitata* var. *digitata*, *Mentzelia oligosperma*, *Stenosiphon linifolius*, *Oenothera missouriensis*, *Amsonia ciliata* var. *filifolia*, *Centaurium texense*, *Evolvulus Nuttallianus*, *Heliotropium tenellum*, *Onosmodium subsetosum*, *Scutellaria Bushii*, *Satureja arkan-*

*sana*, *Penstemon Cobaea* var. *purpureus*, *Galium virgatum*, *Houstonia nigricans*, *Valerianella ozarkana*, *Solidago Gattingeri*, *Aster sericeus*, *Aster oblongifolius*, *Aster ptarmicoides*, *Parthenium hispidum*, *Marshallia caespitosa* var. *signata*, *Echinacea paradoxa*, *Palafoxia callosa*, and *Rudbeckia missouriensis*. Some of these species are widespread over the greater part of the Ozark region whereas others such as *Juniperus Ashei*, *Delphinium Treleasei*, *Lesquerella filiformis*, *Acacia angustissima* var. *hirta*, *Phyllanthus polygonoides*, *Stenosiphon linifolius*, *Amsonia ciliata* var. *filifolia*, *Penstemon Cobaea* var. *purpureus*, *Marshallia caespitosa* var. *signata*, and *Palafoxia callosa* are confined to the bald knobs and limestone glades of the White River section and tributaries of the southwestern Ozarks.

Most of the characteristic species of sandstone glades are likewise found on chert and granite glades in the Ozarks, but not on limestone. Those restricted to such types of substrata include *Cheilanthes lanosa*, *Selaginella rupestris*, *Scirpus koilolepis*, *Polygonum tenue*, *Talinum parviflorum*, *Crotonopsis elliptica*, *Hypericum gentianoides*, *Oenothera limifolia*, and *Trichostema dichotomum*.

Viewed broadly, the flora of the Ozark region is a forest flora, with the oak-hickory and pine-oak type

of woodland with a *Vaccinium vacillans* understory predominating on acid soils, while sugar maple, blue ash, chinquapin oak, walnut, papaw, linden, deciduous holly, southern buckthorn, and other forest species prevail on soils derived from limestone. The forest, with its associated herbaceous plants, belongs to the Carolinian flora, and floristically it is intermediate between the austral and boreal phases, with a slight predominance of southern species. The herbaceous plants of general distribution on the uplands are usually species that range from the Appalachian plateau to the grassy plains.

Aside from the correlated occurrence and restriction manifested by numerous species in the Ozarks to rocky glades, other types of habitats in the region provide equally special types of ecological niches occupied by characteristic species. Thus, the gravel bars of the Ozark streams are inhabited by some species of limited occurrence, such as *Hamamelis vernalis*, *Ansonia illustris*, and *Vernonia crinita*. In the cool waters (54–60 degrees Fahrenheit) of the Ozark springs and spring branches certain aquatic species are restricted to spring water and usually not found in Missouri outside the Ozark region, such as *Sparganium americanum*, *Potamogeton amplifolius*, *Potamogeton illinoensis*, *Anacharis Nuttallii*, *Lemna trisulca*, *Ranunculus longirostris*, *Nasturtium officinale* var. *officinale*, *Myriophyllum heterophyllum*, and *Veronica comosa*. Aquatic species generally found in the warmer waters of Ozark streams, but not in the cool water of the spring branches include *Potamogeton nodosus*, *Vallisneria americana*, *Heteranthera dubia*, and *Nuphar luteum* subsp. *ozarkanum*.

Some species present in the Ozark region are restricted in their occurrence to the protection of moist bluffs and shaded rocky ledges of ravines and canyons. Thus, it will be noted that *Zigadenus elegans*, *Trautvetteria caroliniensis*, *Galium boreale* var. *hyssopifolium*, and *Campanula rotundifolia* are known only from a few shaded, north-facing limestone bluffs, while *Lycopodium tristachyum*, *L. obscurum* var. *dendroideum*, *L. porophyllum*, *L. lucidulum*, *Dennstaedtia punctilobula*, and *Viola pallens* are equally rare, but encountered only on certain sandstone ledges. Similarly, in the wet meadows developed by calcareous seepage flowing from spring branches in valleys of the Ozarks, especially along seepage of limestone outcrops along streams and their spring fed branches are rarely found *Carex suberecta*, *C. Woodii*, *Pogonia ophioglossoides*, *Liparis Loeselii*, *Filipendula rubra*, *Viola cucullata*, *Menyanthes trifoliata* var. *minor*, *Campanula aparinoides*, and *Aster puniceus* var. *firmus* f. *lucidulus*. The major portion of the distribution of the species noted above lies east

and north of Missouri. All of them appear to represent relict species which have migrated southward or westward into the warmer Ozarks at the time of one of the advances of Pleistocene glaciation, subsequent to which they have persisted in these peculiarly favorable special habitats as remnants of a population able to adapt to the micro-climate or ecological niche of sufficient similarity to their more usual cooler or moister environment farther north or east to enable them to survive in their present location.

Of similar rarity and again representing a significant survival from former geological ages are the species found in and around the unique sink-hole ponds. These upland ponds, resulting from the collapse of the roof of subterranean caverns, formed in late Tertiary time of the last Ozark uplift, occupy natural depressions of the dry and more level upland portions of the Ozark Plateau. They apparently represent the last remnants of parts of the ancient swampy peneplain that formerly existed in the Ozarks prior to its last Tertiary uplift. Primarily Coastal Plain species, such as *Zizaniopsis miliacea*, *Eleocharis equisetoides*, *Scirpus Hallii*, *Echinodorus tenellus*, *Nyssa aquatica*, *Eryngium prostratum*, *Hottonia inflata*, *Hydrolea uniflora*, *Gratiola viscidula*, *Oldenlandia Boscii*, *Diodia virginiana*, *Cephalanthus occidentalis* var. *pubescens*, *Pluchea foetida*, and *Eupatorium hyssopifolium* var. *calcaratum* are isolated in and around some of the ponds. Some of the herbaceous species are known elsewhere in the state only from the Mississippi Embayment section of the Southeastern Lowlands, whereas others have their nearest stations along the Atlantic and Gulf Coastal Plains. Other species of great rarity, which range farther northward, such as *Najas gracillima*, *Potamogeton ephedrus* var. *Nuttallii*, *P. pulcher*, *Glyceria acutiflora*, *Scirpus Torreyi*, *Dulichium arundinaceum*, *Carex decomposita*, *C. alata*, *C. straminea*, *Viola lanceolata*, *Decodon verticillatus*, and *Galium tinctorium* are likewise associated with the more southern Coastal Plain species, and some of them are restricted in Missouri to sink-hole ponds. Since Pleistocene times the Xerothermic period may have further reduced the occurrence of swampy habitats in the dry upland plateau and exterminated all but a small remnant of the Coastal Plain species and other species of formerly Tertiary dispersal which today still survive in these natural ponds.

Other native plants, not previously mentioned as relicts, but whose rarity and limited occurrence in the Ozarks represent remote or isolated stations at or near the limits of the geographical range of the species, are *Cheilanthes tomentosa*, *Dryopteris Clintoniana* var. *australis*, *Juniperus Ashei*, *Calamagrostis insperata*, *Oryzopsis race-*

*mosa*, *Panicum calliphyllum*, *P. nitidum*, *P. annulum*, *Scirpus verecundus*, *S. subterminalis*, *S. Olneyi*, *Rhynchospora capillacea*, *Scleria nitida*, *S. verticillata*, *S. Muhlenbergii*, *Carex interior*, *C. leptalea*, *C. communis*, *C. aquatilis* var. *altior*, *C. stricta* var. *strictior*, *C. torta*, *C. trichocarpa*, *Juncus canadensis* var. *canadensis*, *J. subcaudatus* var. *subcaudatus*, *J. debilis*, *Zigadenus Nuttallii*, *Yucca glauca* var. *mollis*, *Smilacina stellata*, *Trillium nivale*, *Iris cristata*, *Sisyrinchium atlanticum*, *Cypripedium Reginae*, *Habenaria ciliaris*, *Calopogon pulchellus*, *Goodyera pubescens*, *Isotria medeoloides*, *I. verticillata*, *Eriogonum longifolium*, *Silene caroliniana* var. *Wherryi*, *Delphinium exaltatum*, *Berberis canadensis*, *Dicentra canadensis*, *Draba aprica*, *Saxifraga pensylvanica* var. *Forbesii*, *Sullivania renifolia*, *Mitella diphylla*, *Philadelphus pubescens* var. *verrucosus*, *Ribes odoratum*, *Parnassia grandifolia*, *Hamamelis virginiana*, *Fragaria vesca* var. *americana*, *Waldsteinia fragarioides*, *Neviusia alabamensis*, *Desmodium humifusum*, *D. ochroleucum*, *Linum striatum*, *Andrachne phyllanthoides*, *Phyllanthus polygonoides*, *Ilex verticillata* var. *padifolia*, *Euonymus obovatus*, *Ludwigia microcarpa*, *Oenothera fruticosa* var. *linearis*, *O. perennis* var. *perennis*, *O. tetragona* var. *hybrida*, *Hydrocotyle verticillata* var. *verticillata*, *Lyonia mariana*, *Rhododendron roseum*, *Gaylussacia baccata*, *Dodecatheon amethystinum*, *Spigelia marilandica*, *Centaurium texense*, *Amsonia ciliata* var. *filifolia*, *Phlox bifida* var. *stellaria*, *P. carolina* var. *carolina*, *P. amplifolia*, *P. maculata* var. *pyramidalis*, *Phacelia ranunculacea*, *Callicarpa americana*, *Monarda clinopodia*, *Mimulus glabratus* var. *Fremontii*, *Chelone obliqua* var. *speciosa*, *Mitchella repens*, *Lonicera dioica* var. *dioica*, *Viburnum recognitum*, *Liatris spicata*, *Solidago Riddellii*, *Aster furcatus*, *Berlandiera texana* var. *texana*, *Marshallia caespitosa* var. *signata*, and *Lactuca hirsuta* var. *hirsuta* and var. *sanguinea*. The above species occupy particular habitats to which they are peculiarly adapted. Their local ranges likewise appear to be correlated with certain edaphic factors of soil, exposure, and moisture, as well as with past geological events.

A significant floral element of the Ozark flora is that found in the rugged section of the White River and its tributaries in southwestern Missouri. Although the uplands in this section are covered with oak-hickory and various kinds of forest found in other parts of the Ozarks, many rare and unusual plants are found along the river bluffs and in the deep canyons of the tributary streams, and on the limestone bald knobs and glades. Here on protected north-facing bluffs occur such predominant Alleghenian species as *Magnolia acuminata* and *Cladrastis lutea*, the latter not occurring elsewhere in the state, while on south- and west-facing exposures such trees and shrubs as *Juniperus Ashei*, *Ribes odoratum*, *Acacia angustissima* var. *hirta*,

*Cotinus obovatus*, *Sapindus Drummondii*, and *Chionanthus virginica*, and the vining plant, *Cissus incisa*, are present. The majority of the species on these south- and west-facing exposures are mainly of southwestern origin, but a few of these are known from isolated eastern stations in southeastern Missouri. Here also along the bluff ledges and outcrops are found *Notholaena dealbata*, *Cheilanthes alabamensis*, and *C. tomentosa*. On ridge tops and summits of hills where chert or sandstone outcroppings produce acid soil conditions, the native chestnut, *Castanea ozarkensis*, occurs. Many of the species known from limestone glades frequent the exposed rocky areas found throughout this section of the Ozarks, and some, such as *Delphinium Treleasei*, *Phyllanthus polygonoides*, *Stenosiphon linifolius*, *Amsonia ciliata* var. *filifolia*, *Penstemon Cobaea* var. *purpureus*, *Marshallia caespitosa* var. *signata*, and *Palafoxia callosa* are known only from this portion of Missouri and often represent a western and southwestern element of the flora. The flora of this area shows a relationship with a Coastal Plain and southern element, exemplified by the occurrence in both the White River and the Southeastern Lowlands region of *Arundinaria gigantea*, *Quercus falcata*, *Phoradendron flavescens*, *Magnolia acuminata*, *Chionanthus virginica*, *Ampelopsis arborea*, *Jussiaea decurrens*, *Diodia virginiana*, and *Hymenopappus scabiosaeus*. Likewise, the flora of the White River section manifests a strong relationship with the flora of parts of the western and southwestern United States, particularly with that of Oklahoma and Texas.

#### ENDEMIC SPECIES OF THE OZARKS

Some of the species occurring in the Ozark region of Missouri are known solely or chiefly from Missouri, Arkansas, and Oklahoma, and apparently have originated within this circumscribed area. Their present distribution is either confined to the area or the mass of their distribution occupies the Ozark region with outlying stations in unglaciated portions of adjacent states. Over the lapse of time since the Ozarks have been available for plant occupation since the end of the Paleozoic Era, endemic species, subspecies, and varieties may have developed from the beginning in the area itself, or, after separation from geographically related species, become gradually localized to the section in the Ozarks where now found. Among such endemics are *Juniperus Ashei*, *Tradescantia ozarkana*, *T. Ernestiana*, *T. longipes*, *Trillium pusillum* var. *ozarkanum*, *T. viride* var. *viride*, *Nemastylis Nuttallii*, *Carya texana*, *Castanea ozarkensis*, *Nuphar luteum* subsp. *ozarkanum*, *Delphinium Treleasei*, *D. carolinianum* var. *Nortonianum*, *Clematis Fremontii* var. *Riehlii*, *C. versicolor* (also in Kentucky and Tennessee), *Ranunculus Harveyi*,

*Heuchera puberula*, *H. missouriensis*, *Ribes missouriense* var. *ozarkanum*, *Hamamelis vernalis*, *Crataegus padifolia*, *C. Lettermani*, *C. sicca*, *C. noelensis*, *C. dispessa*, *C. latebrosa*, *C. nuda*, *Amorpha brachycarpa*, *Andrachne phyllanthoides*, *Callirhoe Papaver* var. *Bushii*, *C. digitata* var. *digitata*, *Vaccinium stamineum* var. *interius*, *Amsonia illustris*, *Phlox pilosa* var. *ozarkana*, *Onosmodium subsetosum*, *Scutellaria Bushii*, *Penstemon Cobaea* var. *purpureus*, *P. arkansanus*, *Gerardia flava* var. *calycosa*, *Ruellia pedunculata*, *Galium arkansanum*, *Valerianella ozarkana*, *V. Bushii*, *Vernonia crinita*, *Grindelia lanceolata*, *Solidago arguta* var. *neurolepis*, *S. Drummondii*, *S. Gattingeri*, *Aster anomalus*, *Parthenium hispidum*, *Rudbeckia fulgida* var. *palustris*, *R. missouriensis*, and *Echinacea paradoxa*.

Other species not mentioned above may also have originated in the Ozark region, but, since they occupy a much wider geographical range, are omitted.

#### GEOGRAPHICAL DISTRIBUTION IN GENERAL WITHIN THE OZARK REGION

While many of the species confined in Missouri to the Ozark region are of widespread occurrence throughout the Ozarks, some, however, are known only from the eastern section, while others are concentrated in the western sector, and still others known only from the southernmost portion of the state. This frequently indicates the direction from which migration has originated or entered the region. For example, the dominant and characteristic element of the flora found over the southeastern part of the Ozark region is of Alleghenian relationship, and it is in this section where a number of eastern plants reach their western limit of distribution. Species of more northern range are frequently found in the Ozarks along north-facing bluffs along streams, or in deep V-shaped valleys of the more rugged parts of the region, or in cool moist springs, wet meadows, swamps, or wet ledges where constant seepage prevails. On the dry, exposed, and sunnier south-and west-facing wooded slopes, rocky open glades, and prairie openings, the plants whose main distribution is southwestern, southern, or western, comprise an important or dominant element of the vegetation. The Ozark region in this discussion has been interpreted as extending from the southernmost border of the state from McDonald County on the west to Butler, Bollinger, and Cape Girardeau counties on the east, thence north across the Missouri River to a portion of Marion County on the northeast, south and westward paralleling the Missouri River to Boone County. The counties between Marion and Boone in the region indicated have preserved for the most part many characteristic Ozark herbaceous

and woody plants absent north of them. Moreover, they have preserved topographical and old weathered rock surfaces similar to that of other Ozark landscape to the south.

#### Prairie Region

##### (a) Glaciated Prairie or Dissected Till Plains

This area of Missouri lying mainly north of the Missouri River, except for the inclusion of small areas in St. Louis, Saline, Cooper, Lafayette, and Jackson counties, is covered with glacial drift pertaining to the Nebraskan and Kansan Glacial age. Most of the stratified rocks occurring in this area are of Mississippian and Pennsylvanian age. Rocks of Ordovician, Silurian, and Devonian age also occur north of the Missouri River, but they occur mainly in the section assigned to the Ozark region. Much of the Glaciated Prairie area is forested, with forests of a similar type to those of the Ozarks, but with less diversification of species, a majority of the more southern species disappearing entirely from the flora. Some northern species of plants which are wholly or mostly absent from the Ozarks to the south are found in this region and include *Matteuccia Struthiopteris* var. *pennsylvanica*, *Phalaris arundinacea*, *Phragmites communis* var. *Berlandieri*, *Calamagrostis canadensis* var. *Macouniana*, *Eleocharis Wolfii*, *Scirpus paludosus* var. *paludosus*, *Allium tricoccum*, *Smilacina stellata*, *Medeola virginiana*, *Salix gracilis* var. *textoris*, *Populus tremuloides*, *Quercus ellipsoidalis*, *Ulmus Thomasi*, *Urtica dioica* var. *procera*, *Arenaria lateriflora*, *Anemone canadensis*, *Cardamine Douglassii*, *Spiraea alba*, *Rosa blanda*, *R. virginiana*, *Prunus virginiana*, *Acer nigrum*, *A. Negundo* var. *violaceum*, *Euphorbia Geyeri*, *Vitis riparia*, *Fraxinus pennsylvanica*, *Asclepias Sullivantii*, *Collomia linearis*, *Chelone obliqua* var. *speciosa*, *Sambucus pubens*, *Viburnum Lentago*, *V. dentatum* var. *Deamii*, *Senecio pauperculus* var. *Balsamitae*, *S. aureus* var. *semicordatus*, and *Prenanthes alba*.

Forested hills with deeply dissected ravines abound in the vicinity of streams. In the valleys of the streams are often expanses of alluvial wet meadows or 'bottom prairies' characterized by species of grasses, sedges, rushes, and other herbaceous plants. Swamps and oxbow lakes are frequent in the valley bottoms. In the more level sections of the upland and on ridges, prairie is frequently encountered with grasses, sedges, legumes, composites, and other perennial herbs dominant. The prairie flora is often preserved in strips along railroads and has its center of distribution mainly farther west, whereas the flora of the woodlands appear to represent evident extensions of an eastern, northern, and southern floral element.

*Saline Springs and Salt Licks*

In portions of this region occur natural saline and mineral springs which sometimes form salt 'licks.' They are present in areas in the valleys of streams usually in territory of low relief and reach their greatest development in Saline, Randolph, Howard, and Cooper counties. The soil immediately around the springs is heavily charged with concentrated alkaline salts, and usually supports an unusual assemblage of plants, some of which are known only from such places. *Distichlis spicata*, a grass usually found in brackish soil along the coastal section of the United States, occurs at its only recorded station in the interior of North America around a salt 'lick' in the valley of Heath Creek, in Saline County. *Typha angustifolia* and *Eleocharis parvula*, occurring in marshy ground around certain saline springs, are known in Missouri chiefly from these stations. Floating in the water of the springs or their branches are clumps of *Zannichellia palustris* var. *major*, *Ruppia maritima* var. *rostrata*, *Potamogeton pectinatus*, and *Callitriche heterophylla*, as well as species of algae, such as *Chara* and *Nitella*. Other species present around the saline springs include *Typha latifolia*, *Diplachne fascicularis* and *D. acuminata*, *Echinochloa pungens*, *Scirpus americanus*, *S. paludosus* var. *paludosus*, *S. fluviatilis*, *Atriplex rosea* and *A. patula* var. *hastata*, and *Polygonum aviculare*.

*Loess Hills*

Perhaps the most unusual part of the dissected till plains are the loess hills or mounds of northwestern Missouri along the Missouri River, best developed in Atchison and Holt counties, but extending south-eastward into Jackson County below Kansas City. The thick accumulation of loess and its characteristic erosion has developed a peculiar type of topography marked by terraced exposed hills or mounds separated by deep, steep-sided ravines. Many forest species extend up the deeper ravines, but rapid erosion and wind action have kept the slopes bare in most places. A flora characteristic of the region west and northwest of Missouri dominates the exposed parts of the mounds with grasses and other herbaceous plants constituting the bulk of the vegetation. Some of the species of the Great Plains reach their eastern limit of geographical range here. The characteristic species of this region include *Muhlenbergia cuspidata*, *Sporobolus airoides*, *Bouteloua hirsuta*, *B. gracilis*, *Yucca glauca* var. *glauca*, *Anemone cylindrica*, *Cleome serrulata*, *Oxytropis Lambertii*, *Astragalus lotiflorus*, *Psoralea argophylla*, *Dalea enneandra*, *Glycyrrhiza lepidota*, *Euphorbia marginata*, *E. glyptosperma*, *Oenothera serrulata*, *Gaura coccinea*, *Penstemon grandiflorus*, *Symphori-*

*carpos occidentalis*, *Liatris punctata* var. *nebraskana*, *Heterotheca subaxillaris*, *Chrysopsis villosa* var. *canescens*, *Lygodesmia juncea*, and *Lactuca pulchella*.

The incursion of this plains flora into the state may have taken place in relatively recent times during a period some time subsequent to the final retreat of the glaciers and perhaps within the past few thousand years.

(b) *Osage Plains Section or Unglaciaded Prairie*

This portion of the Interior Highland has remained unglaciaded and occupies a wedge-shaped division south of the Missouri River in the western part of the state, merging irregularly and indefinitely into the western border of the Ozark Region. The Ozark flora occurring in the area is dominant on broken rocky ground along the streams, while the prairie and plains flora occupies the more level and open sections of the uplands in a wide transition zone. There is sharp contrast between the floras growing on different geological formations, which include mainly Mississippian and Pennsylvanian limestones, sandstones, chert, and shales. Broad shallow valleys containing numerous small lakes and sloughs abound, particularly in areas possessing soft and easily weathered formations of Pennsylvanian shales and sandstones. Wet meadows and bottom prairies occur in the valleys of the streams, with particularly well developed flood plains along the Grand and Marais des Cygnes rivers. On the drier or rocky level upland a true prairie flora is found, similar to that of the glaciaded prairie or dissected till plains of northern Missouri, except for an increasing proportion of southwestern species appearing towards the south. In the unglaciaded Osage section most of the characteristic northern species of plants found in the glaciaded prairie section are absent, and there is a greater variety of trees and shrubs along the streams.

More than in any other part of the state, the prairie flora has been better preserved in this section due to the maintenance of large tracts used for grazing and hay production. Plants characteristic of this region include *Sagittaria ambigua*, *Panicum scoparium*, *P. malacophyllum*, *Schedonnardus paniculatus*, *Andropogon saccharoides*, *Eleocharis lanceolata*, *Rhynchospora Harveyi*, *Fimbristylis dichotoma*, *Carex arkansana*, *C. oklahomensis*, *Tradescantia Tharpii*, *Juncus kansanus*, *Sisyrinchium campentre* var. *kansanum*, *Anemone caroliniana*, *Lotus Purshianus*, *Ammannia auriculata*, *Rhexia interior*, *Sabatia campestris*, *Salvia azurea* var. *grandiflora*, *Gerardia fasciculata*, *Collinsia violacea*, *Gutierrezia dracunculoides*, *Aster paludosus* subsp. *hemisphericus*, *Helianthus salicifolius*, *Marshallia caespitosa* var. *caespitosa*, and *Krigia occidentalis*.

Sandstone and chert glades and bluffs in the unglaciaded prairie Osage section often harbor a very



specialized flora not found elsewhere in the state. Some of the unusual plants which occur on the sandstone formations are *Geocarpum minimum*, *Corydalis crystallina*, *Selenia aurea*, *Sedum Nuttallianum*, and *Saxifraga texana*. An unusual formation of extensive chert glades, known as the Grand Falls Chert of the Mississippi rocks, is developed in the valleys of Turkey Creek and Shoal Creek in Jasper and Newton counties. Rains which fill the depressions between the broken portions of the impermeable chert rocks often remain until evaporated by the sun. Under the peculiar edaphic conditions developed here, a number of plants occur which are restricted to this section. Among those restricted to this area are *Portulaca retusa* and *Lathyrus pusillus*.

#### EXCLUDED SPECIES

Throughout this work a species has been placed in an excluded section following the listing of the last species within a given genus. The species placed in the excluded list are those which have been misidentified or attributed to the state by error or which are not supported by an herbarium record or are based upon cultivated material. A number of species previously reported by Palmer and Steyermark in their *Annotated Catalogue of Flowering Plants* are shown in the present work to have been either misidentified or represented by specimens since reinterpreted otherwise. For some species reported by Fernald in the eighth edition of Gray's *Manual of Botany* and Gleason's *New Britton and Brown Illustrated Flora* there do not appear to be any voucher herbarium specimens to support the existence of the report, and such species have been excluded.

For a number of species which Benjamin Franklin Bush reported to the writer in various personal communications, no specimens have ever been found. Bush informed me that many of his earlier collections had been sent to Dr. N. L. Britton and to George Vasey for determination. He stated that from 1888 to 1910 he sent many specimens to Britton from Dunklin, Pemiscot, Oregon, Taney, Barry, and McDonald counties, and believed that all these should be in the herbarium of the New York Botanical Garden. He further stated that all the species collected in Jackson County up to about 1907 were sent to K. K. Mackenzie to insert in the manual upon which he and Mackenzie were working, and that these should be in the Mackenzie Herbarium at The New York Botanical Garden. The following species reported to me by Bush as based upon his collections were supposed by him to be in the New York Botanical Garden Herbarium: *Jeffersonia diphylla*, *Dalea aurea*, *Ononis arvensis*, *Lupinus perennis*, *Petalostemum villosum*, *Opuntia*

*polycantha*, *Bifora americana* [= *B. radians*], *Hydrocotyle umbellata*, *Ammoselinum Popei*, *A. Butleri*, *Conioselinum chinense*, *Ludwigia alata*, and *Breweria aquatica*. Careful search through that herbarium by Dr. David D. Keck has failed to turn up any of the above species, a few of which are noted in the present flora as misidentifications of other species. Correspondence with Drs. Mathias and Constance, specialists in the Umbelliferae, concerning the species of that family referred to in the above list, has produced similar negative evidence.

As some of the species recorded for Missouri are known only from specimens collected for the World's Fair Collection held in Chicago in 1893, and have not been found since in the state, I have suspected that there may have been some confusion as to the origin or source of the material mounted. In this connection it is of interest to note Bush's reply in answer to the writer's query about these collections. In his letter of September 15, 1933, to the writer, Bush states, 'In 1893 I had charge of the work preparing the herbarium for the Chicago World's Fair. I had Mr. Kellogg write the labels and had all the specimens mounted at the warehouse in St. Louis. I collected the greater part of the specimens, some 2,100 species, and got several hundred from Eggert and a few from Letterman. You can depend on these specimens being from the state, unless it can be shown that they are certainly outside of our flora.' Again, in his letter of October 21, 1934, Bush wrote that 'all of the specimens [in World's Fair collection] were collected in Missouri, unless they were collected by Eggert in Illinois. Eggert had a habit of marking all specimens St. Louis, even if he got them in St. Clair Co., Illinois, but I think there are very few of these amongst the plants he gave me.' It does seem to this author that there may be doubt as to the source of some of these World's Fair collections, especially those for which no record has ever turned up in the state since.

It should also be pointed out here that a number of reports for the occurrence of Missouri species were based upon cultivated material collected in St. Louis by Dr. Earl E. Sherff. In *Rhodora* 54: 256. 1952, I have noted that 'The great majority of Sherff's specimens labeled "St. Louis" were (according to personal communication with Dr. Sherff) collected either from cultivated plants found on the grounds of the Missouri Botanical Garden or in other parts of St. Louis. . . . These specimens represented by duplicates in several herbaria have been misconstrued by other workers to represent collections of wild or spontaneous plants, which is certainly far from the real situation.' Such collections as Sherff's collection (no. 194) from St. Louis 'cited by Munz from a Gray

Herbarium specimen, was obtained, according to an examination of Dr. Sherff's notebook, on July 2, 1910, and undoubtedly was collected from cultivated plants at the same time with such other cultigens as *Hydrangea quercifolia*, *Sedum acre*, *Heuchera sanguinea*, and *Tolmiea Menziesii*. As was noted in the present flora, the report of *Achillea ptarmica* in Gleason's *New Britton and Brown Illustrated Flora*, was based upon a cultivated specimen collected by Sherff in St. Louis.

Directing the attention of botanists and other field workers to the above notes and data may help to eradicate some of the reports which tend to persist and accumulate in a local flora, and should caution them against accepting reports based on cultivated or nonauthenticated specimens.

#### SPECIES WHOSE GEOGRAPHIC RANGE APPROACHES MISSOURI

Intensive and careful future exploration of Mis-

souri should add scores of native or introduced species which at present are unknown in the state. The following lists taken from substantiated records of adjacent states include species whose known distribution approaches reasonably close to the borders of Missouri, and thereby suggest a possible clue to their further extension into Missouri. It is hoped that such information may be a source which may serve future workers to track down additions to the Missouri flora. For each of the following species a letter separated by a dash indicates the probable part of Missouri (north-east, east, south, southeast, west, southwest, and north-west) from which the particular species may be expected. These lists are not complete, but include some of the species thought most likely as extending into the state. These lists, of course, do not provide for the numerous possibilities of introduced and adventive species, nor for the native ones which afford surprising outlying stations removed from their usual range.

*From Illinois* (records taken from Jones *et al.*, *Vascular Plants of Illinois*. 1955, and from records by John W. Voigt and Robert H. Mohlenbrock, Jr.).

*Equisetum fluviatile* – NE.  
*Dryopteris noveboracensis* – SE.  
*Trichomanes Boschianum* – SE.  
*Potamogeton Friesii* – SE.  
*Potamogeton natans* – SE.  
*Aristida tuberculosa* – NE.  
*Panicum yadkinense* – SE.  
*Carex cephaloidea* – NE.  
*Carex retrorsa* – SE.  
*Carex Sprengelii* – NE.  
*Carex Tuckermani* – NE.  
*Eleocharis intermedia* – E.  
*Eleocharis ovata* – NE.  
*Eleocharis palustris* – NE.  
*Scirpus Smithii* – NE.  
*Symplocarpus foetidus* – NE.  
*Luzula echinata* – SE.  
*Luzula multiflora* – SE.  
*Lilium umbellatum* – NE.  
*Tipularia discolor* – SE.  
*Castanea dentata* – SE.  
*Quercus Prinus* – SE.  
*Ulmus serotina* – SE.  
*Aristolochia Nashii* – SE.  
*Polygonum tomentosum* – E. (intro.)  
*Silene armeria* – E. (cult.)  
*Caltha palustris* – NE.  
*Cimicifuga cordifolia* – SE.  
*Ranunculus ambigens* – SE.

*Jeffersonia diphylla* – SE.  
*Fumaria officinalis* – NE. (adventive)  
*Alliaria officinalis* – E.  
*Alyssum alyssoides* – NE.  
*Cleome speciosissima* – SE. (cult.)  
*Sedum telephioides* – SE.  
*Heuchera parviflora* var. *Rugelii* – SE.  
*Geum virginianum* – SE.  
*Prunus nigra* – NE.  
*Amorpha nitens* – SE.  
*Apios Priceana* – SE.  
*Astragalus tennesseensis* – E.  
*Cassia hebecarpa* – E.  
*Linum intercursum* – SE.  
*Linum virginianum* – SE.  
*Polygala polygama* – NE.  
*Euphorbia helioscopia* – NE.  
*Celastrus articulatus* – SE. (intro.)  
*Hibiscus esculentus* – SE. (intro.)  
*Hypericum adpressum* – SE.  
*Hypericum denticulatum* – SE.  
*Hypericum ellipticum* – E.  
*Lechea minor* – SE.  
*Lechea stricta* – NE.  
*Viola affinis* – SE.  
*Viola pubescens* – NE.  
*Myriophyllum verticillatum* – SE.  
*Callitriche palustris* – SE.  
*Cornus stolonifera* – NE.

Sanicula marilandica – NE.  
 Halesia carolina – SE.  
 Lysimachia terrestris – NE.  
 Lysimachia vulgaris – SE. (intro.)  
 Asclepias exaltata – E., NE., SE.  
 Breweria Pickeringii var. Pattersoni – NE.  
 Allocarya figurata – E.  
 Heliotropium curassavicum – E.  
 Pycnanthemum pycnanthemoides – SE.  
 Stachys Clingmanii – SE.  
 Synandra hispidula – SE.  
 Penstemon calycosus – E., SE.

Penstemon Deamii – SE.  
 Synthyris Bullii – NE.  
 Viburnum cassinoides var. cassinoides – SE.  
 Valeriana pauciflora – SE.  
 Artemisia Absinthium – SE., E.  
 Aster Shortii – NE., SE.  
 Aster umbellatus – NE.  
 Bidens coronata – NE., E., SE.  
 Lactuca biennis – SE.  
 Picris echioides – NE.  
 Solidago bicolor – SE.  
 Xanthium oviforme – E.

*From Arkansas* (records furnished by Dr. Dwight M. Moore)

Pilularia americana – SW.  
 Festuca dertonensis – SW.  
 Festuca versuta – SW.  
 Poa arachnifera – SE.  
 Anthoxanthum aristatum – SW.  
 Limnnodea arkansana – SW.  
 Cynosurus echinatus – S. from Oregon and Howell counties  
 Erianthus contortus – SW.  
 Andropogon glomeratus – SE.  
 Sorghastrum Elliottii – SW.  
 Sphenopholis filiformis – S.  
 Axonopus affinis – SE.  
 Axonopus furcatus – SW.  
 Panicum brachyanthum – SW.  
 Panicum hirticaule – SW.  
 Panicum lucidum – SE.  
 Panicum Webberianum – SW.  
 Paspalum Boscianum – SW.  
 Digitaria violascens – S. of Oregon Co.  
 Eleocharis tortilis – S.  
 Juncus coriaceus – S. of Howell and Ozark counties  
 Nothoscordum striatum – SW.  
 Aletris farinosa – SW.  
 Sisyrinchium hostile – SW.  
 Tipularia discolor – S. of Howell Co.  
 Spiranthes montana – SW.  
 Carya leiodermis – S.  
 Ulmus crassifolia – SE.  
 Aristolochia reticulata – S. of Howell Co.  
 Stellaria uniflora – SW.  
 Stellaria Nuttallii – SW.  
 Silene ovata – SW.  
 Magnolia tripetala – SW.  
 Magnolia macrophylla – SE. (15 mi. W. of Dunklin Co. line)  
 Schizandra coccinea – SE.

Asimina parviflora – SE.  
 Delphinium newtonianum – S.  
 Anemone quinquefolia – S.  
 Drosera brevifolia – SW.  
 Podostemum ceratophyllum – S.  
 Saxifraga Palmeri – SW.  
 Heuchera arkansana – SW.  
 Philadelphus Sharpianus – S.  
 Philadelphus intectus var. pubigerus – S.  
 Alchemilla microcarpa – SW.  
 Agrimonia microcarpa – SW.  
 Rubus cuneifolius – S.  
 Amorpha nitens – SE.  
 Petalostemon Stanfieldii – SW.  
 Geranium columbinum – SW.  
 Oxalis filipes – S.  
 Oxalis interior – SW.  
 Polygala cruciata – SW.  
 Euphorbia Peplus – SW.  
 Abutilon incanum – S.  
 Hypericum adpressum – S.  
 Viola blanda – SW.  
 Viola canadensis – S.  
 Viola hastata – SW.  
 Viola palmata – SW.  
 Oenothera arenicola – S.  
 Trepocarpus aethusae – S.  
 Halesia carolina – S.  
 Halesia monticola var. vestita – S.  
 Styrax grandifolia – S.  
 Rhododendron canescens – S.  
 Rhododendron oblongifolium – S.  
 Rhododendron viscosum – S.  
 Lyonia ligustrina – S.  
 Vaccinium Elliottii – S.  
 Gentiana saponaria – SW.  
 Amsonia Hubrichtii – SW.

*Ipomoea barbiger*a – SW.  
*Ipomoea setosa* – SW.  
*Ipomoea trichocarpa* – S.  
*Nemophila microcalyx* – SW.  
*Nemophila phacelioides* – SW.  
*Verbena Lambertii* – SW.  
*Scutellaria cordifolia* – S.  
*Scutellaria integrifolia* – S.  
*Scutellaria resinosa* – SE.  
*Bouchetia anomala* – SW.  
*Penstemon multicaulis* – SW.  
*Penstemon Wherryi* – SW.  
*Penstemon tenuis* – SE.  
*Utricularia geminiscapa* – S.  
*Utricularia subulata* – S.

*Galium parisiense* – SW.  
*Valerianella longiflora* – SW.  
*Valerianella Nuttallii* – SW.  
*Sphenoclea zeylanica* – SE.  
*Aster texanus* var. *parviceps* – S.  
*Carduus leptoccephalus* – S.  
*Coreopsis cardaminefolia* – SE.  
*Coreopsis heterolepis* – S.  
*Elephantopus tomentosus* – SE.  
*Eupatorium album* var. *glandulosum* – S. of Oregon Co.  
*Rudbeckia amplexens* – S.  
*Senecio tomentosus* – SW., SE.  
*Solidago bicolor* – SW.  
*Solidago microphylla* – SE.

*From Kansas* (records based on F. C. Gates, *Flora of Kansas*. 1940, and Woodson's Monograph of *Asclepias*, *Ann. Mo. Bot. Gard.* 41. 1954).

*Sagittaria cuneata* – W.  
*Sagittaria esculenta* – W.  
*Tridens albescens* – W.  
*Eragrostis secundiflora* – W., NW.  
*Melica Porteri* – W.  
*Alopecurus myosuroides* – W., NW.  
*Redfieldia flexuosa* – W., NW.  
*Agropyron cristatum* – SW.  
*Panicum Wilcoxianum* – W., NW.  
*Eleocharis elliptica* – W., NW.  
*Juncus neomexicanus* – W.  
*Allium arenicola* – SW.  
*Cooperia Drummondii* – SW.  
*Populus Sargentii* – W.  
*Corylus cornuta* – SW. (W. of Vernon Co.)  
*Comandra pallida* – NW. (W. of Holt and Cass counties)  
*Polygonum omisum* – W.  
*Eriogonum annuum* – NW.  
*Alliaria officinalis* – W.  
*Potentilla sulfurea* – NW. (W. of Andrew and Platte counties)  
*Rosa pimpinellifolia* – W.  
*Astragalus plattensis* – W. (W. of Jackson Co.)  
*Dalea aurea* – NW. (W. of Andrew and Holt counties)  
*Psoralea digitata* – NW. (near Platte Co.)  
*Psoralea lanceolata* – SW. (near McDonald Co.)  
*Sophora sericea* – SW. (W. of Jasper Co.)  
*Petalostemon villosus* – NW. (near Platte Co.)  
*Petalostemon occidentale* – W.  
*Galactia regularis* – SW.  
*Vicia oregana* – NW. (W. of Holt and Atchison counties)

*Vicia sparsifolia* – W. (W. of Jackson Co.)  
*Zygophyllum fabago* – W.  
*Polygala alba* – NW.  
*Stillingia salicifolia* – SW.  
*Euphorbia lucida* – NW.  
*Sphaeralcea coccinea* – W.  
*Hybanthus verticillatus* – NW.  
*Opuntia polyacantha* – W. (W. of Jackson Co.)  
*Opuntia tortispina* – SW. (W. of Jasper Co.)  
*Neomamillaria missouriensis* – W. (W. of Cass Co.)  
*Neomamillaria similis* – SW. (W. of Newton Co.)  
*Cornus instolonea* – W. (W. of Jackson and Cass counties)  
*Berula pusilla* – NW. (W. of Andrew Co.)  
*Eryngium Leavenworthii* – SW. (near Bates, Vernon, and Jasper counties)  
*Lomatium orientale* – W. (W. of Bates Co.)  
*Lomatium villosus* – NW.  
*Sanicula marilandica* – NW.  
*Periploca graeca* – SW.  
*Asclepias arenaria* – NW. (near Buchanan and Jackson counties)  
*Asclepias speciosa* – NW.  
*Asclepias pumila* – NW.  
*Asclepias Engelmanniana* – SW.  
*Asclepias Nuttalliana* – W. (W. of Jackson Co.)  
*Ipomoea leptophylla* – W.  
*Lippia cuneifolia* – SW. (near McDonald Co.)  
*Lycopus uniflorus* – NW. (W. of Buchanan Co.)  
*Stachys annua* – W. (W. of Jackson Co.)  
*Chamaesaracha conoides* – SW.  
*Physalis hederifolia* var. *comata* – NW.  
*Gerardia densiflora* – SW.

Penstemon albidus – W., NW.  
 Valerianella amarella – SW. (W. of Bates and Vernon  
 counties)  
 Lobelia appendiculata – SW.  
 Helianthus Besseyi – W. (W. of Jackson Co.)  
 Hymenoxys linearifolia – NW. (W. of Holt Co.)

Gnaphalium uliginosum – W. (W. of Jackson Co.)  
 Senecio Riddellii – W. (cult.)  
 Cirsium ochrocentrum – NW. (by Holt Co.)  
 Pyrrhopappus grandiflorus – NW. (W. of Platte Co.)  
 Hieracium paniculatum – W. (W. of Jackson Co.)

*From Oklahoma* (records based on publications of U. T. Waterfall)

Sphenopholis filiformis – SW.  
 Rivina humilis – SW.  
 Stellaria muscorum – SW. (by McDonald Co.)  
 Stellaria Nuttallii – SW.  
 Neptunia lutea – SW.  
 Dalea purpurea – SW.

Hybanthus verticillatus – SW.  
 Asclepias asperula var. capricornu – SW.  
 Nemophila phacelioides – SW.  
 Dichondra repens var. carolinensis – SW.  
 Castilleja indivisa – SW.

In addition to the above are numerous species known only from McCurtain or LeFlore counties, southeastern Oklahoma, where occur floral elements of the Coastal Plain and southeastern United States.

Some of these already have been found in southern Missouri, but additional ones known from this section of Oklahoma may be expected eventually to occur in Missouri.