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THE VASCULAR FLORA OF DRAPER'S BLUFF UNION-JOHNSON COUNTIES, ILLINOIS

Marc Evans and Sherri Wadham
Department of Botany, Southern Illinois University
Carbondale, Illinois 62901

ABSTRACT: A floristics study of Draper's Bluff in extreme southern Illinois is presented with descriptions of 4 broad community associations. This is followed by an annotated checklist of 507 vascular plants found within the study area. A brief description of climate, topography and geology, and soils is also included.

This floristics study was undertaken in an area of the Shawnee National Forest known as Draper's Bluff. It is located in extreme southern Illinois on the Union-Johnson county line, approximately 16 miles S.S.W. of Marion, Illinois. The study area extends through Sections 25 and 36 of T 11S - R 1E, and Sections 30 and 31 of T 11S - R 2E. The total area encompassed by the study is approximately 525 acres, of which 325 acres are owned by the U.S. Forest Service. The remainder is under private ownership.

This area was chosen for study because it has long attracted botanists, but has never been systematically botarized. The objectives of this study were to (1) compile a list of the vascular plants collected and identified from the area, (2) to describe the plant communities, and (3) to give a general description of the climate, topography and geology, and soils associated with these communities.

PHYSICAL DESCRIPTION OF AREA

CLIMATE. The climate of the Shawnee Hills reflects its mid-latitude continental location, with hot humid summers, cool to cold winters, and fairly abundant precipitation throughout the year. Winter and spring tend to be the wettest seasons, while summer and fall are generally drier.

The average annual temperature at Anna (11 miles S.W. of the study area), is 14°C. Average temperature for January, the coldest month, is 1.6°C while July, the hottest month, has an average of 26°C. The average frost free period is 200 days, with the last killing frost occurring April 9th and the average first killing frost occurring

October 26th.

The average annual precipitation at Anna is 120 cm., of which 54% or 64.8 cm. falls during the growing season. March, usually the wettest month, receives an average of 11.7 cm. of precipitation while October, the driest month, receives an average of 8.7 cm. Average yearly snowfall is generally about 25.4 cm. (Page, 1949).

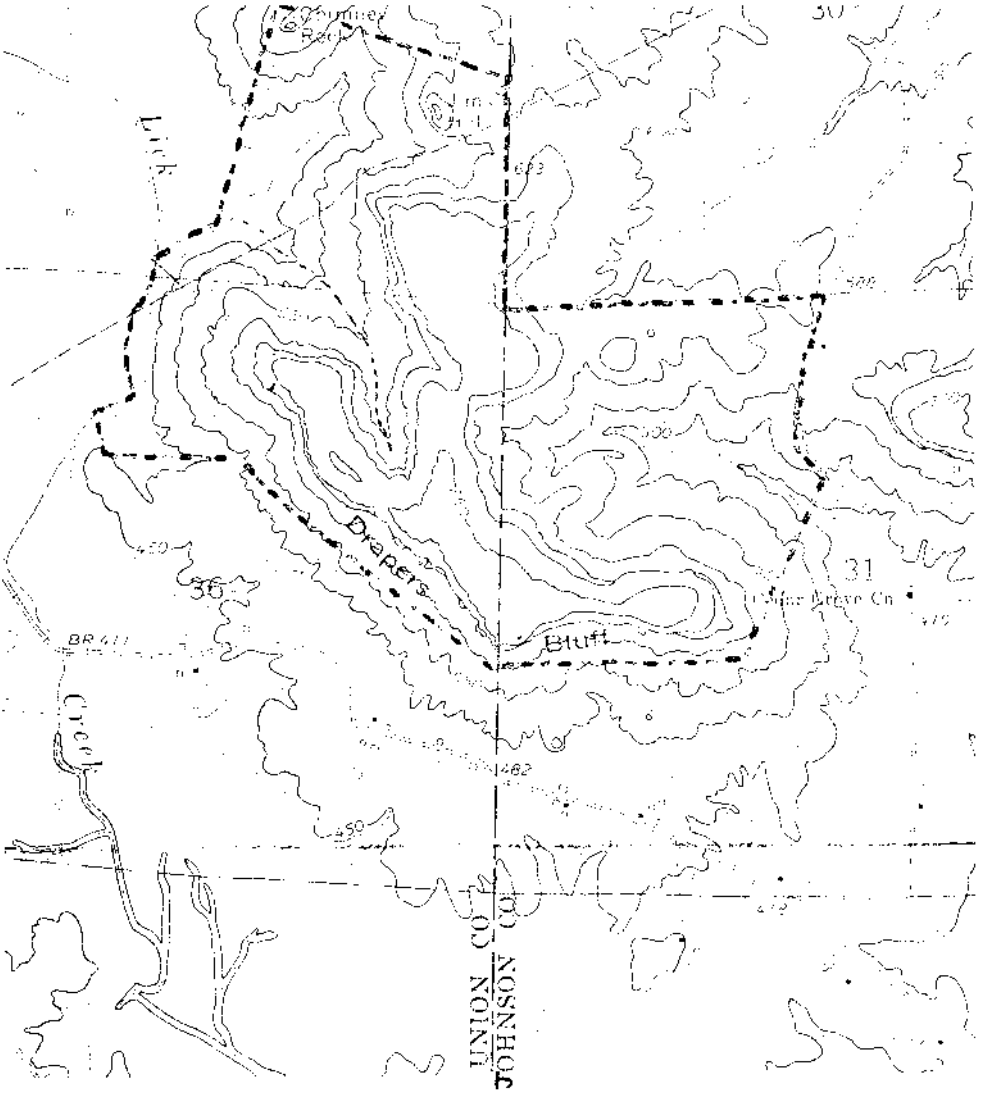
TOPOGRAPHY AND GEOLOGY. Physiographically, Draper's Bluff is located in the Greater Shawnee Hills Section of the Shawnee Hills Division in the Interior Low Plateau Province of North America (Leighton, et al., 1948). The bluff forms a prominent part of the sandstone cuesta, a continuous asymmetrical ridge which runs east and west across southern Illinois (Harris, et al., 1977).

Within the study area, the lowest elevation of approximately 410 feet above sea level occurs along Lick Creek on the N.W. side of the study boundary. From the creek, the slopes rise steeply to the top of the bluff where the highest elevation is approximately 770 feet above sea level. The most outstanding topographic feature of the study area is the vertical sandstone escarpment which forms the face of Draper's Bluff. These cliffs have an average height of 90-100 feet with the tallest rising over 110 feet. The escarpment face runs N.W.-S.E. for nearly 3/4 of a mile, then turns abruptly to the East and continues for about 1/2 mile before breaking down. The large cliffs resume again in neighboring Cedar Bluff (Fig. 1).

This varied relief reflects the bedrock geology of the area. Highly resistant sandstone caps the ridges and forms the large cliffs, while less resistant shales and limestones form the substrata of the lowland areas. According to Weller (1927), the present relief of the area can mainly be attributed to stream erosion and was largely completed before the Illinoian glacial period.

The dominant type of rock, which is Pennsylvanian in age, is Battery Rock Sandstone of the lower Caseyville formation. This sandstone is one of the prominent cliff-forming units along the southern slope of the Greater Shawnee Hills, where it occupies a band a mile or more in width (Harris, et al., 1977). The Battery Rock is a thick bedded, well-cemented conglomeritic sandstone with occasional layers of quartz pebble conglomerate occurring (Willman, et al., 1975).

Underlying the Battery Rock Sandstone and forming the bedrock of the lower areas are shale and limestone of Upper Mississippian age. Grove Church Shale and Kinkaid Limestone are the representative members of this formation (Harris, et al., 1977). They form the gentler slopes and are, for the most part, covered with a mantle of soil. Kinkaid limestone is occasionally exposed in stream beds and around several small springs. Grove Church Shale is exposed in a road cut immediately east of Draper's Bluff and is named for Cedar Grove Church, which is located nearby (Willman, et al., 1975).



0 ¼ ½ 1 mile

Boundary of study area

Lick Creek
Quadrangle
Illinois

Fig. 1

SOILS. The soils of the study area are of the Hosmer-Manitou association, which occurs on upland areas, and the Sharon-Belknap association, which is found in the lowland areas. The upland soils, except those on very steep slopes, have developed from loess under forest vegetation, while the bottomlands contain soils derived from sediments washed from leached upland soils (Fernbacher, et al., 1955).

On gently sloping, uneroded uplands, loess thickness varies from 80 to over 200 inches, while steep slopes and eroded uplands have from 40 inches to very little, if any, loess present. Four soil types of the Hosmer-Manitou soil association occur on the upland areas. These soils are all acidic, low in available phosphorous, and medium in available potassium.

The Stoy and Hosmer soil types can be found on ridgetops and moderate slopes in loess over 40 inches in thickness. The Stoy, a silt loam, occurs on nearly level to gently sloping uplands, while the Hosmer soil, also a silt loam, occurs on gently sloping to steep upland areas. They are both light-colored, medium textured soils, but the Stoy is imperfectly drained while the Hosmer is moderatley well drained (Anonymous, 1949). Because of their depth and the relatively flat topography they occupy, most of these soil types were cultivated at one time. They now support various stages of old field succession.

The Manitou soil type occurs on steeply sloping upland areas where loess thickness is from 20 to 40 inches, and the Wellston-Muskingum complex developes on steep uplands with only 10 to 20 inches of loess. Both of these soils are light-colored, medium textured, and well drained, but the Wellston-Muskingum complex, because of its shallow depth, contains many stones and bedrock outcrops (Anonymous, 1949). Both of these soil types, because of their shallow depth and steep locations, are associated with forest vegetation. They support either mesic or dry woods, depending on the directional aspect of the slope.

In the floodplain area along Lick Creek, the Sharon-Belknap soil association occurs. The four soils in this association are all light colored, acid silt loams with the main differences between the types being drainage. The Sharon soil is moderatly to well drained, the Belknap soil is imperfectly drained, and the Bonnie soil is poorly to very poorly drained. The Burnside soil is imperfectly to well drained, but differs from the others in that bedrock occurs only 12 - 35 inches below the surface (Anonymous, 1949). In the study area. these soils were at one time heavily disturbed, but now support a late successional stage of bottomland forest. The poorest drained soils contain marsh-like areas with standing water for most of the year.

PROCEDURES

The study was conducted from February, 1976, through October, 1977. Frequency of collecting trips varied from 2 to 3 times weekly during the spring and early summer, to not less than once a week during mid-summer through fall. All voucher specimens were placed in the herba-

rium at Southern Illinois University in Carbondale (SIU). All nomenclature follows that of Mohlenbrock (1975).

PLANT COMMUNITIES

Due to the varied topography of the study area and the resulting diversity of habitats, many plant communities occur within a relatively small area. Each community is not delineated by distinct boundaries, but rather grades into those surrounding it, creating a mixed association of plants at the edges. Four broad plant communities have been recognized; the 1) Lowland communities, 2) Wooded Slope communities, 3) Blufftop communities, and 4) Disturbed communities.

Lowland Communities

These communities include a narrow zone of vegetation along the streambank of Lick Creek, a broad floodplain woods, and a small area of shallow standing water. Bounded on the west by Lick Creek and elsewhere by steeply ascending wooded slopes, these areas are subjected to periodic flooding. The lowlands occur at an elevation below 420 feet above sea level and the topography is generally flat.

STREAMBANK. Lick Creek is a slow, turbid stream approximately 6 meters wide where it borders the study area. Its steep muddy banks contain few rock outcrops and support minimal herbaceous taxa. Dominant trees along the streambank are Platanus occidentalis, Celtis occidentalis, Acer saccharinum, and Ulmus americana. The mid-layer is composed of Acer negundo, Carpinus caroliniana, Acer saccharum, and saplings of the dominant canopy trees. Dense stands of Arundinaria gigantea form a conspicuous shrubby layer along much of the streambank, while Salix interior and Sambucus canadensis are common shrubs in more open, often disturbed areas. Immediately adjacent to the streambank and extending up the base of the wooded slopes, a rich herbaceous layer highlights the vernal aspect of the lowlands. First to flower in the spring are Corydalis flavula, Dicentra cucullaria, Sanguinaria canadensis, and Trillium recurvatum. With the advent of April, the ground is carpeted with Erythronium albidum, E. americanum, Collinsia verna, Stylophorum diphyllum, Viola pennsylvanica, V. striata, and V. sororia. These are closely followed by Geranium maculatum, Hybanthus concolor, Hydrophyllum appendiculatum, H. virginianum, and Polemonium reptans. The closing of the tree canopy signals the end of spring and a sharp reduction in the number of flowering herbs. Taxa found during the summer and fall are essentially the same as those of the floodplain woods.

FLOODPLAIN WOODS. Where the distance between Lick Creek and the wooded slopes widens substantially, a broad floodplain woods occurs. Aerial photographs taken in 1940 indicate that the entire floodplain was cleared sometime prior to that date. Widely-spaced trees, a sparse shrubby layer, and an often continuous ground cover of Impatiens biflora contribute to the park-like physiognomy of this area.

Dominant trees composing the canopy layer are those of the stream-

bank, as well as Liriodendron tulipifera, Liquidambar styraciflua, Quercus palustris, and Fraxinus pennsylvanicus var. subintegerrima on better drained sites. The mid-layer is represented by Carpinus caroliniana, Acer saccharum, Ulmus americana, and Prunus serotina. The intermittent shrubby layer is composed primarily of Staphylea trifolia and Lindera benzoin. Woody vines include Smilax hispida, Campsis radicans, and Toxicodendron radicans.

In early spring, Corydalis flavula, Isopyrum biternatum, Arisaema triphyllum, and various species of Viola and Ranunculus compose the herbaceous layer. Valeriana pauciflora, Polygonum punctatum, and Arisaema dracontium appear somewhat later. By mid-summer, the herbaceous layer is reduced to Impatiens biflora, Pilea pumila, Aster simplex, and A. shortiana. Unusual plants occurring in the floodplain woods include Penstemon alluviorum, Pilea opaca, Xanthoxylum americanum, and Solidago patula.

SEMI-AQUATIC LOWLAND. One particularly low-lying area adjacent to Lick Creek remains flooded beneath shallow standing water for much of the growing season. A major disturbance, resulting from construction of a pipeline through the study area, separates this area from the rest of the lowlands and has undoubtedly affected the natural drainage pattern to some extent.

This semi-aquatic habitat supports no woody vegetation, except along the periphery where Sambucus canadensis is a common shrub. The herbaceous layer is composed of such summer-flowering taxa as Carex tribuloides, C. vulpinoidea, Scirpus cyperinus, S. atrovirens, and Juncus effusus. The prominent grass is Glyceria striata, which is abundant. Localized colonies of Alisma subcordata and Saururus cernuus are well-established. Also present are Typha latifolia, Cryptotaenia canadensis, Rorippa sessilifolia, R. islandica var. fernaldiana, and Rumex acetosella.

Uncommon species occurring here include Carex comosa, Galium tinctorium, and Festuca ovina var. duriuscula.

Wooded Slope Communities

The wooded slopes comprise over half the acreage of the study area and are the richest in terms of number of species and diversity of habitats. The slopes occur mainly between the 420 and 650 foot contours and include all ravines or canyons, and other sloping woods which are bordered by the lowland woods and the sandstone bluffs. Because of various exposures to the sun and the resulting moisture-temperature differences, the wooded slopes can be generally divided into two communities: the mesic slope woods and the dry slope woods.

MESIC SLOPES. The mesic slope community consists of those slopes having a northerly or easterly exposure and other protected slopes such as those in deep ravines or canyons. The moist and cool environment of these protected locations has created a rich mesic habitat that

supports a wide variety of woody and herbaceous vegetation.

The forest is composed of tall trees which form a dense canopy. Many species share dominance with Liriodendron tulipifera, Carya cordiformis, Acer saccharum, Quercus rubra, Nyssa sylvatica, and Fraxinus americana commonly found. Also found are Ulmus americana, U. rubra, Carya ovata, C. ovalis, and Juglans nigra. On the lower slopes just above the floodplain, Fagus grandifolia becomes prominent.

The mid-layer is commonly composed of Asimina triloba, Carpinus caroliniana, Acer negundo, A. rubrum, and saplings of the dominant trees. Aralia spinosa forms a conspicuous thicket in one area. Characteristic shrubs of the mid-layer are Lindera benzoin and Staphylea trifolia, while Hydrangea arborescens is common on moist rocky ledges. Vines commonly found are Parthenocissus quinquefolia, Smilax hispida, Vitis cenerea and Toxicodendron radicans.

The rich mesic slopes, particularly those protected by surrounding cliffs, support a large variety of herbaceous plants. These are for the most part vernal and flower before the trees form a dense canopy. For a brief period during March and April, these ephemeral herbs carpet the forest floor with bright colors. Erigenia bulbosa, Sanguinaria canadensis, Dentaria laciniata, Claytonia virginica, Trillium recurvatum, and Uvularia grandiflora are found throughout the community at this time. Also found are Erythronium americanum, Dicentra cucularia, Trillium flexipes, Asarum canadense, Arisaema triphyllum, Isopyrum biternatum, and many other early flowering species. Flowering shortly after these are Geranium maculatum, Delphinium tricorne, Polygonatum commutatum, Phlox divaricata ssp. laphamii, Hydrophyllum virginianum, Smilacina racemosa, Actaea pachypoda, and several species of Ranunculus and Viola. Along the moist bases of sandstone cliffs, many shallow shelter caves occur. Several of these support large localized colonies of Dodecatheon frenchii.

The approach of summer is marked by the flowering of Spigelia marilandica, Valeriana pauciflora, Circaea quadrisulcata, and Hydrophyllum appendiculatum. During the summer, fewer herbaceous plants can be found in flower. Some of those found are Silene stellata, Lysimachia lanceolata, Desmodium glutinosum, and D. nudiflorum. Autumn is characterized by the flowering of Verbesina alternifolia, Solidago caesia, Eupatorium rugosum, and Epifagus virginiana, where beech trees are common.

Several woodland grasses found were Leersia virginica, Panicum polyanthes, P. boscii, Festuca obtusa, and Bromus pubescens. Sedges which were occasionally found are Carex rosea, C. shortiana, C. blanda, C. bushii, and C. flaccosperma.

Along with the abundant flowering herbs, many ferns can also be found on the mesic slopes. Commonly occurring are Dryopteris marginalis, Polystichum acrostichoides, Adiantum pedatum, Cystopteris fragilis var. protrusa, Thelypteris hexagonoptera, and Botrychium virginianum.

Numerous bedrock outcrops and large blocks of sandstone which have fallen from the cliff face lie scattered about the mesic slopes. These rocks, which are well shaded and fairly moist most of the year, support many mosses, liverworts, and herbaceous plants. Aquilegia canadensis, Heuchera parviflora var. rugelii, and Arabis laevigata can commonly be found growing in crevices and on thin soil which has accumulated on the ledges. Two ferns also typical of this habitat are Asplenium rhizophyllum and Polypodium vulgare var. virginianum.

Along some of the cliffs, large joint blocks of sandstone have separated from the main cliff, forming deep mesophytic defiles. One in particular is very striking. Sheer cliffs approximately 60 feet in height form the walls which are only 25 - 30 feet apart. The soil is sandy and supports many liverworts, mosses, and ferns. Twelve species of ferns were found to occur within this small area, several of which were found at this station only within the study area. Dryopteris intermedia, Athyrium pycnocarpon, A. thelypterioides, and Onoclea sensibilis cover the floor of the canyon, while Asplenium trichomanes grows on the moist rock walls.

Immediately adjacent to this canyon, a rich north-facing ravine is located. This is the only location within the study area for Dicentra canadensis, but the outstanding feature of the ravine is the large colony of Orchis spectabilis. Over 100 individuals were observed in the vegetative state, while at least 50 were found in flower. This large colony of orchids was found growing in close association with a large colony of Thelypteris hexagonoptera.

Other notable species which occur only as isolated individuals or small colonies include Hydrastis canadensis, Panax quinquefolia, Obolaria virginica, Solidago patula, Botrychium biternatum, Orobanche uniflora, Carex careyana, C. convoluta, and C. albursina.

DRY SLOPES. The dry slope woods community consists of those slopes that are unprotected with a southerly or westerly exposure. The slopes are generally steep and the soils are relatively thin with many rock ledges and outcrops. The canopy trees, which are smaller and less diverse than those occurring on the mesic slopes, are variously spaced and somewhat sparse.

The dominant canopy trees are Quercus velutina, Q. alba, Carya tomentosa, and C. glabra. On the more xeric, upper reaches of the slopes, Quercus stellata, Q. marilandica, and Juniperus virginiana become prominent. Common sub-canopy species include Ulmus alata, Amelanchier arborea, Cornus florida, Quercus muhlenbergii, and some saplings of the canopy trees. Shrubs commonly encountered are Vaccinium arborium, V. vacillans, and Rhus aromatica. Common vines are Smilax bona-nox, S. glauca, Vitis aestivalis, Parthenocissus quinquefolia, and Toxicodendron radicans.

A well developed herbaceous layer is noticeably lacking in this community. Those taxa present are scattered and rarely form dense

stands. Antennaria plantaginifolia and Houstonia pusilla are the only plants commonly found flowering in early spring. As spring progresses, Hypoxis hirsuta, Tradescantia virginiana, Phlox bifida and Cynoglossum virginianum can be found in flower. Late spring and summer bring the period of greatest flowering. Commonly found are Oxalis violacea, Heuchera hirsuticaulis, Monarda bradburiana, M. fistulosa, Potentilla simplex, Gerardia flava, and Cunila origanoides. Also found are Hypericum hypericoides var. multicaule, Ruellia humilis, and Asclepias variegata.

During the late summer, several legumes can be found in flower. These include Lespedeza virginica, L. procumbens, Psoralia psoralioides var. eglandulosa, Stylosanthes biflora, Desmodium paniculatum, D. nuttalli, and D. rigidum. Three woodland sunflowers, Helianthus divaricatus, H. decapetalus, and H. strumosus, are also occasionally found during the late summer and fall. The fall aspect is further characterized by several other composites. These include Aster anomalus, A. cordifolius, A. oblongifolius, Solidago caesia, and S. petiolaris.

Several grasses and sedges are found to occur in the dry slope woods. Characteristic grasses are Agrostis perennans, Panicum latifolium, P. linearifolium, P. boscii, Danthonia spicata, Muhlenbergia retroflexa, Carex artitecta and C. glaucodea.

The dry rocky slopes support only a few species of ferns. Woodsia obtusa and Asplenium platyneuron can be found on the more exposed sites, while Dryopteris marginalis and Polystichum acrostichoides can be found on the shadier sites. Colonies of Polypodium polypodioides occur occasionally on exposed rock ledges.

BLUFFTOP COMMUNITIES

The dry blufftop communities are a characteristic feature of the Shawnee Hills. On Draper's Bluff, the communities represented are the xeric sandstone ledges, xeric scrub woods, and dry blufftop woods.

Soil depth is a major factor influencing species composition in each community. The soil achieves its greatest depth on the summit of the blufftop and becomes increasingly shallow as it approaches the cliff edges, where sandstone bedrock is exposed. From the exposed rock ledges which are almost devoid of plant life, to the upland Oak-Hickory forest, each stage in the continuing process of primary succession is represented.

XERIC LEDGES. The sandstone escarpment which forms the face of Draper's Bluff affords both westerly and southerly exposures. The height of the cliffs generally exceeds that of the tallest trees rooted in the slopes below. On the edge of the cliffs, exposed rock occurs in discontinuous bands ranging from several inches to over 20 feet in width.

On the extreme edges, lichens are the only taxa to colonize the

bare rock. Further back from the edge, mosses intermix with lichens, contributing to soil formation and providing a substrate to which vascular plants may adhere. Horizontal bedding planes form relatively level shelves or ledges which harbor a thin layer of sandy soil. Other thin soil areas occur as scattered patches in depressions and as the narrow outer margins of the loess cap.

The vernal aspect is represented chiefly by Nothoscordium bivalve, Krigia oppositifolia, Oxalis violacea, Oenothera linifolia, and Houstonia pusilla. As spring progresses into summer, prominent flowering plants include Stylosanthes biflora, Plantago pusilla, and such notable succulents as Sedum pulchellum, Talinum parviflorum, Polianthes virginica, and Opuntia compressa. Grasses include Danthonia spicata, Agrostis perennans, Aristida dichotoma, and Muhlenbergia sobolifera. Cheilanthes lanosa, a characteristic fern of this habitat, thrives in the sandy soil and partial shade provided by the adjacent scrub woods.

By mid-summer, flowering activity is reduced to the few species which can withstand the intense heat and dryness. Flowering at this time are Hypericum gentianoides, Ascyrum hypericoides var. multicaule, Krigia virginica, and Crotonopsis elliptica. Lechea tenuifolia and Plantago virginica are occasionally encountered.

In several places along the bluff, huge blocks of sandstone have broken away from the main cliff. These blocks often provide well-protected crevices and recesses which harbor small colonies of Asplenium pinnatifidum and Polygonum tenue.

Vertical cracks in the bedrock ledges frequently contain deeper soil capable of supporting a number of woody taxa. Occurring here are stunted individuals from the adjacent scrub woods, such as Juniperus virginiana, Quercus stellata, and Q. marilandica, as well as shrubby forms of Prunus serotina and Amelanchier arborea.

Along the outer margins of the loess cap, dense stands of Vaccinium arboreum generally mark the transition zone from the xeric ledge into the xeric scrub woods community. Vaccinium vacillans also occurs along this zone, but to a lesser extent.

XERIC SCRUB WOODS. As the xeric ledges grade into the deeper soil of the loess cap, a xeric scrub woods becomes predominant. This community is characterized by scrub trees and a somewhat sparse herbaceous layer.

Juniperus virginiana is the most conspicuous tree dominating the outer margins where the soil is thinnest. Further back, Quercus stellata, Q. marilandica, Q. alba, and Carya tomentosa intermix with cedars to form the canopy. Important mid-layer trees include Ulmus alata, Amelanchier arborea, and saplings of Q. alba, Q. velutina, and Carya spp. The shrub layer is dominated by Rhus aromatica, with Rubus flagellaris and R. allegheniensis occasionally found. Woodsia obtusa is a fern scattered throughout this community.

The prevernal aspect of the xeric scrub woods is initiated as many

of the woody species begin to flower. Antennaria plantaginifolia is the only herb to flower at this early date. The vernal aspect is more varied, with the flowering of Specularia perfoliata, Sisyrinchium albidum, Dodecatheon meadia, Tradescantia virginica, and Phlox bifida. As the hot days of summer approach, flowering activity is greatly reduced. Summer taxa, which include Helianthus decapetalus, Cunila origanoides, Aster oblongifolius and Solidago petiolaris, generally persist until the end of the growing season. Grasses commonly occurring include Vulpia octoflora, Panicum linearfolium, and P. latifolium.

Jim's Hill, an isolated sandstone bluff, is dominated by a similar scrub woods community. Species unique to this part of the study area include Tephrosia virginiana, occurring on an exposed west-facing ledge, and Clitoria mariana, occurring in the scrub woods.

DRY BLUFFTOP WOODS. Continuing upslope, the scrub trees decrease in abundance and Quercus alba, Q. velutina, Carya tomentosa, and C. ovalis become increasingly abundant. Where the soil reaches its maximum depth, a dry Oak-Hickory woods community predominates. This dry open woods caps the summit of the blufftop and extends to the narrow moss and lichen covered ledges of north and east facing cliffs. Where this community meets adjacent old fields, Juniperus virginiana, and Quercus imbricaria are frequently encountered. Cornus florida, Cercis canadensis, Ulmus rubra, and saplings of Carya spp. comprise the understory. Woody vines include Parthenocissus quinquefolia, Vitis aestivalis, Dioscorea quaternata, Smilax bona-nox, and Toxicodendron radicans.

The pre-vernal aspect is stark, with the only flowering plant being Antennaria plantaginifolia. The vernal aspect is more productive with the flowering of Phlox bifida, Viola triloba var. dilatata, Tradescantia virginiana, Podophyllum peltatum, and Penstemon pallidus. Monarda bradburiana, Polytaenia nuttallii, and the sedges, Carex cephalophora and C. retroflexa also appear as spring progresses. Summer is the most productive season for the dry blufftop woods. Plants which flower then include Galactia volubilis, Galium pilosum, Helianthus divaricatus, Monarda fistulosa, Desmodium paniculatum, and D. rigidum. Taxa which flower late in the summer and generally persist into fall include Ruellia humilis, Desmodium nuttallii, D. marilandicum, Lespedeza virginica, Aster cordifolius, A. anomalus, and Solidago ulmifolia.

Grasses are numerous in the open woods, and include Sphenopholis obtusata, Festuca pratensis, Muhlenbergia sobolifera, and Panicum praecocius. Several ferns which occur occasionally throughout this community are Polystichum acrostichoides, Asplenium platyneuron, and Dryopteris marginalis.

At the summit of Draper's Bluff can be found a depression, approximately 50 feet in diameter, which retains a shallow pool of water throughout most of the year. Although located within the dry woods community, a characteristic wetland flora has become associated with this microhabitat. Quercus palustris is the dominant tree along the pond margin and Gleditsia triacanthos occurs frequently. Although not normally associated with wetlands, two mature individuals of Quercus

coccinea are rooted in the deep leaf litter within the pond. The predominant shrub is Cephalanthus occidentalis and woody vines include Campsis radicans, Lonicera japonica, and Smilax bona-nox. The flora of the pond margin consists of Scirpus georgianus, Carex sparganioides, Cinna arundinacea, Panicum rigidulum, and scattered individuals of Erechtites hieracifolia.

DISTURBED COMMUNITIES

Various stages of advanced secondary succession occur where wooded land was formerly cleared. These disturbed communities include the old fields and a pipeline cut. A substantial portion of the vegetation is composed of adventive and pioneer species whose associations are, for the most part, transient. The intermingling of foreign adventive plants with native successional plants produces a rich species diversity.

OLD FIELDS. Several old fields are located on Draper's Bluff. Their topography is generally flat, with a slight incline towards the summit of the ridgetop. Abandoned from cultivation at least 40 years ago, an early woody or pioneer tree stage of succession predominates. Of all taxa occurring in the old fields, 25% were found to be non-native, and of the native species, 42% are commonly associated with prairie habitats.

Extensive stands of Rhus glabra and R. copallina are conspicuous throughout the fields. Other prominent pioneer trees include Diospyros virginiana, Sassafras albidum, and Juniperus virginiana. Young trees which have invaded along the edges include Quercus alba, Q. velutina, Prunus serotina, Carya ovalis, and Fraxinus pennsylvanica. Shrubby trees such as Crataegus spp. and Prunus americana prefer the moist depressions and drainageways. Rubus flagellaris, R. occidentalis, Rosa multiflora, and R. setigera are common shrubs, often forming thickets near trails.

The spring aspect is late in arriving in the old fields. The herbaceous layer remains sparse and unimpressive well into May. The first herbs to flower are Viola rafinesquii, Veronica arvensis, Cardamine hirsuta and Houstonia pusilla. More conspicuous at this time, however, are the numerous and showy flowers of Prunus americana, P. munsoniana, and Crataegus spp.

As spring progresses into summer, the number and diversity of flowering herbs increases rapidly. Common taxa include Daucus carota, Achillea millefolium, Chrysanthemum leucanthemum, Euphorbia corollata, and Rudbeckia hirta. Trails and old roads harbor a number of species which would otherwise not persist in such an advanced successional community. Occurring here are Prunella vulgaris, Dianthus armeria, Blephilia ciliata, and Juncus interior. Glyceria striata and the sedges, Carex scoparia and C. vulpinoidea, prefer the moist ground along trails and in ditches.

Summer is by far the most productive season in the fields. Grasses

form an almost continuous ground cover over much of the area, creating a physiognomy reminiscent of tall grass prairies. The largest field on the bluff is dominated by Sorghastrum nutans. Schizachyrium scoparium, and Andropogon gerardii are also numerous and widespread. Smaller fields on the bluff are dominated by Andropogon virginicus and Schizachyrium scoparium. Other common grasses are Tridens flavus, Agrostis hyemalis, and Poa annua.

Summer flowering herbs include Asclepias syriaca, A. tuberosa, Pycnanthemum tenuifolium, Crotolaria sagittalis, and Oenothera biennis. Abundant on trails are Gerardia tenuifolia, Ruellia humilis, Cassia fasciculata, and Stylosanthes biflora. Last to flower are Lespedeza stipulacea, L. virginica, Bidens aristosa, Solidago canadensis, S. graminifolia, S. nemoralis, Aster pilosus, and A. simplex, which persist into the autumn months.

Unusual taxa occurring in the old fields are Spiranthes vernalis, Gerardia fasciculata, Lespedeza hirta, Carex gravida, Prunus virginiana, Rubus occidentalis, Aster dumosus, Pycnanthemum pilosum, and Poa angustifolia.

PIPELINE CUT. In 1947, a 50 foot wide cut through the forest was completed for the purpose of installing two sections of oil and gas pipelines. The cut enters the study area just south of Jim's Hill and extends west to Lick Creek. The topography it follows is undulating, with steep east and west facting slopes forming moist troughs at their bases and drier grounds at their summits.

In the 30 years following the disturbance, a secondary successional community composed of both native woodland and adventive wasteground species has developed. Prominent trees along the cut include such pioneer species as Diospyros virginiana, Sassafras albidum, Rhus glabra, and R. copallina. Gleditsia triacanthos, Populus deltoides, and Platanus occidentalis occur in low-lying areas. Woodland species encroaching along the margins of the cut include Acer saccharum, Quercus rubra, Liriodendron tulipifera, Carya cordiformis, and Fraxinus americana.

Prominent shrubs are Rosa carolina, R. multiflora, Rubus flagellaris, and R. allegheniensis. Hydrangea arborescens occurs where streams dissect the cut, and Sambucus canadensis is abundant near Lick Creek.

This open habitat is favored by numerous grasses; these include Phleum pratense, Andropogon virginicus, Chasmanthium latifolium, Setaria lutescens, Festuca pratensis, and Bromus commutatus.

The moist ground near Lick Creek supports a rich herbaceous flora, including Senecio glabellus, Eupatorium rugosum, E. coelestinum, Aster ontarionis, Valerianella radiata, and Stachys tenuifolia. Cyperus strigosus, Carex shortiana, and C. lurida also favor this wet habitat.

On higher ground, wasteground species such as Erigeron annuus, Ambrosia artemesiifolia, Polygonum convolvulus, Rumex crispus, Verbascum thapsus, and Geranium carolinianum occur in close association with

native woodland species such as Gillenia stipulata, Cacalia atriplicifolia, Gnaphalium obtusifolium, Polygonum virginianum, Geranium maculatum and Hydrastis canadensis.

TAXONOMIC SUMMARY

A total of 91 families, 282 genera, 507 species, and 34 varieties are listed. Pteridophyta is represented by 2 families, 12 genera, and 20 species; Gymnospermeae is represented by 1 family, 1 genera, and 1 species; Monocotyledoneae is represented by 12 families, 58 genera, and 118 species; and Dicotyledoneae is represented by 76 families, 211 genera, and 368 species.

The list further reveals the largest family to be Compositae with a total of 68 species, followed by Poaceae with 51 species, Leguminosae with 32 species, and Cyperaceae with 27 species.

41 taxa (about 8%) are considered to be introduced or naturalized.

ANNOTATED CHECKLIST OF VASCULAR PLANTS

The following species have thus far been identified from the Draper's Bluff study area. The order of listing follows that of Mohlnebrock (1975). Habitat and relative abundance within the habitat are noted for each taxon. Relative abundance is listed as being common, occasional, uncommon, or rare. The number refers to the representative voucher specimen on file in the herbarium at Southern Illinois University in Carbondale. Where other botanists' collections are cited, the collector's name and specimen number are included.

A total of 34 county records were recorded for the study area. Unpublished county records are denoted by a single asterisk (*) if reported for Union County, and a double asterisk (**) if reported for Johnson County. The source used to determine current species distributions within the state of Illinois was Mohlenbrock and Ladd (1978).

PTERIDOPHYTA

OPHIOGLOSSACEAE

*Botrychium biternatum (Sav.) Underw. Dry open woods; rare; 460.

Botrychium dissectum Spreng. var. obliquum (Muhl.) Clute. Open woods; common; 108.

Botrychium virginianum (L.) Sw. Rich woods; common; 193.

POLYPODIACEAE

Adiantum pedatum (Tourn.) L. Rich mesic woods; common; 258.

Asplenium pinnatifidum Nutt. Crevices of sandstone cliffs; uncommon; 237.

Asplenium platyneuron (L.) Oakes. Dry woods; common; 237.

Asplenium rhizophyllum L. On sandstone rocks in moist woods; occasional; 126.

Asplenium trichomanes L. On moist sandstone boulders in mesic canyon; rare; 423.

Athyrium pycnocarpon (Spreng.) Tidestr. Moist sandy soil in mesic canyon; uncommon; 432.

Athyrium thelypteroides (Michx.) Desv. Moist sandy soil in mesic canyon; uncommon; 431.

Cheilanthes lanosa (Michx.) D.C. Eat. Dry bluffs; occasional; 260.

Cystopteris fragilis (L.) Bernh. var. protrusa Weath. Moist woods; common; 434.

Dryopteris marginalis (L.) Gray. Woods; common; 102.

Dryopteris intermedia (Muhl.) Gray. Moist sandy soil in mesic canyon; uncommon; 433.

Onoclea sensibilis L. Rich mesic woods; uncommon; 419.

Polypodium polypodioides (L.) Watt. var. michauxianum Weath. On sandstone rocks in dry woods; uncommon; 107.

Polypodium vulgare L. var. virginianum (L.) Eat. On shaded sandstone rocks; occasional; 101.

Polystichum acrostichoides (Michx.) Schott. Woods; common; 631.

Pteridium aquilinum (L.) Kuhn. var. latiusculum (Desv.) Underw. Base of bluff; Wilson 1434 (SIU).

Thelypteris hexagonoptera (Michx.) Weath. Rich mesic woods; occasional; 249.

Woodsia obtusa (Spreng.) Torr. Blufftops and upland woods; occasional; 262.

GYMNOSPERMAE

PINACEAE

Pinus echinata Mill. Old field; escaped from pine plantation; 605.

CUPRESSACEAE

Juniperus virginiana L. Blufftops and old fields; common; 210.

ANGIOSPERMAE

TYPHACEAE

Typha latifolia L. Marshy area along Lick Creek. Occasional; 569.

ALISMACEAE

Alisma subcordatum Raf. Low wet ground; occasional; 586.

POACEAE

Agrostis alba L. Open woods; common; 421.

Agrostis hyemalis (Walt.) BSP. Old field; common; 522.

Agrostis perennans (Walt.) Tuckerm. Bluff ledge; occasional; 603.

Aleopecurus carolinianus Walt. Moist soil on bluff; occasional; 521.

Andropogon gerardii Vitman. Old field; common; 650.

Andropogon virginicus L. Old field; common; 651.

Aristida dichotoma Michx. Rock outcrop; occasional; 610.

Arundinaria gigantea (Walt.) Chapm. Along creek; common; 565.

Bromus commutatus Schrad. Marshy area; common; 564.

Bromus pubescens Muhl. Mesic woods; common; 566.

Bromus racemosus (L.) Chess. Disturbed area; occasional; 567.

Chasmanthium latifolium (Michx.) Yates. Moist open woods; common; 296.

Cinna arundinacea L. Pond margin; uncommon; 322.

Dactylis glomerata L. Old field; common; non-native; 299.

Danthonia spicata (L.) Beauv. Blufftop woods; common; 218.

Digitaria sanguinalis (L.) Scop. Fields; common; 641.

Echinochloa pungens (Poir.) Rydb. Moist soil; occasional; 384.

Elymus canadensis L. Disturbed area; common; 292.

Elymus hystrix L. Woods; common; 398.

Elymus virginicus L. Woods; common; 316.

Eragrostis capillaris (L.) Nees. Dry rocky woods; occasional; 361.

Festuca obtusa Bieler. Moist woods; occasional; 185.

*Festuca ovina L. var. duriuscula (L.) Koch. Along creek; uncommon; 562.

Festuca pratensis Huds. Bluff-top woods; common; 346.

Glyceria striata (Lam.) Hitchc. Old field; common; 291.

Leersia virginica Willd. Mesic woods; common; 602.

Muhlenbergia sobolifera (Muhl.) Trin. Blufftop woods; common; 349.

Panicum anceps Michx. Disturbed area; common; 356.

Panicum boscii Poir. Woods; common; 224.

Panicum lanuginosum Ell. Bluff ledge; common; 283.

Panicum lanuginosum Ell. var. implicatum (Scribn.) Fern. Shaded depression on bluff ledge; occasional; 341.

Panicum latifolium L. Dry rocky woods; common; 541.

Panicum linearfolium Scribn. Dry blufftop woods; occasional; 481.

Panicum microcarpon Muh. Woods; occasional; 223.

Panicum polyanthes Schult. Moist woods; occasional; 266.

*Panicum praecocius Hitchc. and Chase. Sandy soil on bluff; uncommon; 372.

Panicum rigidulum Bosc. Pond margin; common; 596.

**Panicum villosissimum Nash. Blufftop woods; occasional; 225.

Paspalum ciliatifolium Michx. Rock outcrop; common; 303.

Paspalum laeve Michx. Disturbed area; common; 651.

Phleum pratense L. Disturbed area; common; 286.

**Poa angustifolia L. Old field; rare; 534.

Poa annua L. Old field; common; 495.

Poa pratensis L. Trail in woods; occasional; 517.

Poa sylvestris Gray. Floodplain woods; uncommon; 531.

Schizachyrium scoparium (Michx.) Nash. Old field; common; 360.

Setaria lutescens (Weigel.) Hubb. Disturbed area; common; 387.

Sorghastum nutans (L.) Nash. Old field; common; 385.

Sphenopholis obtusata (Michx.) Scrib. Blufftop woods; occasional; 535.

Sphenopholis obtusata (Michx.) Scrib. var. major (Torr.) Erdman. Old field; occasional; 472.

Tridens flavus (L.) Hitchc. Old field; common; 591.

Vulpia octoflora (Walt.) Rydb. var. tenella Willd. Blufftop; common; 493.

CYPERACEAE

**Carex albursina Sheldon. Woods; uncommon; 468.

Carex artitecta Mack. Dry woods; common; 469.

Carex blanda Dewey. Mesic woods; occasional; 489.

*Carex bushii Mack. Woods; occasional; 211.

**Carex careyana Torr. Mesic woods; rare; 508.

Carex cephalophora Muhl. Dry blufftop woods; common; 510.

**Carex comosa Boott. wet ground; rare; 567.

Carex convoluta Mack. Wooded slopes; uncommon; 281.

Carex flaccosperma Dewey. Woods; occasional; 511.

Carex glaucodea Tuckerm. Old field; occasional; 525.

*Carex gravida Bailey. Old field; rare; 551.

Carex hirsutella Mack. Old field; common; 277.

**Carex lurida Wahlenb. Floodplain woods; occasional; 526.

Carex retroflexa Muhl. Dry woods; occasional; 276.

Carex rosea Schk. Rich mesic woods; occasional; 552.

*Carex scoparia Schk. Old field; uncommon;

Carex shortiana Dewey. Lowland woods; uncommon; 527.

**Carex sparganioides Muhl. Pond margin; rare; 485.

**Carex texensis (Torr.) Bailey. Low moist woods; uncommon; 484.

Carex tribuloides Wahlenb. Wet ground; occasional; 568.

Carex vulpinoidea Michx. Old field; common; 320.

Cyperus ovularis (Michx.) Torr. Sandy soil on bluff; common; 298.

Cyperus strigosus L. Disturbed area; common; 447.

Eleocharis obtusa (Willd.) Schult. Wet ground; common; 570.

Scirpus atrovirens Will. Wet ground; common; 580.

Scirpus cyperinus (L.) Kunth. Wet ground; common; 287.

Scirpus georgianus Harper. Pond margin; occasional; 238.

ARACEAE

Arisaema dracontium (L.) Schott. Rich woods; common; 523.

Arisaema triphyllum (L.) Schott. Woods; common; 105.

COMMELINACEAE

Commelina communis L. Moist woods; occasional; non-native; 353.

Tradescantia ohiensis Raf. Disturbed area; occasional; 593.

Tradescantia virginiana L. Open woods; common; 169.

JUNCACEAE

Juncus acuminatus Michx. Wet ground; occasional; 172.

Juncus biflorus Ell. Wet ground; occasional; 271.

Juncus dudleyi Wieg. Moist ground; occasional; 270.

Juncus effusus L. var. solutus Fern. and Wieg. Wet ground; common; 575.

Juncus interior Wieg. Olf field; common; 365.

Juncus tenuis Willd. Disturbed area; common; 407.

Luzula multiflora (Retz.) Lejeune. Rocky woods; common; 144.

Luzula multiflora (Retz.) Lejeune var. echinata (Small) Muhl. Old field; occasional; 483.

LILIACEAE

Allium canadense L. Old field; common; 550.

Erythronium albidum Nutt. Floodplain woods; uncommon; 637.

Erythronium americanum Ker. Mesic woods; common; 128.

Hemerocallis fulva L. Streambank; non-native; uncommon; 574.

Hypoxis hirsuta (L.) Coville. Dry rocky woods; occasional; 503.

Narcissus pseudo-narcissus L. Old homesite; uncommon; 458.

Nothoscordum bivalve (L.) Britt. Bluff; common; 133.

Polianthes virginica (L.) Shinners. Bluff; occasional; 632.

Polygonatum commutatum (Schultz.) A. Dietr. Moist woods; occasional; 470.

Smilacina racemosa (L.) Desf. Rich woods; common; 111.

Trillium flexipes Raf. Rich mesic woods; occasional; 139.

Trillium recurvatum Beck. Rich woods; common; 116.

Uvularia grandiflora Sm. Rich woods; common; 130.

SMILACACEAE

Smilax bona-nox L. Dry woods; common; 544.

Smilax glauca Walt. Olf field; common; 543.

Smilax hispida Muhl. Flood-plain woods; common; 542.

DIOSCORACEAE

Dioscorea quaternata (Walt.) J. F. Gmel. Woods; occasional; 554.

Dioscorea villosa L. Trail in woods; common; 528.

IRIDACEAE

Sisyrinchium albidum Raf. Dry woods; occasional; 176.

Sisyrinchium angustifolium Mill. Moist woods; occasional; 187.

ORCHIDACEAE

Aplectrum hyemale (Muhl.) Torr. Mesic woods; uncommon; 618.

Corallorhiza wisteriana Conrad. Rich woods; occasional; 145.

Orchis spectabilis L. Rich mesic woods; locally abundant; 498.

Spiranthes cernua (L.) Rich. Old field and edge of woods; occasional; 454.

*Spiranthes vernalis Engelm. & Gray. Old field; rare; 588.

SAURURACEAE

Saururus cernuus L. Wet ground; uncommon; 571.

SALICACEAE

Populus deltoides Marsh. Flood-plain woods; occasional; 533.

Salix interior Rowlee. Stream-bank; occasional; 620.

Salix nigra Marsh. Streambank; occasional; 539.

JUGLANDACEAE

Carya cordiformis (Wang.) K. Koch. Mesic woods; common; 607.

Carya glabra (Mill.) Sweet. Woods; common; 587.

Carya ovalis (Wang.) Sarg. Woods; common; 253.

Carya ovata (Mill.) K. Koch. Rich woods; occasional; 644.

Carya texana Buckl. Dry woods; uncommon; 418.

Carya tomentosa (Poir.) Nutt. Dry blufftop woods; occasional; 609.

Juglans nigra L. Rich rocky woods; occasional; 514.

BETULACEAE

Carpinus caroliniana Walt. Mesic woods; common; 645.

Corylus americana Walt. Woods; common; 454.

Ostrya virginiana (Mill.) K. Koch. Woods; common; 179.

FAGACEAE

Fagus grandiflora Ehrh. Low rich woods; occasional; 638.

Quercus alba L. Upland woods; common; 553.

Quercus coccinea Muenchh. Upland woods; uncommon; 597.

Quercus imbricaria Michx. Dry woods; common; 509.

Quercus macrocarpa Michx. Low ground; occasional; 579.

Quercus marilandica Muenchh. Dry rocky woods; common; 259.

Quercus muhlenbergii Engelm. Woods; common; 259.

Quercus palustris Muenchh. Low woods; occasional; 628.

Quercus rubra L. Upland woods; common; 473.

Quercus shumardii Buckley. Moist woods; occasional; 443.

Quercus stellata Wang. Dry woods; common; 308.

Quercus velutina Lam. Upland woods; common; 506.

ULMACEAE

Celtis occidentalis L. Low woods; occasional; 490.

Celtis occidentalis L. var. pumila (Pursh) Gray. Floodplain woods; occasional; 261.

Ulmus alata Michx. Rocky woods; common; 241.

Ulmus americana L. Woods; common; 621.

Ulmus rubra Muhl. Upland woods; common; 524.

MORACEAE

Morus alba L. Woods; occasional; non-native; 371.

Morus rubra L. Woods; common; 268.

URTICACEAE

Boehmeria cylindrica (L.) Sw. Low woods; common; 614.

Pilea opaca (Lunell) Rydb. Floodplain woods; uncommon; 368.

Pilea pumila (L.) Gray. Floodplain woods; common; 412.

ARISTOLOCHIACEAE

Asarum canadense L. var. reflexum (Bickn.) Robins. Mesic woods; common; 648.

POLYGONACEAE

Polygonum convolvulus L. Disturbed area; common; non-native; 396.

*Polygonum pennsylvanicum L. Disturbed area; occasional; 332.

Polygonum pennsylvanicum L. var. laevigatum Fern. Wet ground; common; 354.

Polygonum punctatum Ell. Wet ground; common; 280.

Polygonum tenue Michx. Sandy soil on bluff; occasional; 358.

Polygonum virginianum L. Disturbed area; common; 357.

Rumex acetosella L. Wet ground; common; non-native; 186.

Rumex crispus L. Disturbed area; common; non-native; 529.

CHENOPODIACEAE

Chenopodium album L. Disturbed area; common; 643.

PHYTOLACCACEAE

Phytolacca americana L. Disturbed area; common;

PORTULACACEAE

Claytonia virginica L. Woods; common; 119.

Tallinum parviflorum Nutt. Bluff ledge; uncommon; 269.

CARYOPHYLLACEAE

Cerastium vulgatum L. Disturbed area; common; non-native; 160.

Dianthus armeria L. Old field; common; non-native; 219.

Silene stellata L. Woods; occasional; 344.

*Stellaria graminea L. Disturbed area; occasional; non-native; 494.

Stellaria media (L.) Cyrillo. Disturbed woods; common; non-native; 619.

RANUNCULACEAE

Actaea pachypoda L. Rich woods; common; 147.

Anemone virginiana L. Dry open woods; common; 294.

Aquilegia canadensis L. On rocks and outcrops in woods; occasional; 257.

Delphinium tricorne Michx. Moist woods; occasional; 134.

Hydrastis canadensis L. Rich woods; uncommon; 520.

Isopyrum biternatum (Raf.) Torr. & Gray. Rich woods; common; 122.

Ranunculus abortivus L. Moist woods; common; 143.

Ranunculus fascicularis Muhl. Moist open woods; occasional; 464.

Ranunculus hispidus Michx. Rich woods; common; 112.

Ranunculus recurvatus Poir. Moist woods; common; 165.

Ranunculus septentrionalis Poir. Moist woods; common; 478.

Ranunculus septentrionalis Poir. var. caricetorum (Greene) Fern. Low woods; uncommon; 627.

BERBERIDACEAE

Caulophyllum thalictroides (L.) Michx. Rich woods; occasional; 129.

Podophyllum peltatum L. Open woods; common; 208.

MENISPERMACEAE

Menispermum canadense L. Mesic woods; occasional; 634.

MAGNOLIACEAE

Liriodendron tulipifera L. Rich slope woods; common; 515.

ANNONACEAE

Asimina triloba (L.) Dunal. Rich mesic woods; common; 647.

LAURACEAE

Lindera benzoin (L.) Blume. Rich mesic woods; common; 370.

Sassafras albidum (Nutt.) Nees. Old field; common; 131.

PAPAVERACEAE

Corydalis flavula (Raf.) DC. Moist woods; common; 120.

Dicentra canadensis (Goldie) Walp. Rich mesic woods; uncommon; 457.

Dicentra cucullaria (L.) Bernh. Rich woods; common; 110.

Sanguinaria canadensis L. Rich moist woods; common; 114.

Stylophorum diphyllum (Michx.) Nutt. Rich woods; uncommon; 138.

CRUCIFERAE

Arabidopsis thaliana (L.) Heynh. Blufftop; occasional; non-native; 461.

Arabis laevigata (Muhl.) Poir. On boulders in woods; common; 146.

Barbarea vulgaris R. Br. var. arcuata (Opiz) Fries. Disturbed area; common; non-native; 152.

Cardamine hirsuta L. Moist woods; occasional; non-native; 103.

Cardamine parviflora L. var. arenicola (Britt.) O.E. Schultz. Woods; occasional; 163.

Dentaria laciniata Muhl. Woods; common; 109.

Draba brachycarpa Nutt. Moist rocky ledges; common; 639.

Draba verna L. Old fields; common; non-native; 462.

Lepidium virginicum L. Old field; common; 232.

Rorippa islandica (Oeder) Borbas var. fernaldiana Butt. & Abbe. Wet ground; common; 582.

Rorippa sessiliflora (Nutt.) Hitchc. Wet ground; occasional; 583.

CRASSULACEAE

Sedum pulchellum Michx. Bluff; common; 229.

SAXIFRAGACEAE

Heuchera hirsuticaulis (Wheelck.) Rydb. Dry woods; common; 155.

Heuchera parviflora Bartl. var. rugelii (Shuttlw.) Rosend., Butt. and Lak. Moist ledges; common; 251.

Hydrangea arborescens L. Moist rocky woods; common; 233.

HAMAMELIDACEAE

Liquidambar styraciflua L. Flood-plain woods; common; 537.

PLATANACEAE

Platanus occidentalis L. Flood-plain woods; common; 613.

ROSACEAE

Agrimonia parviflora Ait. Stream-bank; occasional; 359.

Agrimonia rostellata Wallr. Low woods; common; 293.

Amelanchier arborea (Michx.f.) Fernald. Bluff edges and dry woods; common; 106.

Crataegus engelmanii Sarg. Old field; occasional; 500.

Crataegus pruinosa (Wendl.) K. Koch. Old field; occasional; 501.

Geum canadense Jacq. Woods; common; 252.

Geum vernum (Raf.) Torr. & Gray. Low woods; common; 149.

Gillenia stipulata (Muhl.) Baill. Woods; uncommon; 557.

Malus pumila Mill. Near abandoned building; rare; non-native; 453.

Potentilla recta L. Old field; occasional; 630.

Potentilla simplex Michx. Old field; common; 150.

Prunus americana Marsh. Old field; occasional; 474.

*Prunus munsoniana Wight & Hedrick. Old field; occasional; 475.

Prunus serotina Ehrh. Bluffs; common; 476.

**Prunus virginiana L. Old field; rare; 302.

Rosa carolina L. Old field; common; 199.

Rosa multiflora Thunb. Old field; common; non-native; 189.

Rosa setigera Michx. Old field; occasional; 623.

Rubus allegheniensis Potter. Disturbed area; common; 222.

Rubus flagellaris Willd. Dry blufftop woods; occasional; 190.

Rubus occidentalis L. Edge of woods and field; common; 497.

Rubus occidualis Bailey. Edge of woods on bluff; rare; 491.

Rubus pennsylvanicus Poir. Old field; occasional; 561.

LEGUMINOSAE

Amphicarpa bracteata (L.) Fern. Edge of old field; occasional; 378.

Cassia fasciculata Michx. Old field; common; 321.

Cercis canadensis L. Woods; common; 127.

Clitoria mariana L. Dry woods; uncommon; 323.

Crotolaria sagittalis L. Old field; common; 350.

Desmodium glutinosum (Muhl.) Wood. Rich woods; occasional; 328.

Desmodium laevigatum (Nutt.) DC. Dry woods; uncommon; 300.

Desmodium marilandicum (L.) DC. Dry woods; uncommon; 381.

Desmodium rigidum (Ell.) DC. Dry woods; uncommon; 640.

Desmodium nudiflorum (L.) DC. Woods; occasional; 330.

Desmodium nuttallii (Schindl.) Schub. Woods; uncommon; 383.

Desmodium paniculatum (L.) DC. Dry woods; occasional; 317.

Galactia volubilis (L.) Britt. var. mississippiensis Vail. Blufftop woods; uncommon; 317.

Gleditsia triacanthos L. Woods; occasional; 404.

Lespedeza cuneata (Dum.-Cours.) G. Don. Fields; occasional; non-native; 440.

Lespedeza hirta (L.) Hornem. Edge of dry woods; occasional; 601.

Lespedeza procumbens Michx. Old field and dry woods; occasional; 367.

Lespedeza repens (L.) Bart. Disturbed area; occasional; 409.

Lespedeza stipulacea Maxim. Fields; common; non-native; 288.

Lespedeza virginica (L.) Britt. Dry woods; occasional; 369.

Melilotus alba Desr. Old fields; common; non-native; 540.

Melilotus officinalis (L.) Lam. Old fields; common; non-native; 578.

Psoralea psoralioides (Walt.) Cory var. eglandulosa (Ell.) Freeman. Dry slope woods; occasional; 536.

Robinia pseudoacacia L. Edge of woods; occasional; 590.

Stylosanthes biflora (L.) BSP. Blufftop; common; 217.

Tephrosia virginiana (L.) Pers. Bluff; uncommon; 255.

Trifolium arvense L. Moist disturbed area; occasional; non-native; 581.

Trifolium campestre Schreb. Disturbed area; occasional; non-native; 202.

Trifolium dubium Sibth. Moist disturbed area; uncommon; 576.

Trifolium hybridum L. Moist disturbed area; occasional; 577.

Trifolium pratense L. Old fields and disturbed areas; common; non-native; 205.

Trifolium repens L. Old field; common; non-native; 204.

OXALIDACEAE

Oxalis dillenii Jacq. Disturbed area; common; 178.

Oxalis violacea L. Woods; common; 177.

GERANIACEAE

Geranium carolinianum L. Slope woods; common; 200.

Geranium maculatum L. Rich woods; common; 137.

RUTACEAE

Xanthoxylum americanum Mill. Lowland woods; rare; 612.

SIMAROUBACEAE

Ailanthus altissima (Mill.) Sw. Edge of woods; rare; non-native; 351.

EUPHORBIACEAE

Acalypha gracilens Gray. Woods and fields; occasional; 265.

Crotonopsis elliptica Willd. Bluff; occasional; 297.

Euphorbia corollata L. Old field; common; 243.

ANACARDIACEAE

Rhus aromatica Ait. Upland woods; occasional; 132.

Rhus copallina L. Old fields; common; 555.

Rhus glabra L. Old field; common; 626.

Toxicodendron radicans (L.) Kuntze. Woods; common; 652.

AQUIFOLIACEAE

Ilex decidua Walt. Moist woods; occasional; 558.

CELASTRACEAE

Euonymus atropurpureus Jacq. Mesic ravine; occasional; 502.

STAPHYLEACEAE

Staphylea trifolia L. Mesic woods; common; 463.

ACERACEAE

Acer negundo L. Mesic woods; common; 318.

Acer rubrum L. Rocky woods; common; 444.

Acer rubrum L. var. rubrum L. f. tomentosum (Desf.) Dansereau. Dry wooded slope; rare; 466.

Acer saccharinum L. Flood-plain woods; occasional; 563.

Acer saccharum Marsh. Rich woods; common; 487.

Acer saccharum Marsh. var. schneckii Rehder. Rich woods; occasional; 507.

BALSAMINACEAE

Impatiens biflora Walt. Flood-plain woods; common; 336.

RHAMNACEAE

Ceanothus americanus L. Mesic woods; occasional; 212.

VITACEAE

Parthenocissus quinquifolia (L.) Planch. Woods; common; 305.

Vitis aestivalis Michx. Rocky woods; common; 242.

Vitis cenerea Engelm. Woods; common; 516.

HYPERICACEAE

Ascyrum hypericoides L. var. multicaule (Michx.) Fern. Dry woods; common; 295.

Hypericum drummondii (Grev. & Hook.) Torr. & Gray. Old field; common; 364.

Hypericum gentianoides (L.) BSP. Bluff ledge; occasional; 290.

Hypericum punctatum Lam. Old field; common; 272.

CISTACEAE

Lechea tenuifolia Michx. Blufftop; occasional; 289.

VIOLACEAE

Hybanthus concolor (T. F. Forst.) Spreng. Rich woods; common; 273.

**Viola pratincola Greene. Woods; rare; 118.

Viola pubescens Ait. Moist woods; occasional; 141.

Viola rafinesquii Greene. Old field; common; non-native; 158.

Viola sororia Willd. Woods; common; 115.

Viola striata Ait. Moist woods; occassional; 898.

Viola triloba Schwein. Wooded slopes; common; 488.

Viola triloba Schwein var. dilatata (Ell.) Brainerd. Dry blufftop woods; occasional; 864.

PASSIFLORACEAE

Passiflora lutea L. var. glabriflora Fern. Thicket in old field; occasional; 284.

CACTACEAE

Opuntia compressa (Salisb.) Macbr. Bluff; occasional; 246.

NYSSACEAE

Nyssa sylvatica Marsh. Mesic woods; common; 231.

ONAGRACEAE

Circaea quadrisulcata (Maxim.) Franch. and Sav. Moist woods; occasional; 236.

Ludwigia alternifolia L. Old fields; occasional; 309.

Oenothera biennis L. Old fields; common; 340.

Oenothera linifolia Nutt. Bluff ledges; occasional; 174.

ARALIACEAE

Aralia spinosa L. Wooded slopes; occasional; 649.

Panax quinquefolius L. Rich rocky woods; uncommon; 198.

UMBELLIFERAE

Chaerophyllum procumbens (L.) Crantz. Rich moist woods; common; 471.

Cryptotaenia canadensis (L.) DC. Wet ground; occasional; 237.

Daucus carota L. Old field; common; non-native; 327.

Erigenia bulbosa (Michx.) Nutt. Rich moist woods; common; 121.

Osmorhiza claytonii (Michx.) Clarke. Rich woods; occasional; 152.

Osmorhiza longistylis (Torr.) DC. var. villicaulis Fern. Rich woods; uncommon; 245.

Polytaenia nutallii DC. Rocky woods; occasional; 188.

Sanicula canadensis L. Woods; occasional; 285.

Sanicula gregaria Bickn. Floodplain woods; occasional; 240.

Thaspium trifoliatum (L.) Gray. Rocky woods; uncommon; 164.

Thaspium trifoliatum (L.) Gray. var. flavum Blake. Rocky woods; occasional; 206.

CORNACEAE

Cornus florida L. Edge of old fields and woods; common; 113.

Cornus racemosa Lam. Slope woods; common; 642.

ERICACEAE

Monotropa hypopithys L. Dry woods, on decomposed log; rare; 339.

Vaccinium arboreum Marsh. Bluffs and dry slopes; common; 230.

Vaccinium vacillans Torr. Bluffs; occasional; 159.

PRIMULACEAE

Dodecatheon frenchii (Vasey) Rydb. Bases of cliffs and overhangs; occasional; 194.

Dodecatheon meadia L. Open woods; common on bluff; 195.

Lysimachia ciliata L. Lowland woods; occasional; 248.

Lysimachia lancolata Walt. Moist woods; common; 247.

Samolus parviflorus Raf. On rock in stream; uncommon; 394.

EBENACEAE

Diospyros virginiana L. Old field; common; 220.

OLEACEAE

Fraxinus americana L. Woods; common; 547.

Fraxinus pennsylvanica Marsh. Upland woods; occasional; 532.

Fraxinus pennsylvanica Marsh. var. subintegerrima (Vahl) Fern. Woods; common; 512.

LOGANIACEAE

Spigelia marilandica L. Mesic woods; uncommon; 234.

GENTIANACEAE

Obolaria virginica L. Rich mesic woods; rare; 504

Sabatia angularis (L.) Pursh. Old field; uncommon; 310.

Swertia caroliniensis (Walt.) Kuntze. Rich woods; occasional; 546.

APOCYNACEAE

Apocynum cannabinum L. Old field; common; 239.

ASCLEPIADACEAE

Asclepias syriaca L. Old field; common; 264.

Asclepias tuberosa L. var. interior (Woods.) Shinners. Old field; common; 263.

Asclepias variegata L. Rocky slope woods; uncommon; 215.

Asclepias verticillata L. Old field; uncommon; 422.

CONVOLVULACEAE

Convolvulus arvensis L. Old field; occasional; non-native; 324.

Ipomoea lacunosa L. Old field; occasional; 406.

POLEMONIACEAE

Phlox bifida Beck. Upland woods; common; 117.

Phlox divaricata L. ssp. laphamii (Wood) Wherry. Woods; common; 124.

Phlox pilosa L. Dry slope woods; occasional; 499.

Polemonium reptans L. Moist low woods; occasional; 140.

HYDROPHYLLACEAE

Hydrophyllum appendiculatum Michx. Rich woods; occasional; 180.

Hydrophyllum virginianum L. Low rich woods; occasional; 192.

Phacelia bipinnatifida Michx. Rich rocky woods; occasional; 197.

BORAGINACEAE

Cynoglossum virginianum L. Rich wooded slopes; occasional; 157.

Myosotis virginica (L.) BSP. Old field; occasional; 467.

VERBENACEAE

Verbena hastata L. Disturbed area; common; 345.

Verbena simplex Lehm. Old field; occasional; 326.

Verbena urticifolia L. Old field; occasional; 366.

LABIATAE

Blephilia ciliata (L.) Benth. Old field; common; 214.

**Collinsonia canadensis L. Rocky woods; uncommon; 377.

Cunila origanoides (L.) Britt. Dry rocky slopes and bluff; common; 380.

Glecoma hederacea L. var. micrantha Moricand. Floodplain woods; occasional; non-native; 123.

Monarda bradburiana Beck. Dry woods; occasional; 168.

Monarda fistulosa L. Dry woods; occasional; 589.

Prunella vulgaris L. Old field; common; non-native; 228.

Prunella vulgaris L. var. lanceolata (Bart.) Fern. Old field; occasional; 629.

Pycnanthemum incanum (L.) Michx. Old field; occasional; 337.

*Pycnanthemum pilosum Nutt. Old field; rare; 342.

Pycnanthemum tenuifolium Schrad. Old field; common; 267.

*Scutellaria parvula Michx. var. australis Fassett. Blufftop; occasional; 518.

*Scutellaria parvula Michx. var. leonardii (Epling) Fern. Rocky woods; occasional; 175.

Stachys tenuifolia Willd. Moist disturbed area; occasional; 625.

SOLANACEAE

Solanum carolinense L. Old field; common; 250.

SCROPHULARIACEAE

Collinsia verna Nutt. Rich floodplain woods; occasional; 135.

*Gerardia fasciculata Ell. Old field; uncommon; 402.

Gerardia flava L. Rocky woods; common; 386.

Gerardia tenuifolia Vah. Old field; common; 439.

Lindernia dubia (L.) Pennell. Open woods; occasional; 538.

Mimulus alatus Ait. Dry creek bed; occasional; 425.

**Penstemon alluviorum Pennell. Floodplain woods; rare; 545.

Penstemon digitalis Nutt. Woods; occasional; 560.

Penstemon pallidus Small. Blufftop woods; common; 167.

Scrophularia marilandica L. Disturbed are; occasional; 329.

Verbascum thapsus L. Disturbed area; occasional; non-native; 348.

Veronica arvensis L. Old field; occasional; non-native; 151.

Veronicastrum virginicum (L.) Farw. Disturbed area; uncommon; 325.

BIGNONIACEAE

Campsis radicans (L.) Seem. Old field, edge of woods; common; 646.

OROBANCHACEAE

Epifagus virginiana (L.) Bart. Parasitic on beech roots; occasional; 399.

Orobanche uniflora L. Rich slope woods; rare; 153.

ACANTHACEAE

Ruellia humilis Nutt. Dry blufftop woods; common; 382.

Ruellia pedunculata Torr. Rich rocky woods; occasional; 226.

PLANTAGINACEAE

Plantago aristata Michx. Old field; common; 244.

Plantago lanceolata L. Old fields and trails; common; 173.

Plantago pusilla Nutt. Blufftop; occasional; 530.

Plantago rugelii Dcne. Old field; common; 307.

Plantago virginica L. Bluff ledge; common; 207.

RUBIACEAE

Cephalanthus occidentalis L. Pond; rare; 600.

Diodia teres Walt. Old field; occasional; 301.

Galium aparine L. Woods; common; 156.

Galium circaezans Michx. Mesic woods; common; 513.

Galium pilosum Ait. Blufftop woods; common; 333.

Galium tinctorium L. Low wet woods; rare; 573.

Galium triflorum Michx. Wet woods; occasional; 216.

Houstonia longifolia Gaertn. var. tenuifolia (Nutt.) Wood. Blufftop woods; common; 181.

Houstonia pusilla Schoepf. Rocky woods; common; 136.

CAPRIFOLIACEAE

Lonicera japonica Thunb. Disturbed areas; common; non-native; 635.

Sambucus canadensis L. Moist disturbed area; common; 479.

Symphoricarpos orbiculatus Moench. Dry woods and rock outcrops; occasional; 622.

Triosteum angustifolium L. On rocks in dry woods; uncommon; 154.

VALERIANACEAE

Valeriana pauciflora Michx. Low woods; uncommon; 184.

Valerianella radiata Dufr. Wet disturbed area; occasional; 203.

CAMPANULACEAE

Campanula americana L. Roadside; common; 319.

Lobelia cardinalis L. Old field; occasional; 424.

Lobelia inflata L. Old field; common; 338.

Lobelia puberula Michx. Open woods; occasional; 410.

Specularia perfoliata (L.) A. DC. Bluff; common; 221.

COMPOSITAE

Achillea millefolium L. Old field; common; non-native; 161.

Ambrosia artemisiifolia L. Disturbed area; common; 375.

Ambrosia bidentata Michx. Old field; common; 376.

Antennaria plantaginifolia (L.) Richards. Dry upland woods; common; 125.

Arctium minus (Hill) Bernh. Disturbed area; occasional; 352.

**Aster anomalus Engelm. Bluff-top woods; occasional; 446.

Aster cordifolius L. Woods; occasional; 256.

*Aster dumosus L. Old field; rare; 604.

Aster oblongifolius Nutt. Dry blufftop woods; occasional; 611.

Aster ontarionis Wieg. Disturbed area; common; 437.

Aster patens Ait. Old field; occasional; 395.

Aster pilosus Willd. Old field; common; 438.

Aster praealtus Poir. Old field; occasional; 279.

Aster shortii Lindl. Floodplain woods; common; 616.

Aster simplex Willd. Lowland woods; common; 615.

Aster turbinellus Lindl. Old field; occasional; 420.

Aster vimineus Lam. Old field; occasional; 436.

Bidens aristosa L. Old field; common; 392.

Bidens coronata (L.) Britt. Old field; occasional; 374.

Cacalia atriplicifolia L. Disturbed area; occasional; 391.

Cacalia muhlenbergii (Sch.-Bip.) Fern. Woods; uncommon; 254.

Chrysanthemum leucanthemum L. Old field; common; non-native; 201.

Circium discolor (Muhl.) Spreng. Old field; occasional; 379.

Elephantopus carolinianus Willd. Disturbed area; occasional; 390.

Erechtites hieracifolia (L.) Raf. Pond margin; occasional; 599.

Erigeron annuus (L.) Pers. Disturbed area; common; 556.

Erigeron philadelphicus L. Disturbed area in woods; common; 196.

**Erigeron pulchellus Michx. Low woods; occasional; 496.

Erigeron strigosus Muhl. Disturbed area; occasional; 400.

Eupatorium coelestinum L. Moist disturbed area; occasional; 401.

*Eupatorium fistulosum Barratt. Wet ground; rare; 572.

Eupatorium purpureum L. Edge of woods; common; 331.

Eupatorium rugosum Houtt. Moist disturbed area; occasional; 592.

Eupatorium serotinum Michx. Woods; common; 595.

Gnaphalium obtusifolium L. Disturbed area; occasional; 653.

Gnaphalium purpureum L. Open woods; occasional; 183.

Helenium autumnale L. Old field; occasional; 334.

Helianthus decapetalus L. Dry open woods; occasional; 335.

Helianthus divaricatus L. Open woods; common; 304.

Helianthus hirsutus Raf. Open woods; occasional; 636.

Helianthus microcephalus Torr. & Gray. Moist disturbed area; occasional; 274.

**Helianthus occidentalis Riddell. Field on bluff; rare; 182.

Helianthus strumosus L. Woods; occasional; 362.

Heliopsis helianthoides (L.) Sweet. Old field; occasional; 213.

Hieracium gronovii L. Old field; occasional; 363.

Iva annua L. Parking lot; uncommon; 598.

Krigia biflora (Walt.) Blake. Old field; common; 170.

Krigia dandelion (L.) Nutt. Open woods; occasional; 191.

Krigia oppositifolia Raf. Bluff-top; occasional; 171.

Krigia virginica (L.) Willd. Bluff; uncommon; 306.

Lactuca canadensis L. Disturbed area; common; 355.

Polymnia canadensis L. Base of cliff in woods; occasional; 278.

Prenanthes altissima L. Disturbed area; occasional; 411.

Pyrrhopappus carolinianus (Walt.) DC. Dry woods; occasional; 343.

Rudbeckia hirta L. Old field; common; 227.

Senecio glabellus Poir. Moist disturbed area; common; 166.

Silphium perfoliatum L. Moist disturbed area; occasional; 408.

Solidago caesia L. Base of cliff; occasional; 445.

Solidago canadensis L. Old field; common; 393.

*Solidago graminifolia (L.) Salisb. Old field; occasional; 389.

**Solidago juncea Ait. Open woods; common; 311.

Solidago nemoralis Ait. Old field; common; 426.

**Solidago patula Muhl. Moist woods; uncommon; 373.

Solidago petiolaris Ait. Rock outcrop; uncommon; 606.

Solidago ulmifolia Muhl. Disturbed area; common; 377.

Taraxacum officinale Weber. Disturbed area; common; non-native; 624.

Verbesina alternifolia (L.) Britt. Moist open woods; occasional; 403.

Verbesina helianthoides Michx. Open woods on bluff; common; 275.

Vernonia gigantea (Walt.) Trel. Disturbed area; common; 405.

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