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The Vascular Flora of Starr's Cave State Preserve

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Starr's Cave State Preserve is a 140 acre tract of wooded bottomlands and limestone bluffs along Flint Creek in Des Moines County, southeastern Iowa. The vascular flora of the preserve was inventoried in 1975-79. This flora consists of 339 species in 79 families. Several rare species of southern and Ozarkian distribution occur here, including four species whose status in Iowa is threatened: blue ash (*Fraxinus quadrangulata*), winged monkey-flower (*Mimulus alatus*), winter grape (*Vitis cinerea*), and pagoda mint (*Blephila ciliata*). Twelve plant communities are found within the preserve, including 5 forest communities, 3 disturbance communities, 2 limestone exposure communities, a prairie opening community, and a streambank community. A quantitative comparison with the floras of 3 physiographically similar preserves in northern Iowa showed a 40-44% similarity among these northern preserves, and a 35-37% similarity between each of these and Starr's Cave.

INDEX DESCRIPTORS: Starr's Cave State Preserve, Iowa flora, floristic comparison, forest communities, prairie opening community.

The limestone exposures along Flint Creek within Starr's Cave State Preserve have long been recognized as stratigraphically significant by Iowa geologists (Keyes, 1895; Prior, 1977). The floristic aspects of the preserve are no less significant but much less studied. The purpose of this study was to provide recent comprehensive data on the vascular flora of Starr's Cave Preserve, and to attempt to quantitatively compare this flora to those of three physiographically similar preserves in northern Iowa.

LOCATION

Starr's Cave Preserve is a 140 acre tract of wooded bottomlands and limestone bluffs along Flint Creek in Des Moines County, southeastern Iowa. The preserve is located one-half mile north of the Burlington city limits along Irish Ridge Road (County X60) which forms its eastern boundary. The main body of the preserve lies in the NW $\frac{1}{4}$ section 19 T-70N R-2W, while a smaller contiguous portion is in the NE $\frac{1}{4}$ section 24 T-70N R-3W. The Mississippi River and the state of Illinois lie 3 miles due east, while the Des Moines River and the state of Missouri are approximately 40 miles south-southwest.

GEOLOGY

Flint Creek has carved the sedimentary bedrock at Starr's Cave Preserve to a depth of over 100 feet, resulting in steep rocky slopes and vertical escarpments. Four major rock formations are exposed here (Campbell, 1966). At the base of the section is the English River siltstone of Devonian age. All over-topping strata are of Mississippian age. In ascending order they are: 1) the North Hill formation, consisting of the McCraney limestone, the Prospect Hill siltstone, and the type section of the Starr's Cave oolite, 2) the Wassonville limestone, and 3) the Burlington formation, composed of the Dolbee Creek, Haight Creek, and Cedar Fork members. The highly resistant Burlington dolomitic limestone forms an overhanging ledge 44 feet thick which projects up to 12 feet beyond the vertical wall below (Campbell, 1966).

Starr's Cave (from which the preserve takes its name) is the largest of three caves within the preserve. The mouth of the cave is situated in the vertical limestone wall on the north bank of Flint Creek, approximately 40 feet above the stream bed (figure 1). The cave trends northeasterly and has been explored for about 750 feet (Bounk, 1978).

Des Moines County was last glaciated by the Illinoian ice sheet (Campbell, 1966). The resulting glacial till has been only slightly modified by subsequent aeolian loess deposition. The loamy Clinton and Lindley soils which cover the uplands and slopes of the preserve are derived from this till and loess. The soils of the bottomlands are Landes fine sandy loam, derived from alluvium. Weathering of the exposed bedrock has contributed to the residual soils around the outcrops.

HISTORY OF THE AREA

Prior to white settlement eastern Iowa was the domain of the Sac and



Figure 1. Starr's Cave.

Mesquakie (Fox) tribes. The bluffs bordering Flint Creek were a source of flint (chert) which these tribes used to fashion arrowheads, spear-points, and other tools.

The stucco farmhouse on the south bank of Flint Creek was erected in 1860 by William H. Starr, whose name became associated with the nearby cave. A sawmill, dam, and icehouse (none of which remain) were also constructed (Settles, 1973). The large barn and silo are probably newer. The nearby ruins of a small crudely-constructed stone building are reputedly those of "... a trading post where the early pioneers traded for furs with the Indians." (Settles, 1973). This may be the American Fur Company post established along Flint Creek in 1808 by Colonel John W. Johnson (Antrobus, 1915).

The Starr's Cave vicinity has principally been used for agriculture. Row crops were grown on the narrow bottomlands, and the wooded slopes and uplands have been pastured and timbered. An early county plat book (Northwest Publishing, 1897) indicates a zinc mine in the immediate vicinity of the cave. The nature of its operation is unknown.

Although the Starr's Cave area has been popular for recreation since the 1850's, an attempt to secure state park status in 1924 failed (Pammel, 1925). The land eventually came into the hands of Herbert Dunn, who sold the property to the Iowa Conservation Commission in 1974. The preserve is currently managed by the Des Moines County Conservation Board.

PREVIOUS STUDIES

L.H. Pammel (1924) published a brief description of the Starr's Cave area, listing 20 common forest trees. Pammel visited the site in October 1923 to investigate its potential as a state park.

An unpublished list of 53 plants observed on "Starr's Cave Hill" in 1908 was discovered in the herbarium of the former Parson's College, Fairfield, Iowa. This list (Clark, 1908) is reproduced verbatim in Table 1. The synonyms in parentheses have been added to bring the nomenclature up to date.

PLANT COMMUNITIES

Twelve plant communities occur at Starr's Cave Preserve (Figure 2). Five forest communities may be distinguished, based on topographic position and species composition. A prairie community occupies small openings on the wooded ridges and bluffs. Disturbance communities occur where man's activities have modified or destroyed the native vegetation. These include second-growth woods, upland pastures, and disturbed bottomlands. Minor associations of species are distinguishable on the exposed and shaded limestone outcrops and on the wet sandy banks of Flint Creek.

1. **ALLUVIAL WOODS.** The bottomlands of Flint Creek are forested with deciduous softwoods resistant to periodic flooding. Dominant members of this community include silver maple (*Acer saccharinum*), cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), peach-leaf willow (*Salix amygdalioides*), and green ash (*Fraxinus pennsylvanica*). Increasing numbers of hardwoods occur on terraces less subject to inundation and at the base of slopes. These include black maple (*Acer nigrum*), butternut (*Juglans cinerea*), black walnut (*Juglans nigra*), and swamp white oak (*Quercus bicolor*). Dense thickets of shrubby willows (*Salix* spp.) stabilize the wet sandbars along the creek. Wild grapes (*Vitis* spp.), nettles (*Laportea canadensis*, *Urtica dioica*), scouring rush (*Equisetum hyemale*), and poison ivy (*Toxicodendron radicans*) characterize the herbaceous layer.

2. **WOODS ON EAST-, SOUTH-, AND WEST-FACING SLOPES.** A mixed hardwood forest covers these slopes. The dominant canopy trees are white oak (*Quercus alba*), red oak (*Quercus borealis*), bitternut hickory (*Carya cordiformis*), and mockernut hickory (*Carya tomen-*

rosa). A well-developed understory of small trees is present, and includes hop-hornbeam (*Ostrya virginiana*), blue beech (*Carpinus*

Table 1. "List of Plants noticed on bluffs northwest of Burlington, Starr's Cave Hill, July 14, 1908. Mrs. C.C. Clark in party." See text for explanation.

<i>Helianthemum canadense</i>
<i>Lechea tenuifolia</i>
<i>Hypericum prolificum</i>
<i>Hypericum cistifolium</i> (<i>H. sphaerocarpum</i>)
<i>Linum sulcatum</i>
<i>Ceanothus americanus</i>
<i>Rhus glabra</i>
<i>Polygala verticillata</i>
<i>Baptisia leucantha</i>
<i>Amorpha canescens</i>
<i>Petalostemum violaceum</i> (<i>P. purpureum</i>)
<i>Astragalus canadensis</i>
<i>Desmodium paniculatus</i>
<i>Desmodium canadense</i>
<i>Desmodium acuminatum</i> (<i>D. glutinosum</i>)
<i>Lespedeza violacea</i>
<i>Lespedeza capitata</i>
<i>Phaseolus diversifolius</i> (<i>Strophostyles helvola</i>)
<i>Cassia chamaecrista</i> (<i>C. fasciculata</i>)
<i>Psoralea onobrychis</i>
<i>Physocarpus opulifolius</i>
<i>Rubus villosus</i> (<i>R. allegheniensis</i>)
<i>Geum album</i> (<i>G. canadense</i>)
<i>Potentilla arguta</i>
<i>Potentilla canadensis</i> (<i>P. simplex</i>)
<i>Pimpinella integerrima</i> (<i>Taenidia integerrima</i>)
<i>Eryngium yuccifolium</i>
<i>Cornus</i> sp.
<i>Eupatorium altissimum</i>
<i>Liatris scariosa</i>
<i>Liatris cylindracea</i>
<i>Erigeron strigosus</i>
<i>Antennaria plantaginifolia</i>
<i>Silphium integrifolium</i>
<i>Parthenium integrifolium</i>
<i>Echinacea angustifolia</i> (<i>E. pallida</i>)
<i>Rudbeckia hirta</i>
<i>Helianthus occidentalis</i>
<i>Coreopsis palmata</i>
<i>Asclepias verticillata</i>
<i>Asclepias tuberosa</i>
<i>Penstemon pubescens</i> (<i>P. pallidus</i>)
<i>Veronica virginica</i> (<i>Veronicastrum virginicum</i>)
<i>Gerardia grandiflora</i>
<i>Ruellia ciliosa</i> (<i>R. humilis</i>)
<i>Teucrium canadense</i>
<i>Pycnanthemum pilosum</i>
<i>Pycnanthemum lanceolatum</i> (<i>P. virginianum</i>)
<i>Plantago aristata</i>
<i>Comandra umbellatum</i>
<i>Euphorbia corollata</i>
<i>Ostrya virginiana</i>
<i>Quercus alba</i>
<i>Allium canadense</i>

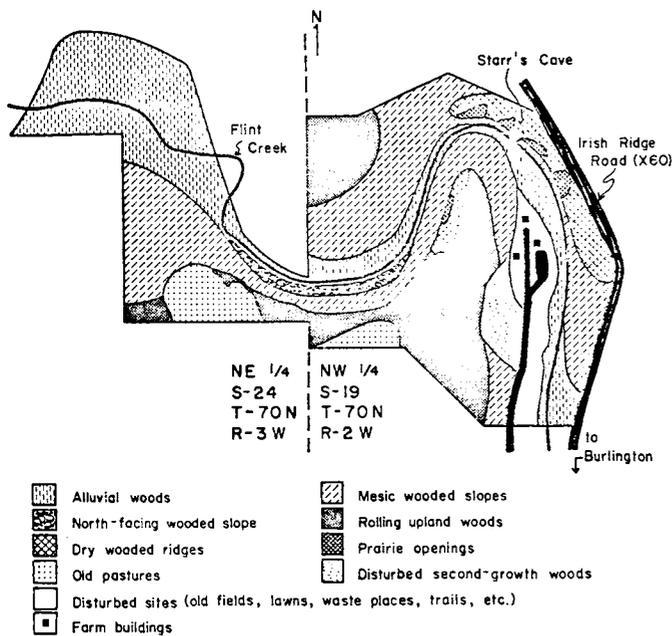


Figure 2. Plant communities of Starr's Cave State Preserve.

caroliniana), bladdernut (*Staphylea trifolia*), and wafer-ash (*Ptelea trifoliata*).

The herbaceous layer of this community includes many spring-flowering ephemerals: Dutchman's-breeches (*Dicentra cucullaria*), bloodroot (*Sanguinaria canadensis*), blue-bells (*Mertensia virginica*), Jack-in-the-pulpit (*Arisaema triphyllum*), toadshade (*Trillium recurvatum*), and rue-anemone (*Anemone thalictroides*).

3. **WOODS ON NORTH-FACING SLOPE.** The limestone bluffs on the south bank of Flint Creek are bordered at their base by a steep talus. This north-facing slope is sheltered from the drying influence of sun and wind, thus favoring the growth of species which require cool moist conditions.

Sugar maple (*Acer saccharum*) and basswood (*Tilia americana*) dominate this rocky slope. Red oak (*Quercus borealis*) and buckeye (*Aesculus glabra*) are scattered among the dominants, and blue beech (*Carpinus caroliniana*) is an important understory tree. The well-developed shrub layer consists of pagoda dogwood (*Cornus alternifolia*), Kentucky viburnum (*Viburnum molle*), grape honeysuckle (*Lonicera prolifera*), and dogberry (*Ribes cynobasti*).

The herbaceous layer is characterized by snow trillium (*Trillium nivale*), hepatica (*Hepatica acutiloba*), bishop's-cap (*Mitella diphylla*), bellwort (*Uvularia grandiflora*), false hellebore (*Veratrum woodii*), maidenhair fern (*Adiantum pedatum*), and bulblet fern (*Cystopteris bulbifera*). Walking fern (*Camptosorus rhizophyllus*) is restricted to a few mossy limestone boulders on this slope.

4. **ROLLING UPLAND WOODS.** The oaks and hickories dominate the forests of the gently rolling uplands. White oak (*Quercus alba*), bur oak (*Quercus macrocarpa*), black oak (*Quercus velutina*), shagbark hickory (*Carya ovata*), and mockernut hickory (*Carya tomentosa*) predominate. Gooseberry (*Ribes missouriense*), Virginia creeper (*Parthenocissus quinquefolia*), sweet cicely (*Osmorhiza claytoni*), black snakeroot (*Sanicula* spp.), beggar's-lice (*Hackelia virginiana*), bedstraw (*Galium* spp.), yellow violet (*Viola eriocarpa*), and spring-beauty (*Claytonia virginica*) characterize the understory.

5. **DRY WOODED RIDGES AND BLUFFS.** This community occupies the ridges and bluff crests above Flint Creek. The soil is thin excessively drained clay or silt loam overlaying fractured limestone. Direct exposure to the hot afternoon sun and dry winds of summer produces a warm dry environment. The dominant trees are those which also dominate the upland woods; it is the sub-dominant species which distinguish this community. These characteristic species include the blue ash (*Fraxinus quadrangulata*), chestnut oak (*Quercus prinoides* var. *acuminata*), red cedar (*Juniperus virginiana*), nine-bark (*Physocarpus opulifolius*), black cherry (*Prunus serotina*), redbud (*Cercis canadensis*), and shadbush (*Amelanchier arborea*). The herbaceous layer includes sicklepod (*Arabis canadensis*), yellow pimpernel (*Taenidia integerrima*), Indian tobacco (*Lobelia inflata*), four-leaf milkweed (*Asclepias quadrifolia*), woodland sunflower (*Helianthus strumosus*), hawkweed (*Hieracium scabrum*), cancer-root (*Orobanche uniflora*), coral-root orchid (*Corallorhiza odontorhiza*), hirsute sedge (*Carex hirsutella*), and sessile-leaved tick-trefoil (*Desmodium sessilifolium*).

6. **PRAIRIE OPENINGS.** Small openings dominated by prairie species occur at the most xeric sites on these wooded ridges. Dominants include big and little bluestems (*Andropogon gerardi*, *A. scoparius*), three-awn (*Aristida oligantha*), several low-growing species of panicgrass (*Panicum* spp.), and Mead's sedge (*Carex meadii*).

Characteristic herbs include butterfly milkweed (*Asclepias tuberosa*), purple prairie-clover (*Petalostemum purpureum*), leadplant (*Amorpha canescens*), milkvetch (*Astragalus canadensis*), purple cone-flower (*Echinacea pallida*), Indian plantain (*Cacalia atriplicifolia*), puccoon (*Lithospermum canescens*), bird's-foot and arrowhead violets (*Viola pedata*, *V. sagittata*), yellow flax (*Linum sulcatum*), whorled milkwort (*Polygala verticillata*), pinweed (*Lechea tenuifolia*), frostweed (*Helianthemum bicknellii*), violet wood-sorrel (*Oxalis violacea*), bastard toadflax (*Comandra umbellata*), New Jersey tea (*Ceanothus americana*), false foxglove (*Aureolaria grandiflora*), pale beard-tongue (*Penstemon pallidus*), yellow star-grass (*Hypoxis hirsuta*), blue-eyed grass (*Sisyrinchium campestre*), tufted buttercup (*Ranunculus fascicularis*), and wild rose (*Rosa carolina*).

The prairie community appears to have decreased in extent in historical times. All species listed by Clark (1908) from "Starr's Cave Hill" (apparently the ridge above the cave) are characteristic of upland prairie or oak savannah (Table 1). Several species on this list have not been re-collected in this study. These species include two blazing-stars (*Liatriis cylindracea*, *L. scariosa*), rattlesnake-master (*Eryngium yuccifolium*), French-grass (*Psoralea onobrychis*), western sunflower (*Helianthus occidentalis*), wild quinine (*Parthenium integrifolium*), rabbit's-foot bush-clover (*Lespedeza capitata*), tickseed (*Coreopsis palmata*), wild indigo (*Baptisia leucantha*), and tall cinquefoil (*Potentilla arguta*). These conspicuous species would not likely be overlooked. It seems more probable that they have been extirpated by an increase in forest cover on the ridge. This succession is due to the cessation of the prairie fires which formerly excluded most woody plants from the uplands. The situation here is identical to that described by Niemann and Landers (1974) at Woodman Hollow State Preserve in Webster County, Iowa.

7. **SECOND-GROWTH WOODS.** A wooded area of a disturbed nature occurs on the slopes and uplands just south and west of the farmhouse. The area has been timbered and pastured in the past. Settles (1973) indicated that a large vineyard once occupied this approximate area. The trees are young and of uniform size. Characteristic species include box elder (*Acer negundo*), black locust (*Robinia pseudo-acacia*), red cedar (*Juniperus virginiana*), white mulberry (*Morus alba*), shingle oak (*Quercus imbricaria*), and choke cherry (*Prunus virginiana*). The copious shrub layer includes brambles (*Rubus* spp.), garden honeysuckles (*Lonicera bella*, *L. morrowi*), gooseberry (*Ribes missouriense*), greenbrier (*Smilax hispida*), prickly-ash (*Xanthoxylum*

americanum), buckbrush (*Symphoricarpos orbiculatus*), multiflora rose (*Rosa multiflora*), and dogwoods (*Cornus* spp.)

8. **OLD PASTURES.** Two large pastures occupy part of the uplands south of Flint Creek. Dominant grasses are blue-grass (*Poa* spp.) and brome (*Bromus* spp.), associated with timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), red clover (*Trifolium pratense*), sweet-clover (*Melilotus* spp.), and Canada goldenrod (*Solidago canadensis*).

9. **DISTURBED BOTTOMLANDS.** The use of the floodplain of Flint Creek for agriculture has destroyed much of its native vegetation. Two fallow fields, cultivated through the early 1970's, lie along the creek near the farmhouse. The south field was planted in prairie grasses in 1979, while the north field remains a ruderal community. Common species here include pig weeds (*Amaranthus* spp.), goosefoot (*Chenopodium album*), ragweed (*Ambrosia* spp.), poison hemlock (*Conium maculatum*), wormwood (*Artemisia annua*), thistles (*Cirsium* spp.), wild carrot (*Daucus carota*), quack-grass (*Agropyron repens*), mustard (*Barbarea vulgaris*), purslane (*Portulaca oleracea*), and nodding spurge (*Euphorbia preslii*).

There are blue-grass lawns around the parking lot, picnic area, and farmhouse. In neglected areas of these lawns grow dandelion (*Taraxacum officinale*), shepherd's purse (*Capsella bursa-pastoris*), purple dead-nettle (*Lamium purpureum*), ground ivy (*Glechoma hederacea*), and chickweeds (*Cerastium vulgatum*, *C. nutans*, *Stellaria media*).

Thickets of small shrubs and tall coarse weeds border the forested bottoms, old fields, and trails. These thickets are composed of dogwood (*Cornus* spp.) brambles (*Rubus* spp.), smooth sumac (*Rhus glabra*), poison ivy (*Toxicodendron radicans*), burdock (*Arctium minus*), bergamot (*Monarda fistulosa*), wild lettuce (*Lactuca floridana*), giant hyssop (*Agastache nepetoides*), Jerusalem artichoke (*Helianthus tuberosus*), and brown-eyed Susans (*Rudbeckia triloba*).

10. **DRY EXPOSED VERTICAL LIMESTONE.** Crevices in the exposed vertical rock walls lining Flint Creek provide habitat for a few species adapted to such a harsh environment. Certainly the most distinctive member of this community is the cliff-brake (*Pellaea glabella*). Other members of this association include the spikenard (*Aralia racemosa*), columbine (*Aquilegia canadensis*), pellitory (*Parietaria pennsylvanica*), and the rock-creeses (*Arabis* spp.).

11. **MOIST SHADED VERTICAL LIMESTONE.** This habitat is not frequent within the preserve. Only mosses, columbine, and bulblet fern (*Cystopteris bulbifera*) seem to utilize it.

12. **WET OPEN MARGINS OF FLINT CREEK.** A number of wetland species are found on the wet sandbars and banks of Flint Creek. This community includes the bulrush (*Scirpus atrovirens*), reed canary-grass (*Phalaris arundinacea*), sticktight (*Bidens* spp.), monkey-flower (*Mimulus* spp.), water pimpernel (*Lindernia dubia*), ditch stonecrop (*Penthorum sedoides*), bittercress (*Cardamine pennsylvanica*), speedwell (*Veronica peregrina*), groundnut (*Apios americana*), and cockle-bur (*Xanthium strumarium*).

FLORISTIC COMPARISON

Comprehensive floristic surveys of three physiographically similar state preserves have been published in recent years: White Pine Hollow (Thorne, 1964), Brush Creek Canyon (Eilers, 1974), and Woodman Hollow (Niemann and Landers, 1974).

These preserves are situated along small streams which have cut deep into sedimentary bedrock to produce a rugged, varied topography. Each harbors several forest communities as well as small bluff-top prairie openings.

The geographic relationships of the four preserves presents opportunity for floristic comparison: White Pine Hollow (Dubuque County) and Brush Creek Canyon (Fayette County) are located in northeastern

Iowa, Woodman Hollow (Webster County) is located in central Iowa, and Starr's Cave (Des Moines County) is located in southeastern Iowa.

A number of common forest and prairie species are found in all four preserves. A partial list of these would include white oak (*Quercus alba*), red oak (*Quercus borealis*), bur oak (*Quercus macrocarpa*), shagbark hickory (*Carya ovata*), bitternut hickory (*Carya cordiformis*), black maple (*Acer nigrum*), butternut (*Juglans cinerea*), white ash (*Fraxinus americana*), green ash (*Fraxinus pennsylvanica*), hop-hornbeam (*Ostrya virginiana*), red cedar (*Juniperus virginiana*), maidenhair fern (*Adiantum pedatum*), lady fern (*Athyrium angustum*), Pennsylvania sedge (*Carex pensylvanica*), bloodroot (*Sanguinaria canadensis*), Dutchman's-breeches (*Dicentra cucullaria*), bottle-brush grass (*Hystrix patula*), big bluestem (*Andropogon gerardi*), and lead-plant (*Amorpha canescens*).

In contrast, each preserve possesses certain characteristic native species which distinguish it from the other preserves. The characteristic species of White Pine Hollow and Brush Creek Canyon are those whose presence in Iowa is restricted to the northeastern corner. The distributions of these species are centered in the coniferous forests of Canada and the Great Lakes region. A few are disjunct by several hundred miles. These species have been discussed at length by Thorne (1964), Hartley (1966), Eilers (1974), and Roosa and Eilers (1978).

The case at Starr's Cave is the opposite. The characteristic species here are those whose distributions in Iowa are restricted to the southeastern corner. Their floristic affinities lie with the Ozark Plateau, the southern Appalachians, or the Atlantic Coastal Plain.

Species which exhibit this pattern include the blue ash (*Fraxinus quadrangulata*), false hellebore (*Veratrum woodii*), sessile-leaved tick-trefoil (*Desmodium sessilifolium*), bush-clover (*Lespedeza virginica*), goat's-beard (*Aruncus dioicus*), climbing prairie rose (*Rosa setigera*), winter grape (*Vitis cinerea*), four-leaf milkweed (*Asclepias quadrifolia*), pagoda mint (*Blephila ciliata*), winged monkey-flower (*Mimulus alatus*), pale beard-tongue (*Penstemon pallidus*), Kentucky viburnum (*Viburnum molle*), black-jack oak (*Quercus x bushii*), woodland blue-eyed grass (*Sisyrinchium angustifolium*), hirsute sedge (*Carex hirsutella*), Short's sedge (*Carex shortiana*), purple-top (*Tridens flavus*), and deer-tongue panic-grass (*Panicum clandestinum*).

Woodman Hollow is further removed from floristic centers in the east. The species which characterize it are rare or infrequent in central Iowa, but not infrequent in the northeastern corner of the state. These species have been discussed by Niemann and Landers (1974) and Peck (1976).

An attempt was made to quantitatively measure similarities among the reported floras of these preserves, using an empirical formula developed by zoologists to measure faunal resemblance (Simpson, 1960) which has previously been adapted to floristic studies (Eilers, 1971):

$$FS\% = \frac{C}{N_1 + N_2 - C} \times 100$$

FS% = percent floristic similarity

C = number of taxa in common

N₁ = number of taxa in first flora

N₂ = number of taxa in second flora

The data used to calculate these similarity indices are tabulated on Table 2. From these data, the similarity values in Table 3 were calculated.

The exact significance of these indices is difficult to determine. The values seem rather low when compared to those reported by Eilers (1971). This is possibly due to the much larger areas involved in Eilers' (1971) comparison.

Table 2. Data used to compute floristic similarity indices.

preserve	total no. of spp.	no. of spp. in common		
		Woodman Hollow	White Pine Hollow	Brush Creek Canyon
Starr's Cave	339	184	231	157
Woodman Hollow	341	—	270	172
White Pine Hollow	517	—	—	240
Brush Creek Canyon	266	—	—	—

Based on phytogeographic factors, it was hypothesized that the reported floras of the three northern preserves (Brush Creek Canyon, White Pine Hollow, and Woodman Hollow) would resemble each other to a greater degree than any one would resemble the flora of Starr's Cave. The values on Table 3 would seem to substantiate this.

These preserves may also be compared by the number of taxa they harbor which are considered threatened or endangered in Iowa (Roosa and Eilers, 1978).

White Pine Hollow harbors twelve species considered endangered, nine considered threatened, and one of undetermined status. Brush Creek Canyon is refuge for two endangered and two threatened species. One endangered species, *Dryopteris intermedia*, was collected at Woodman Hollow in 1903 (Peck, 1976). It was not found by Niemann and Landers (1974).

No endangered species occur at Starr's Cave. Four species are threatened: blue ash (*Fraxinus quadrangulata*), winged monkey-flower (*Mimulus alatus*), winter grape (*Vitis cinerea*), and pagoda mint (*Blephila ciliata*). The status of sessile-leaved tick-trefoil (*Desmodium sessilifolium*) and flase pennyroyal (*Isanthus brachiatus*) is undetermined.

ANNOTATED CATALOGUE

The catalogue of vascular plants which follows is based upon collections and observations made from 1975 to 1979. Intensive field study was conducted each week of the 1978 and 1979 growing seasons. Voucher specimens were collected for each species. Those collected during 1975 and 1976 are deposited in the Herbarium of Iowa State University; those from 1977-79 are deposited in the Herbarium of the University of Northern Iowa.

In the catalogue, plant families are arranged phylogenetically according to the system of Cronquist (1968). Species are arranged alphabetically within families. The nomenclature below class level follows Gleason and Cronquist (1963) except for the following taxa: Equisetophyta and Polypodiophyta (Peck, 1976), Poaceae (Pohl, 1966), and *Carex* (Gilly, 1946). In a few other instances, a binomial is employed which is considered more appropriate than that used by Gleason and Cronquist (1963). Their binomial is then given parenthetically. Vernacular names, in parentheses follow the scientific binomials.

Following each name is a subjective estimation of the local abundance of the species within the preserve, based upon five years of observation. Since these estimates are based upon field observations, valid estimates could not be made for a few species not easily recognized in the field. For these, the frequency estimate is omitted.

Four terms are used to describe abundance: common, frequent, infrequent, and rare. "Common" refers to a species which is dominant in a community or which occurs throughout a substantial portion of the

Table 3. Percent similarity values for a floristic comparison of four Iowa state preserves.

	Woodman Hollow	White Pine Hollow	Brush Creek Canyon
Starr's Cave	37	37	35
Woodman Hollow	—	48	40
White Pine Hollow	—	—	44

preserve. "Frequent" indicates a species of repeated occurrence, but which is not dominant or widespread. "Infrequent" designates a species occasionally encountered, while "rare" is reserved for species of which only a small number of individuals could be located.

It should be emphasized that these designations apply only within the preserve and should not be confused with occurrence on a statewide or county-wide level.

The habitats in which a species has been observed are denoted by Arabic numerals corresponding to the section headings in the plant community descriptions.

Notes on the distribution within Iowa of rare species are appended as a brief paragraph. These notes are based upon specimens examined in the herbaria of Iowa State University, the University of Iowa, the University of Northern Iowa, Iowa Wesleyan College, and the former Parson's College. Species marked with an asterisk (*) are not considered indigenous to the preserve.

EQUISETOPHYTA

EQUISETACEAE

Equisetum arvense L. (field horsetail) — infrequent; 12

Equisetum hyemale L. (scouring rush) — infrequent; 1, 12

POLYPODIOPHYTA

OPHIOGLOSSACEAE

Botrychium dissectum Spreng. (grape fern) — rare; 2, 4. Both the var. *dissectum* and the var. *obliquum* (Muhl.) Clute occur here.

Botrychium virginianum (L.) Sw. (rattlesnake fern) — frequent; 2, 4, 7

ADIANTACEAE

Adiantum pedatum L. (maidenhair fern) — frequent; 2, 3

Pellaea glabella Mett. (cliff-brake) — frequent; 10

ASPLENIACEAE

Athyrium angustum (Willd.) Presl. (lady fern) — infrequent; 2, 4

Asplenium platyneuron (L.) Oakes (ebony spleenwort) — infrequent; 2, 4

Camptosorus rhizophyllus (L.) Link (walking fern) — rare; 3

Cystopteris bulbifera (L.) Bernh. (bulblet fern) — frequent; 3, 11

Cystopteris protrusa (Weatherby) Blasdel (creeping fragile fern) — common; 1, 2, 3, 4

Dryopteris spinulosa (O.F. Muell.) Watt. (spinulose wood fern) — rare; 2. The only known population in the county.

Polystichum acrostichoides (Michx.) Schott (Christmas fern) — infrequent; 2

PINOPHYTA

CUPRESSACEAE

Juniperus virginiana L. (red cedar) — common; 2, 4, 5, 6, 7, 8, 10

MAGNOLIOPHYTA: MAGNOLIOPSIDA

ARISTOLOCHIACEAE

Asarum canadense L. (wild ginger) — frequent; 2, 3

RANUNCULACEAE

- Actaea alba* (L.) Mill. (white baneberry) — frequent; 2, 4
Anemone virginiana L. (thimbleweed) — frequent; 4, 5, 6, 7
Anemonella thalictroides (L.) Spach (rue-anemone) — common; 2, 4, 5
Aquilegia canadensis L. (columbine) — common; 2, 3, 10, 11
Hepatica acutiloba DC (hepatica) — frequent; 2, 3
Isopyrum biternatum (Raf.) T. & G. (false rue-anemone) — infrequent; 1, 2, 3
Ranunculus abortivus L. (small-flowered crowfoot) — frequent; 1, 7, 9, 12
Ranunculus fascicularis Muhl. (tufted buttercup) — infrequent; 5, 6
Ranunculus septentrionalis Poir. (swamp buttercup) — frequent; 1, 12

BERBERIDACEAE

Podophyllum peltatum L. (may-apple) — common; 2, 4

MENISPERMACEAE

Menispermum canadense L. (moonseed vine) — common; 1

PAPAVERACEAE

Sanguinaria canadensis L. (bloodroot) — common; 1, 2, 3, 4

FUMARIACEAE

Dicentra cucullaria (L.) Bernh. (Dutchman's-breeches) — common; 1, 2, 3, 4, 7

PLATANACEAE

Platanus occidentalis L. (sycamore) — common; 1

ULMACEAE

Celtis occidentalis L. (hackberry) — frequent; 1
Ulmus rubra Muhl. (slippery elm) — common; 2, 4

MORACEAE

**Morus alba* L. (white mulberry) — rare; 1
Morus rubra L. (red mulberry) — infrequent; 1, 9

URTICACEAE

Laportea canadensis (L.) Wedd. (wood-nettle) — common; 1
Parietaria pennsylvanica Muhl. (pellitory) — frequent; 4, 5, 9, 10
Pilea pumila (L.) Gray (clearweed) — infrequent; 1
Urtica dioica L. (stinging nettle) — common; 1

JUGLANDACEAE

Carya cordiformis (Wang.) K. Koch (bitternut hickory) — common; 2, 4, 5

Carya ovata (Mill.) K. Koch (shagbark hickory) — very common; 2, 4, 5

Carya tomentosa Nutt. (mockernut hickory) — frequent; 2, 4, 5

Juglans cinerea L. (butternut) — infrequent; 1, 2

Juglans nigra L. (black walnut) — frequent; 1, 2, 4

FAGACEAE

Quercus alba L. (white oak) — very common; 2, 4, 5

Quercus bicolor Willd. (swamp white oak) — infrequent; 1

Quercus borealis Michx. f. (red oak) — common; 2, 3, 4, 5

Quercus x bushii Sarg. (blackjack oak) — rare; 5

True blackjack oak of the southern United States (*Q.*

marilandica Muenchh.) does not reach Iowa in a genetically pure condition. The blackjack oak found in southeastern Iowa is a hybrid population derived from *Q. marilandica* and *Q. velutina*. This hybrid is discussed at length by Cooperrider (1954).

Quercus imbricaria Michx. (shingle oak) — frequent; 1, 2, 3, 4, 5, 7

Quercus macrocarpa Michx. (bur oak) — common; 1, 2, 4, 5, 7

Quercus prinoides Willd. var *acuminata* (Michx.) Gl. (chestnut oak) — frequent; 2, 5

Quercus velutina Lam. (black oak) — common; 4, 5

BETULACEAE

Betula nigra L. (river birch) — frequent; 1, 7

Carpinus caroliniana Walt. (blue beech) — frequent; 2, 3

Ostrya virginiana (Mill.) K. Koch (hop-hornbeam) — very common; 2, 3, 4, 5, 7

CHENOPODIACEAE

**Chenopodium album* L. (goosefoot) — frequent; 9

Chenopodium standleyanum Aellen (goosefoot) — infrequent; 1, 2, 7

AMARANTHACEAE

**Amaranthus albus* L. (redroot pigweed) — infrequent; 9

**Amaranthus graecizans* L. (prostrate pigweed) — infrequent; 9

PORTULACAEAE

Claytonia virginica L. (spring-beauty) — common; 1, 2, 3, 4, 5, 7

**Portulaca oleracea* L. (purslane) — infrequent; 9

CARYOPHYLLACEAE

Cerastium nutans Raf. (nodding chickweed) — infrequent; 9

**Cerastium vulgatum* L. (mouse-ear chickweed) — infrequent; 8, 9

**Saponaria officinalis* L. (bouncing-bet) — infrequent; 9, 12

Silene nivea (Nutt.) Oth. (white campion) — rare; 12

The only known population in the county.

Silene stellata (L.) Ait. f. (starry campion) — infrequent; 2, 4, 7

**Stellaria media* (L.) Cyr. (chickweed) — infrequent; 9

POLYGONACEAE

Polygonum scandens L. (false buckwheat) — infrequent; 1, 9

Rumex acetosella L. (sour dock) — infrequent; 8

Tovara virginiana (L.) Raf. (*Polygonum virginianum* L.) (jumpseed) — infrequent; 1

HYPERICEAE (GUTTIFERAE)

Hypericum punctatum Lam. (spotted St. John's-wort) — infrequent; 5, 6, 8

TILIACEAE

Tilia americana L. (basswood) — common; 2, 3, 4

CISTACEAE

Helianthemum bicknellii Fern. (frostweed) — rare; 6
Lechea tenuifolia Michx. (pinweed) — frequent; 6

VIOLACEAE

Viola eriocarpa Schw. (yellow violet) — common; 1, 2, 4
Viola pedata L. (bird's-foot violet) — frequent; 6. Two distinct color forms occur at Starr's Cave. The first possesses corollas which are uniformly light lavender. This phase occurs throughout Iowa. The second differs in having the two upper petals dark velvety purple. This phase is restricted to the southeastern corner, where it is known from Appanoose, Henry, Jefferson, Muscatine, Van Buren, and Washington Counties.
**Viola rafinesquii* Greene (wild pansy) — rare; 9. A few individuals were collected in the parking lot on dry sand. They most likely are recently introduced from outside the preserve. This species was first collected in Iowa in 1938, and is known only from sandy prairies in Des Moines, Henry, Lee, Louisa, Muscatine, and Polk Counties.
Viola sagittata Ait. (arrowhead violet) — very rare; 6
Viola sororia Willd. (wooly blue violet) — common; 1, 2, 4, 7

SALICACEAE

Populus deltoides Marsh. (cottonwood) — common; 1
Salix amygdaloides Anderss. (peach-leaf willow) — frequent; 1
Salix interior Rowlee (sand-bar willow) — common; 1, 12
Salix rigida Muhl. (heart-leaf willow) — common; 1, 12

BRASSICACEAE (CRUCIFERAE)

Arabis canadensis L. (sicklepod) — infrequent; 5, 10
Arabis hirsuta (L.) Scop. (rock-cress) — infrequent; 5, 10
Arabis laevigata (Muhl.) Poir. (rock-cress) — rare; 3, 10
Arabis shortii (Fern.) Gl. (rock-cress) — infrequent; 1
**Barbarea vulgaris* R. Br. (mustard) — infrequent; 9
**Capsella bursa-pastoris* (L.) Medic. (shepherd's-purse) — common; 9, 12
Cardamine pennsylvanica Muhl. (bittercress) — infrequent; 9, 12
Dentaria laciniata Muhl. (toothwort) — common; 2, 3, 4
**Descurainia pinnata* (Walt.) Britt. var. *brachycarpa* (Rich.) Fern. (tansy-mustard) — rare; 9
**Thlaspi arvense* L. (penny-cress) — infrequent; 9

CRASSULACEAE

Penthorum sedoides L. (ditch stonecrop) — infrequent; 12

SAXIFRAGACEAE

Mitella diphylla L. (bishop's-cap) — rare; 3
Ribes cynosbati L. (dogberry) — infrequent; 3, 10
Ribes missouriense Nutt. (gooseberry) — common; 1, 2, 4, 5, 7

ROSACEAE

Agrimonia gryposepala Wallr. (agrimony) — common; 2, 4, 7
Agrimonia pubescens Wallr. (agrimony) — common; 2, 4, 7

Amelanchier arborea Michx. f. (shadbush) — frequent; 2, 4, 5
Aruncus dioicus (Walt.) Fern. (goat's-beard) — infrequent; 2, 3.
Restricted in Iowa to rich woodlands near the Mississippi River in Clinton, Jackson, Lee, and Muscatine Counties.
Geum canadense Jacq. (white avens) — frequent; 2, 4, 7
Geum laciniatum Murr. (rough avens) — infrequent; 1, 12
Physocarpus opulifolius (L.) Maxim. (nine-bark) — frequent; 5
Potentilla simplex Michx. (cinquefoil) — infrequent; 5, 6
Prunus serotina Ehrh. (black cherry) — frequent; 2, 4, 5, 10
Prunus virginiana L. (choke cherry) — common; 2, 4, 5, 7, 10
Rosa carolina L. (wild rose) — infrequent; 6
**Rosa multiflora* Thunb. (multiflora rose) — infrequent; 7, 8
Rosa setigera Michx. var. *tomentosa* T. & G. (climbing prairie rose) — rare; 5. Range scattered across southern Iowa: Decatur, Lee, Louisa, Lucas, Madison, Polk, and Warren Counties.
Rubus allegheniensis Porter (blackberry) — common; 1, 7, 8, 9
Rubus occidentalis L. (black raspberry) — common; 1, 7, 8, 9

CAESALPINIACEAE (LEGUMINOSAE)

Cassia fasciculata Michx. (partridge pea) — infrequent; 6
Cercis canadensis L. (redbud) — common; 1, 2, 3, 4

FABACEAE (LEGUMINOSAE)

Amorpha canescens Pursh (leadplant) — frequent; 5, 6
Apios americana Medic. (groundnut) — rare; 12
Astragalus canadensis L. (milkvetch) — infrequent; 5, 6
Desmodium cuspidatum (Muhl.) Loud. (tick-trefoil) — frequent; 2, 4, 5, 7. Both the var. *cuspidatum* and the var. *longifolium* (T. & G.) Schub. occur here.
Desmodium glutinosum (Muhl.) Wood (tick-trefoil) — common; 2, 4
Desmodium paniculatum (L.) DC (tick-trefoil) — frequent; 5, 6, 7
Desmodium sessilifolium (Torr.) T. & G. (sessile-leaved tick-trefoil) — rare; 5, 6. This species has been collected previously in the state only in Lee County, in 1923 and 1953. Another station in Des Moines County was discovered in 1978. Its status in Iowa is considered undetermined but of concern (Roosa and Eilers 1978).
Lespedeza virginica (L.) Britt. (bush-clover) — rare; 6. Range in Iowa restricted to the southeastern corner.
**Medicago lupulina* L. (black medic) — infrequent; 8, 9
**Melilotus alba* Desr. (white sweet-clover), frequent; 6, 7, 8, 9
**Melilotus officinalis* (L.) Desr. (yellow sweet-clover) — frequent; 6, 7, 8, 9.

EUPHORBIACEAE

Acalypha rhomboidea Raf. (three-seeded mercury) — infrequent; 1, 9
Acalypha virginica L. (three-seeded mercury) — frequent; 5, 6, 8
Euphorbia corollata L. (flowering spurge) — frequent; 5, 6, 8
Euphorbia preslii Guss. (nodding spurge) — infrequent; 9

VITACEAE

Parthenocissus quinquefolia (L.) Planch. (Virginia creeper) — common; 2, 4, 5, 7
Parthenocissus vitacea (Knerr) Hitchc. (woodbine) — rare; 5
Vitis cinerea Engelm. (winter grape) — infrequent; 1, 12. Range in Iowa restricted to the southeastern corner: Decatur, Fremont, Henry, Jefferson, Lee, Louisa, and Muscatine Counties. Roosa and Eilers (1978) consider this species threatened.
Vitis riparia Michx. (riverbank grape) — frequent; 1, 12

LINACEAE

Linum sulcatum Riddell (yellow flax) — infrequent; 6

POLYGALACEAE

Polygala verticillata L. (whorled milkwort) — rare; 6

STAPHYLEACEAE

Staphylea trifolia L. (bladdernut) — frequent, 2, 3, 4, 5

HIPPOCASTANACEAE

Aesculus glabra Willd. (buckeye) — frequent; 2, 3

ACERACEAE

- Acer negundo* L. (box elder) — frequent; 1, 7, 9
Acer nigrum Michx. f. (black maple) — infrequent; 1, 2
Acer saccharinum L. (silver maple) — common; 1
Acer saccharum Marsh. (sugar maple) — common; 2, 3

ANACARDIACEAE

- Rhus glabra* L. (smooth sumac) — common; 5, 6, 7, 8
Toxicodendron radicans (L.) Kuntze (*Rhus radicans* L.) (poison ivy) — common; 1, 7, 8, 9

RUTACEAE

- Ptelea trifoliata* L. (wafer-ash) — frequent; 2, 4, 5, 7
Zanthoxylum americanum Mill. (prickly-ash) — infrequent; 1, 2, 4, 5

OXALIDACEAE

- Oxalis stricta* L. (yellow wood-sorrel) — frequent; 7, 8, 9
Oxalis violacea L. (violet wood-sorrel) — rare; 5, 6

GERANIACEAE

Geranium maculatum L. (cranesbill) — frequent; 2, 3, 4

BALSAMINACEAE

- Impatiens biflora* Walt. (orange jewelweed) — infrequent; 1, 12
Impatiens pallida Nutt. (yellow jewelweed) — infrequent; 1, 12

ARALIACEAE

Aralia racemosa L. (spikenard) — infrequent; 2, 10

APIACEAE (UMBELLIFERAE)

- Chaerophyllum procumbens* (L.) Crantz. (chervil) — infrequent; 1
 **Conium maculatum* L. (poison hemlock) — infrequent; 9
Cryptotaenia canadensis (L.) DC (honestwort) — infrequent; 1, 2, 4
 **Daucus carota* L. (wild carrot) — infrequent; 8, 9
Osmorhiza claytoni (Michx.) Clarke (sweet cicely) — common; 2, 3, 4, 7
Sanicula canadensis L. (black snakeroot) — common; 2, 4, 7
Sanicula gregaria Bickn. (black snakeroot) — common; 2, 4, 7
Taenidia integerrima (L.) Drude (yellow pimpinell) — rare; 5
Thaspium barbinode (Michx.) Nutt. (meadow parsnip) — infrequent; 1, 2, 4

ASCLEPIADACEAE

- Asclepias quadrifolia* Jacq. (four-leaf milkweed) — rare; 5. Range in Iowa restricted to the southeastern corner.
Asclepias tuberosa L. (butterfly milkweed) — very rare; 6. The only known population in the county.
Asclepias verticillata L. (whorled milkweed) — infrequent; 6, 8

SOLANACEAE

- Physalis heterophylla* Nees (hairy ground-cherry) — infrequent; 6, 8
Physalis longifolia Nutt. var. *subglabrata* (Mack. & Bush) Cronq. (smooth ground-cherry) — rare; 8
Solanum nigrum L. (black nightshade) — infrequent; 8, 9

POLEMONIACEAE

- Phlox divaricata* L. (phlox) — common; 2, 4, 5
Polemonium reptans L. (Jacob's-ladder) — frequent; 2, 4

HYDROPHYLLACEAE

- Ellisia nyctalea* L. (nyctalea) — infrequent; 1, 9, 12
Hydrophyllum appendiculatum Michx. (waterleaf) — infrequent; 1, 3
Hydrophyllum virginianum L. (waterleaf) — frequent; 1, 2, 4

BORAGINACEAE

- Hackelia virginiana* (L.) Johnston (beggar's lice) — frequent; 2, 4
Lithospermum canescens (Michx.) Lehm. (puccoon) — rare; 6.
 The only known population in the county.
Mertensia virginica (L.) Pers. (blue-bells) — frequent; 2

VERBENACEAE

- Phyla lanceolata* (Michx.) Greene (frog-fruit) — infrequent; 12
Verbena stricta Vent. (wooly vervain) — frequent; 6, 8, 9
Verbena urticifolia L. (white vervain) — frequent; 1, 7, 9

PHRYMACEAE

Phryma leptostachya L. (lopseed) — common; 1, 2, 4

LAMIACEAE (LABIATAE)

- Agastache nepetoides* (L.) Ktze. (giant hyssop) — rare; 9
Blephila ciliata (L.) Benth. (pagoda mint) — infrequent; 1, 7.
 Restricted in Iowa to the southeastern corner: Appanoose, Henry, Jefferson, Lee, and Van Buren Counties. Roosa and Eilers (1978) consider this species threatened in Iowa.
 **Glechoma hederacea* L. (ground ivy) — infrequent; 1, 9
Hedeoma hispida Pursh (western penny-royal) — infrequent; 6
Hedeoma pulegioides (L.) Pers. (eastern penny-royal) — rare; 5
Isanthus brachiatus (L.) BSP (false penny-royal) — rare; 10
 **Lamium purpureum* L. (purple dead-nettle) — infrequent; 9. This introduced Eurasian species has not been reported from Iowa. I have collected it at four other locales in Des Moines County. The only other Iowa collection that could be located is an undated collection from Johnson County in the Iowa State University herbarium.
 **Leonurus cardiaca* L. (motherwort) — infrequent; 7, 9
Monarda fistulosa L. (bergamot) — frequent; 1, 4, 7, 8, 9
Prunella vulgaris L. (self-heal) — frequent; 6, 7, 8, 9
Pycnanthemum pilosum Nutt. (wooly mountain-mint) — infrequent; 6

Scutellaria ovata Hill (skullcap) — infrequent; 2, 4
Teucrium canadense L. (germander) — frequent; 1, 5, 6, 8, 9, 12

PLANTAGINACEAE

Plantago aristata Michx. (bottle-brush plantain) — rare; 6
Plantago virginica L. (hoary plantain) — infrequent; 6, 8

OLEACEAE

Fraxinus americana L. (white ash) — frequent; 2, 4, 5
Fraxinus pennsylvanica Marsh. (green ash) — common; 1, 2, 4, 7
Fraxinus quadrangulata Michx. (blue ash) — infrequent; 2, 5,
 10. This species of the Ozark Plateau is restricted in Iowa to
 Lee and Des Moines Counties in the extreme southeastern
 corner of the state. It is considered threatened by Roosa and
 Eilers (1978).

OROBANCHACEAE

Orobanche uniflora L. (cancer-root) — very rare; 5. This species
 is a root parasite. Its host at Starr's Cave is *Ostrya virginiana*.
 This species was observed only in 1976 and 1979, and may not
 produce aerial shoots each year.

ACANTHACEAE

Ruellia humilis Nutt. (wild petunia) — infrequent; 5, 6

SCROPHULARIACEAE

Aureolaria grandiflora (Benth.) Pennell var. *pulchra* Pennell
 (false foxglove) — frequent; 5, 6
Gerardia tenuifolia Vahl. (slender gerardia) — infrequent; 5, 12
Lindernia dubia (L.) Pennell (water pimpernel) — rare; 12
Mimulus alatus Ait. (winged monkey-flower) — rare; 12. Range
 in Iowa restricted to the southeastern corner: Davis, Jefferson,
 Lee, Van Buren, and Washington Counties. This wetland
 species is considered threatened by Roosa and Eilers (1978).
Mimulus ringens L. (common monkey-flower) — infrequent; 12
Penstemon pallidus Small (pale beard-tongue) — rare; 6. Range in
 Iowa restricted to the southeastern corner.
Scrophularia marilandica L. (figwort) — frequent; 1, 2, 4
 **Verbascum thapsus* L. (mullein) — infrequent; 8, 9
Veronica peregrina L. (speedwell) — infrequent; 12
Veronicastrum virginicum (L.) Farw. (culver's-root) — infrequent;
 5, 6

CAMPANULACEAE

Campanula americana L. (bell-flower) — frequent; 1, 7, 9

LOBELIACEAE

Lobelia inflata L. (Indian tobacco) — frequent; 4, 5, 6, 12
Lobelia spicata Lam. (pale lobelia) — infrequent; 5, 6
Lobelia siphilitica L. (great blue lobelia) — infrequent; 12

RUBIACEAE

Galium aparine L. (cleavers) — common; 1, 4, 7, 9
Galium circaeazans Michx. (wild licorice) — common; 2, 4, 5
Galium concinnum T. & G. (shining bedstraw) — common; 2, 4,
 5
Galium triflorum Michx. (fragrant bedstraw) — common; 2, 4, 5

CAPRIFOLIACEAE

**Lonicera bella* Zabel (belle honeysuckle) — frequent; 7, 8
 **Lonicera morrowi* Gray (Morrow's honeysuckle) — frequent; 7, 8
Lonicera prolifera (Kirchner) Rehder (grape honeysuckle) —
 frequent; 3, 5, 10
Symphoricarpos orbiculatus Moench (buckbrush) — common; 4,
 5, 7, 8, 9
Triosteum perfoliatum L. var. *perfoliatum* (horse gentian) —
 infrequent; 4, 7
 **Viburnum opulus* L. var. *opulus* (snowball bush) — infrequent; 7
Viburnum molle Michx. (Kentucky viburnum) — rare; 3. Range
 in Iowa restricted to the extreme southeastern corner: Henry,
 Jefferson, and Van Buren Counties.

ASTERACEAE (COMPOSITAE)

Achillea millefolium L. (yarrow) — infrequent; 6, 8, 9
Ambrosia artemisiifolia L. (little ragweed) — infrequent; 9
Ambrosia trifida L. (giant ragweed) — infrequent; 9
Antennaria neglecta Greene (pussy-toes) — infrequent; 5, 6
Antennaria plantaginifolia (L.) Hook. (pussy-toes) — frequent; 5,
 6
 **Arctium minus* (Hill.) Bernh. (burdock) — frequent; 7, 9
 **Artemisia annua* L. (wormwood) — infrequent; 9. The only
 known population in the county.
Aster laevis L. (smooth aster) — frequent; 5, 6
Aster novae-angliae L. (New England aster) — rare; 6
Aster pilosus Willd. (pilose aster) — frequent; 5, 6
Aster shortii Lindl. (Short's aster) — frequent; 2, 4, 5
Bidens cernua L. (sticktight) — infrequent; 12
Bidens comosa (Gray) Wieg. (*B. tripartita* L., in part)
 (sticktight) — infrequent; 12
Bidens frondosa L. (sticktight) — infrequent; 12
Cacalia atriplicifolia L. (Indian plantain) — infrequent; 5, 6
Cirsium altissimum (L.) Spreng. (tall thistle) — infrequent; 8, 9
Cirsium discolor (Muhl.) Spreng. (field thistle) — infrequent; 9
 **Cirsium vulgare* (Savi) Tenore (bull thistle) — infrequent; 9
Echinacea pallida Nutt. (purple cone-flower) — infrequent; 6.
 The only population in the county.
Erigeron annuus (L.) Pers. (daisy fleabane) — frequent; 6, 8, 9
Erigeron philadelphicus L. (Philadelphia fleabane) — infrequent;
 5, 7, 8
Eupatorium purpureum L. (Joe-Pye weed) — infrequent; 1, 2, 12
Eupatorium rugosum Houtt. (white snakeroot) — common; 2, 4,
 5
Helenium autumnale L. (sneezeweed) — infrequent; 12
Helianthus strumosus L. (woodland sunflower) — common; 4, 5,
 6, 7, 8
Helianthus tuberosus L. (Jerusalem artichoke) — infrequent; 1, 9
Hieracium scabrum Michx. (hawkweed) — rare; 5, 6
Krigia biflora (Walt.) Blake (false dandelion) — infrequent; 6
Kuhnia eupatorioides L. (false boneset) — rare; 6
Lactuca floridana (L.) Gaertn. (wild lettuce) — infrequent; 9
Polymnia canadensis L. (leaf-cup) — infrequent; 2, 3
Prenanthes alba L. (rattlesnake-root) — frequent; 2, 3, 4, 5
Raietida pinnata (Vent.) Barnh. (yellow cone-flower) — rare; 6
Rudbeckia hirta L. (black-eyed Susan) — infrequent; 6, 8
Rudbeckia triloba L. (brown-eyed Susan) — frequent; 9, 12
Senecio pauperculus Michx. (ragwort) — infrequent; 6, 8
Silphium integrifolium Michx. (rosinweed) — infrequent; 6
Silphium perfoliatum L. (cup-plant) — infrequent; 9, 12
Solidago canadensis L. (Canada goldenrod) — frequent; 8
Solidago flexicaulis L. (zig-zag goldenrod) — frequent; 2, 3
Solidago nemoralis Ait. (gray goldenrod) — frequent; 5, 6

- **Taraxacum officinale* Weber (dandelion) — common; 7, 8, 9
Xanthium strumarium L. (cockle-bur) — infrequent; 9, 12

MAGNOLIOPHYTA: LILIOPSIDA

ARACEAE

- Arisaema triphyllum* (L.) Schott (Jack-in-the-pulpit) — common; 1, 2, 3, 4

COMMELINACEAE

- **Commelina communis* L. (Asiatic day-flower) — rare; 9
Tradescantia ohioensis Raf. (spiderwort) — infrequent; 6, 8

JUNCACEAE

- Juncus tenuis* Willd. (path rush) — frequent; 8, 9

CYPERACEAE

- Carex blanda* Dewey (woodland sedge) — common; 1, 2, 4, 7
Carex cephalophora Muhl. (oval-headed sedge) — 4, 5
Carex davisii Schw. & Torr. (Davis' sedge) — infrequent; 1, 9
Carex granularis Muhl. (meadow sedge) — 1, 2
Carex hirsutella Mackenzie (hirsute sedge) — infrequent; 5, 6.
 Range in Iowa restricted to the southeastern corner: Davis, Decatur, Henry, Lee, Van Buren, and Wapello Counties.
Carex hirtifolia Mackenzie (hairy sedge) — 4
Carex meadii Dewey (Mead's sedge) — frequent; 6
Carex normalis Mackenzie (larger straw sedge) — 4, 5
Carex pennsylvanica Lam. (Pennsylvania sedge) — common; 2, 4, 5
Carex rosea Schkuhr (stellate sedge) — common; 2, 3, 4
Carex shortiana Dewey (Short's sedge) — infrequent; 1, 9
Carex typhina Michx. (cattail sedge) — rare; 1
Cyperus filiculmis Vahl. (slender cyperus) — rare; 6
Scirpus atrovirens Willd. (dark-green bulrush) — frequent; 12
Scirpus pendulus Muhl. (*S. lineatus* Michx.) (reddish bulrush) — rare; 6. A small clump of plants occurs on moist sandy clay soil in one of the prairie openings, an unusual habitat for a bulrush. Ordinarily, this species inhabits “. . . swamps or boggy prairie areas, or along ponds and streams.” (Gilly 1946). However, Steyermark (1963) includes “. . . wet limestone glades and ledges.” among the habitats in which it occurs in Missouri.

POACEAE (GRAMINEAE)

- **Agropyron repens* (L.) Beauv. (quack-grass) — infrequent; 8, 9
 **Agrostis alba* L. (redtop) — infrequent; 8, 9, 12
Agrostis perennans (Walt.) Tuck. (upland bentgrass) — rare; 5
Andropogon gerardi Vitman (big bluestem) — frequent; 6
Andropogon scoparius Michx. (little bluestem) — frequent; 6
Aristida olingantha Michx. (three-awn) — frequent; 6
 **Bromus inermis* Leyss. (smooth brome) — frequent; 8, 9
 **Bromus japonicus* Thunb. (Japanese brome) — infrequent; 8
Bromus pubescens Muhl. (woodland brome) — common; 2, 4
 **Bromus tectorum* L. (downy brome) — frequent; 8, 9
 **Dactylis glomerata* L. (orchard grass) — frequent; 8
 **Echinochloa crus-galli* (L.) Beauv. (barnyard grass) — frequent; 1, 8, 9, 12
Elymus canadensis L. (Canada wild-rye) — infrequent; 6
Elymus villosus Muhl. (hairy wild-rye) — infrequent; 1
Elymus virginicus L. (Virginia wild-rye) — frequent; 1
Festuca obtusa Biehler (woodland fescue) — common; 2, 4
Hystrix patula (L.) Moench. (bottle-brush grass) — frequent; 2, 4, 5

- Leersia virginica* Willd. (whitegrass) — infrequent; 2
Muhlenbergia frondosa (Poir.) Fern. (muhly) — infrequent; 1
Muhlenbergia sobolifera (Muhl.) Trin. (muhly) — infrequent; 2
Panicum clandestinum L. (deer-tongue panic-grass) — rare; 2.
 Range in Iowa restricted to the southeastern corner: Davis, Decatur, Iowa, Lee, Muscatine, Van Buren, and Washington Counties.
Panicum depauperatum Muhl. (depauperate panic-grass) — rare; 6. Known in Iowa only from a few widely scattered locations: Clayton, Black Hawk, Dickinson, Emmet, Muscatine, Story, Webster, and Winneshiek Counties.
Panicum implicatum Scribn. (prairie panic-grass) — frequent; 5, 6, 8
Panicum praecocius Hitchcock & Chase (early panic-grass) — infrequent; 6
Panicum scribnerianum Nash (Scribner's panic-grass) — frequent; 6, 8
Phalaris arundinacea L. (reed canary-grass) — infrequent; 12
 **Phleum pratense* L. (timothy) — infrequent; 8
 **Poa annua* L. (annual blue-grass) — infrequent; 1, 9
 **Poa compressa* L. (Canada blue-grass) — frequent; 5, 6, 7, 8, 9
 **Poa pratensis* L. (Kentucky blue-grass) — common; 5, 6, 7, 8, 9
Sphenopholis obtusata (Michx.) Scribn. var. *major* (Torr.) Erdman (wedge-grass) — infrequent; 2
Tridens flavus (L.) Hitchcock (purpletop) — infrequent; 6. Range in Iowa largely confined to the southeastern quarter.

LILIACEAE

- Allium canadense* L. (wild onion) — infrequent; 5, 6
 **Asparagus officinalis* L. (asparagus) — infrequent; 8, 9
Smilacina racemosa (L.) Desf. (false Solomon's-seal) — common; 2, 3, 4
Smilax hispida Muhl. (greenbrier) — infrequent; 1, 2, 7
Trillium nivale Riddell (snow trillium) — infrequent; 3
Trillium recurvatum Beck. (toadshade) — frequent; 1, 2, 4
Uvularia grandiflora Sm. (bellwort) — common; 2, 3
Veratrum woodii Robbins (false hellebore) — rare; 3. Range in Iowa restricted to the extreme southern counties: Appanoose, Davis, Decatur, Henry, Jefferson, Lee, Monroe, Van Buren, and Wayne Counties. This species apparently does not flower each year. I have observed eight populations in four counties over three growing seasons and never observed flowering or fruiting plants.

AMARYLLIDACEAE

- Hypoxis hirsuta* (L.) Cov. (yellow star-grass) — rare; 6

IRIDACEAE

- Sisyrinchium angustifolium* Mill. (woodland blue-eyed grass) — rare; 5. Range in Iowa restricted to the southeastern corner: Decatur, Henry, Johnson, Lee, Van Buren, and Washington Counties.
Sisyrinchium campestre Bickn. (prairie blue-eyed grass) — infrequent; 6

ORCHIDACEAE

- Corallorhiza odontorhiza* (Willd.) Nutt. (coral-root orchid) — very rare; 5. The only known population in the county. Niemann's (1975) discussion of this saprophyte's ecology correlates well with my observations at Starr's Cave.

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