

## Introduction

The purpose of this work is to present an up-to-date account of the seed-plants, ferns, and fern allies growing wild in Missouri or introduced, naturalized, or escaped from cultivation through various sources. In the event that a given plant has seeded itself or is growing away from cultivation or habitation, therefore appearing as associated with other wild-growing species, it has been included on the assumption that (1) it manifests the ability to survive in the wild state and may persist, and (2) it may become collected and preserved by some individual curious to know the name of the particular plant. Many a present-day pest has had its inauspicious beginning as a railroad or ballast-dump plant, only to spread later to become an ubiquitous weed. As it is often difficult to determine whether or not plants casually appearing on dump heaps or along railroads and roadsides may persist and become established, in the present flora they have been given the benefit of the doubt in most cases if vouched for by a herbarium record. Some of these introduced plants have not been re-collected for several decades, but until a thorough and intensive search has been made along railroads and disturbed areas inhabited by them, the apparent present scarcity of the species may be due to lack of adequate collecting from such habitats.

### HISTORICAL SKETCH

The following account is a brief historical sketch of the principal collectors in Missouri up to the present time.

The records of botanical exploration which have been preserved in the form of herbarium specimens collected in Missouri date back principally to 1810-11

when John Bradbury botanized portions of counties along the Missouri and Mississippi rivers. Edwin James on the Long Expedition collected in the counties bordering the Missouri River in 1821 and 1822, and was followed by L. C. Beck between 1826 and 1828 and by Charles Geyer in 1845 on the Nicollet Expedition. Nicolas Riehl botanized around St. Louis and Jefferson counties between 1835 and 1838. Prince Maximilian collected between 1841 and 1843 along the Missouri River, and Dr. A. Wislizenus botanized parts of the eastern Ozarks in 1847 and 1848. Dr. George Engelmann botanized the vicinity of St. Louis between 1840 and 1870. The geologist, Garland C. Broadhead, collected between 1850 and 1880 in a number of central and western Missouri counties. At about the same time G. C. Swallow was engaged in botanical collecting, especially in central Missouri, followed somewhat later by B. F. Shumard, another geologist. B. F. Galloway collected around Boone County between 1855 and 1885. S. M. Tracy was active botanically between 1880 and 1886, publishing his *Catalogue of the phaenogamous and vascular cryptogamous plants of Missouri* in 1885. Benjamin Franklin Bush, one of the most active collectors in Missouri, began in 1882 what was to become a long and fruitful botanical career that ended in 1937. About the same time between 1895 and 1915 K. K. Mackenzie was active in Clay and Jackson counties, while William Trelease botanized sections of the Ozarks and the swamp lands of the southeastern portion of the state between 1885 and 1905. George Letterman collected between 1875 and 1900 around Allenton in St. Louis County, and Henry Eggert botanized St. Louis County and various eastern Ozark and southeastern lowland counties

between 1875 and 1895. Noteworthy collections were made by Colton Russell in southeastern Missouri between 1886 and 1900, by J. W. Blankinship in Oregon and Greene counties between 1885 and 1900, by Stuart Weller in Greene County in 1889 and 1890, and by T. E. Savage and Wilfred Stull from Butler County between 1897 and 1900. N. M. Glatfelter collected willows especially around St. Louis in the late 1890's. Professor E. M. Shepard collected in Greene County between 1885 and 1905. At about the same time (1884), John Kellogg, a disciple of Letterman, began collecting around Allenton, St. Louis County, and was active collecting in the state until 1940. Francis Daniels did active collecting in the vicinity of Columbia, Boone County between 1897 and 1905, publishing his *Flora of Columbia* in 1907. In 1901 Ernest Jesse Palmer collected in southwestern Missouri in Jasper and Newton counties, eventually botanizing the entire state, and he is active to the present day.

Paul C. Standley collected in Greene County between 1903 and 1905. Huron H. Smith collected in southern Missouri, especially in Iron and Wright counties between 1905 and 1908. Reverend John Davis made extensive collections in Lewis, Marion, Ralls, Pike, and St. Charles counties between 1912 and 1921. Jesse More Greenman, formerly curator of the herbarium at the Missouri Botanical Garden, collected in a few of the eastern Ozark counties between 1910 and 1925. W. H. Emig collected in Osage County in 1915-18. Harold W. Rickett botanized in the Ozarks and in Boone and Callaway counties between 1927 and 1937, in 1931 revising Daniels' *Catalogue*. F. P. Metcalf collected aquatic plants in various parts of northern and central Missouri between 1918 and 1920. C. J. Elmore collected in Clay County between 1920 and 1930. A number of Dr. Greenman's students made botanical collections in the state, beginning with Earl Sherff, who botanized the St. Louis and eastern Ozark section between 1910 and 1913, followed by Carl Epling (1920-24), Mildred Mathias (1925-29), and Robert E. Woodson, Jr. (1925-32), who made collections from various parts of the Ozarks. The present author has collected throughout the 114 counties of the state since 1926. Francis Drouet and Lisle Jeffrey were active collectors between 1932 and 1935 in Boone and Callaway counties especially, but also botanized in other counties. J. R. Singleton collected in Nodaway County in 1938 and D. R. Crookshanks in Livingston County between 1936 and 1938. William Drew collected in Boone and Callaway counties around 1940-42. Clair Kucera, from 1950 to the present, has botanized in Boone and Callaway counties and some

of the Ozark region. Other modern collectors have been George Moore, collecting in Laclede County between 1935 and 1945; Bill Bauer, collecting throughout Missouri since 1930; Albert Chandler, collecting mainly in the eastern Ozarks from 1930 to 1955. L. J. Gier and his students have been busy collecting the flora of Clay County since 1940. Victor Muehlenbach has added many species of foreign origin new to the state flora as a result of his botanizing along railroad rights-of-way from 1954 to the present time.

While many other collectors have also contributed to the records, the ones cited above are responsible for the majority of the specimens encountered. Early explorers, such as Meriwether Lewis, Henri Brackenridge, and Henry R. Schoolcraft made observations but did not preserve specimens of plants seen in Missouri. The botanist Frederick Pursh (1812) was the first botanical author to describe plants collected in Missouri, based on the collections of John Bradbury, while Thomas Nuttall described a number of species from Arkansas which extend into Missouri. The work of André Michaux, published in 1803, was based on his collections east of Missouri, but included many species found in the vicinity of St. Louis.

Altogether this botanical activity has resulted in the accumulation of over 200,000 numbered collections from Missouri. Of these the largest have been made by the writer, totaling approximately 60,000 numbers, by Bush, with about 55,000 numbers, and by E. J. Palmer, totaling about 35,000. Kellogg collected about 28,000 numbered Missouri collections, followed in decreasing numbered collections by Eggert, Davis, Broadhead, Letterman, Trelease, Drouet, Woodson, Gier, and others. Despite this apparent activity, most of the 114 counties still possess large areas in need of detailed and careful field work. Each year of intensive field activity in sections previously unbotanized yields a number of species and varieties new to the flora of the state. The taxa which become added to the state flora include not only recently introduced plants brought in by railroads, highway construction, garden escapes, and by various other human agencies, but also native plants which have not been found in previous exploration, partly due to the remoteness of their locality from roads, but mostly due to the lack of sufficient collectors to cover the many yet botanically unexplored parts of the state. Because of this inadequate coverage of each county, even genera which are native to the state have not been found until the past ten years, including such distinct and phytogeographically significant ones as *Lyonia*, *Gaylussacia*, *Bartonia*, and *Obolaria*.

Some of the least worked counties include Andrew,

Atchison, Audrain, Buchanan, Caldwell, Cass, De Kalb, Holt, Johnson, Lafayette, Mercer, Pemiscot, Platte, Randolph, Ray, Saline, Schuyler, Scotland, Shelby, Sullivan, Webster, Worth, and Wright, but the counties in southeastern Missouri situated in the swampy lowlands and traversed by Crowley Ridge, as well as those of southern Missouri containing sink-hole ponds and swampy calcareous, spring-fed meadows continue to produce numerous additions to the native flora. Remote rocky bluffs, previously unbotanized ravines, glades, and rocky exposures bring in their share of botanical records. The careful application of topographical maps to areas of field work in future exploration should add numerous taxa to the flora of the state.

#### GENERAL TREATMENT OF THE FLORA

At the beginning of this work a general key has been provided to enable the reader to reach a given family, or, in many cases, genus. This general key has been grouped into fourteen sections in order to run down readily a given plant into its obvious or main category. After the family is reached, keys within a given family lead to genera, those under genera lead to species, and within the species keys are provided to reach subdivisions of a species. In general the keys have been designed with two objectives: (1) to make available, whenever possible, the most obvious and easily recognizable clues or aids which will furnish a ready means of identification of the plant, and (2) to enlist the use of a number of characters, combining, if necessary, essential details of foliage, flower, and fruit in order that an imperfect specimen or one possessing only certain parts will fit into at least one of the multiple characters presented. In order to facilitate as much as possible the ready identification of the plant, data have been inserted throughout the keys, wherever justifiable, concerning the relative rarity and geographical occurrence, habitat, habit, color of flowers and leaves, and characters of the foliage, items often neglected but frequently useful in the identification of a plant. Another item found in the keys is the insertion of words or explanations of terms placed within parentheses. This has been done in order to avoid the frequent, time-consuming, and distracting use of turning to a glossary at the time of identification of a given plant, and in order to provide immediate explanation of the word in question. By furnishing a glossary within the confines of the key, it is believed that the user of the book gains a more rapid knowledge of those technical or unfamiliar terms encountered and learns to associate them more quickly and more easily.

The relative amount of detail in the keys has in-

cluded the chief diagnostic characters by which a given taxon may be recognized, and has eliminated the need, in most cases, for a description. For this reason and because of the limitation of space, descriptions have been omitted. Measurements have been taken from Missouri material, both dried and living. Where discrepancies exist between measurements given in the chief manuals and those found in Missouri material, such differences are noted accordingly in the text.

Throughout the work each taxon has been given the choice of botanical name, which, in my judgment, is valid according to the present International Rules of Botanical Nomenclature. If the name selected differs from that used in the eighth edition of *Gray's Manual of Botany*, the abbreviation [G] follows; if it differs from Gleason's *New Britton and Brown Illustrated Flora*, [BB] is used; if it differs from Palmer and Steyermark's *Annotated Catalogue of the Flowering Plants of Missouri*, [P & S] is inserted; and if it differs from Steyermark's *Spring Flora of Missouri*, [Steyerm.] is the abbreviation. If the name used is different from that published by a recent worker of that group, the name of the particular individual is placed in brackets, thus [Doe]. These references have been given only for the sake of ready comparison with familiar names likely to be encountered in standard regional and local Missouri works and no complete synonymy is intended.

Following the scientific name there follows, whenever applicable, one or more common names. If a common name occurs, the one most prevalent and widely used in Missouri is given, sometimes followed by other names likely to be used for the same plant. It will be noted that for many plants no common name is known. Wherever possible, the use of coined names or of those translated from the Latin has been avoided. However, where a common name has had some acceptance in general and local works, it is used in this flora. As sometimes happens, certain common names have been based upon a wrongly identified plant or upon one of misleading geographical origin, with the result that the common name used is either unreliable, nonsensical, or illogical. Since many of the established common names which are used are often rooted in ancient tradition, folk-lore, and medical tales, the immediate reason for their usage is not apparent or makes little sense with the result that they are committed to memory parrot-fashion.

The earliest and latest dates of flowering, and in some cases fruiting, are next given, based in all cases on Missouri phenological records. These will be found to differ sometimes from the earliest and latest dates found in the standard regional manuals. Data con-

cerning the habitats occupied by the species in Missouri are presented, followed by the range known in Missouri. A map showing the geographical range within the state by counties usually accompanies each species. In all cases the variations within a given species are represented on the maps by different symbols. In the case of species with a restricted distribution within the state, herbarium specimens exist for each county indicated. However, in the case of certain species, actually twenty-two in all, which have been noted in the field as occurring in every county or in all but five counties at the most, herbarium specimens were not obtained, due to limitations of collecting time as well as herbarium space occupied. In such cases the indication of their occurrence has been based upon field rather than herbarium records. This is likewise true of the records indicated for such weeds and ubiquitous plants as *Verbascum Thapsus*, *Stellaria media*, *Abutilon Theophrasti*, and similar easily recognized taxa. In the case of species showing variations, only those records are mapped which are represented by voucher herbarium specimens. For the sake of graphic expression, the symbols are placed in the middle of each county. In most instances, the actual occurrence of a widespread species is throughout a given county so that it would not be practical to represent its area of total occupation. For all practical purposes, the fact that the species has been found in a given county is shown by its representation from that county.

The citation of specimens with full data taken from the label accompanies a statement of range when the species, variety, or form is a rare one known from only one, two, or few counties. This has also been done in the case of newly revised taxa, where the inclusion of such citations should make clear the specimens now identified as pertaining to a given variation as contrasted to previous work. The specimens have been cited in such cases with two objectives in mind: (1) to establish a scientific record of factual data which should serve as a reference for study and (2) to furnish records not only to taxonomists and plant geographers, but also to those in the fields of ecology, genetics, cytology, morphology, physiology, or horticulture, who may be interested in carrying on additional experiments with the particular taxa treated.

The general range of the species or variety as it exists outside of Missouri follows. In general, the distribution is stated to occur from east to west, except in the case of species of the western United States ranging eastward. A north to south or south to north statement follows: the east to west part of the range given, depending upon whether the particular taxon is more abundant in the northern or southern portion of its

range. General ranges of geographical distribution have been obtained from the latest published state records, monographs and revisions, and regional floras.

The variations and uses possessed by a given species, as well as its known poisonous properties, have been included wherever this knowledge is available.

#### DISCUSSION OF VARIATION

It will be noted that in the present flora the names are sometimes different from those found in such standard regional works as the eighth edition of *Gray's Manual of Botany* and Gleason's *New Britton and Brown Illustrated Flora*. The reasons for this are that (1) perfect unanimity of opinion on all species does not exist among botanists, (2) more detailed studies and recent publications on particular plants have provided other criteria which have necessitated the adoption of different names from those previously used, (3) changes in rules of nomenclature have required a modification of expression in the subdivision of a species, and (4) the writer's own observations of herbarium and living material of a particular taxon both wild or under cultivation in his garden have influenced him and modified his judgment accordingly in accepting or opposing the views of other botanists.

Whenever the present writer has been unable to produce any evidence contrary to the results of another worker, he has accepted that worker's judgment. In most instances, the results of monographic work have been accepted, wherever possible, out of deference and respect to the efforts of the particular worker, who has certainly devoted much more time and labor to his special subject than I have. In other cases, however, where the results published seem to indicate insufficient data, inconclusive evidence, or omission of certain Missouri material deemed of particular importance, I have followed my own judgment. This is certainly no expression of conceit, but merely reflects one's adaptation to a situation in which it seems preferable to express one's own views rather than to accept that with which one cannot agree. This is probably a part of the principle of democratic expression manifested by botanists, and may serve to answer the complaints expressed by those who decry any disagreement among botanists in their concepts of species or who dislike any bickering or modification of previously accepted names. Such examples of differences of opinion are found mentioned throughout this flora.

In other matters involving disagreement where varying points of view exist for the same taxon, I have tried not to take any dogmatic or final stand on the

subject, but have indicated the lack of finality of present judgment by suggesting that future field work and experimentation may reveal further evidence concerning the degree of distinctness of a given variation. In many instances I have admitted the manifestation of a great amount of intergradation between variations, yet have maintained the variations pending future more intensive field and experimental investigations. In other cases, there is such an absence of correlation in the variations noted that I believe that further maintenance of them cannot be justified.

#### SUBDIVISION OF A SPECIES

Since the publication in 1956 of the International Code of Botanical Nomenclature adopted by the Eighth International Botanical Congress in Paris during July, 1954, it has become necessary to change the manner of expression when indicating certain rank of subdivisions of a species. According to Article 25 of these Rules: 'For nomenclatural purposes, a species or any taxon below the rank of species is regarded as the sum of its subordinate taxa, if any. Valid publication of a subordinate taxon which does not include the nomenclatural type of the higher taxon automatically circumscribes a second taxon of the same rank which has its nomenclatural type, the type of the higher taxon and bears the same epithet.

##### Example:

The publication in 1843 of *Lycopodium inundatum* L. var. *bigelowii* Tuckerm. automatically circumscribes another variety, *Lycopodium inundatum* var. *inundatum*, the type of which is that of *Lycopodium inundatum* L.'

Also, according to Article 26 of the Rules: 'In the name of an infraspecific taxon which includes the nomenclatural type of the epithet of the next higher taxon, the epithet of this higher taxon must be repeated unaltered but . . . without citation of an author's name. This epithet can no longer be used when that of the next higher taxon is changed.

##### Examples:

The combination *Lobelia spicata* Lam. var. *originalis* McVaugh, which includes the type of *Lobelia spicata* Lam., must be replaced by *Lobelia spicata* Lam. var. *spicata*.

Since under *Lobelia siphilitica* L. there is described var. *ludoviciana* A. DC., one must write *Lobelia siphilitica* L. var. *siphilitica* if only that part of *L. siphilitica* L. which includes the type is meant.'

Adherence to the above requirements will be found throughout the present flora. At first the repetition of

the specific name for the typical variation may seem superfluous and cumbersome, but eventually the logic and preciseness of this form of expression becomes obvious. If a species has no subspecies, varieties, or forms, then no additional infraspecific name is required. If a form (forma) only has been described within a species, then the typical form (the one containing the nomenclatural type on which the species was based) of the species becomes 'forma' with repetition of the specific name, contrasting it with the other form or forms. If a variety has been described within a species, then the typical variety is the one containing the nomenclatural type on which the species was based and becomes 'variety' with repetition of the specific name, as suggested by the various examples given above. With a little practice, the ease of application of this mode of expression of the infraspecific categories becomes clear and precise.

#### SEQUENCE OF GENERA, FAMILIES, AND ORDERS

The presentation and arrangement of genera have followed, with some exceptions, the eighth edition of Gray's *Manual of Botany* and Gleason's *New Britton and Brown Illustrated Flora*, in many respects following the latter more closely than the former, except for the presentation of the Compositae, which follows more closely the arrangement of Gray's *Manual*. The genus *Geocarpon* in the present flora, based upon floral morphological studies by Mr. E. J. Palmer and myself, is placed in the Caryophyllaceae instead of the Aizoaceae. Some of the respects in which arrangement of genera differs in the present flora from that of Gray's *Manual* are noted in the maintenance of *Najas* in the same family with *Ruppia*, *Zannichellia*, and *Potamogeton*, the merging of *Vulpia* with *Festuca*, merging of *Nyssa* with *Cornaceae*, separation of *Dracopis* from *Rudbeckia*, and merging of *Actinomeris* with *Verbesina*. The proposed systems of Charles E. Bessey in 1897 and 1915, Alfred B. Rendle in 1925, John Hutchinson and Charles Mez in 1926, Richard Wettstein in 1935, Carl Scottsberg in 1940, Alfred Gundersen in 1950, and of other botanists, have all contributed important refinements and modifications to the system of classification of Adolf Engler and Karl Prantl in their *Die Natürlichen Pflanzenfamilien*. Since the latter system is followed at present by most botanists throughout the world, it is the one adopted in the present work, although it is expected that future research in the fields of paleobotany, floral morphology, and comparative anatomy may eventually modify our present concepts of sequence and relationships of families and orders.