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**Vascular Flora of Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois**

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Project Completion Report

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ABSTRACT

The vascular flora of the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois was studied during the 2001 growing season. A total of 334 taxa were found: nine fern and fern-allies, 90 monocots, and 235 dicots. The families with the largest number of taxa included the Poaceae with 52 taxa, the Asteraceae with 46 taxa, and the Cyperaceae with 21 taxa, of which 13 were members of the genus *Carex*. An overstory and ground layer analysis of five mature second growth dry sand savanna sites and one mature second growth sand flatwoods that occurs on the site was also undertaken. In the five dry sand savanna sites, tree density averaged 157 stems/ha, with an average basal area of 11 m<sup>2</sup>/ha. In the overstory *Quercus velutina* Lam. (black oak) ranked first with an average importance value (IV) of 178.8 (out of 200). Associated species included *Q. alba* L. (white oak), *Prunus serotina* Ehrh. (wild black cherry), and *Q. palustris* Muenchh. (pin oak). In the ground layer *Carex pensylvanica* Lam. (Pennsylvania sedge) ranked first with an importance value of 62.8 (out of 200). Associated species included black oak, *Schizachyrium scoparium* (Michaux) Nash (little bluestem), and *Cassia fasciculata/nictitans*, [*C. fasciculata* Michaux (partridge pea) and *C. nictitans* L. (wild sensitive plant)], all with IV's >10. In the sand flatwoods, tree density averaged 302 stems/ha, with an average basal area of 25.7 m<sup>2</sup>/ha. In the overstory pin oak ranked first with an importance value of 188.6 (out of 200). Associated species included *Nyssa sylvatica* Marsh. (sour gum) and white oak. In the ground layer *Carex haydenii* Dewey (Hayden's sedge) ranked first with an importance value of 50.8 (out of 200). Associated species included pin oak seedlings and *Calamagrostis canadensis* (Michaux) Beauv. (bluejoint grass), with IV's >25.

INTRODUCTION

Hooper Branch Savanna Nature Preserve (HBSNP), Iroquois County, Illinois, is located in the Kankakee Sand Area Section of the Grand Prairie Division (Schwegman, et al. 1973). It is within the eastern edge of the former Lake Watseka, a glacial lake formed approximately 14,000 years ago during the Kankakee Torrent (Willman & Frye 1970). Lake Watseka was eventually drained, due to incising of the Illinois and Kankakee rivers, exposing large areas of sand deposits along its shoreline. Wind action sorted these sand deposits into sand dunes and swales, largely on terraces along the Kankakee River Valley. In response to hypsithermal climatic stress, about 8300 A.D., prairie vegetation began replacing deciduous forest in Illinois (King 1981). In 1820, prairie vegetation covered 92% of Iroquois County (Hedborn 1984, Iverson, et al. 1989). Regular fires that swept across the prairies were a major factor in the development and maintenance of savanna communities (Johnson & Ebinger 1992). Exclusion of fire has allowed many oak savanna communities to become closed forest with dense understories (Gleason 1912, 1913, Transeau 1935, Vogel 1974, Ebinger & McClain 1991). The present study was undertaken to determine the structure and composition of the dry sand savanna and the sand flatwoods communities at HBSNP, compare the present dry sand savanna community to an earlier study of this community (Johnson & Ebinger 1992), develop a vouchered flora, and to locate Illinois threatened and endangered species.

## MATERIALS AND METHODS

Field trips were made to the HBSNP at various times during the 2001 growing season. During each trip (11 trips) voucher specimens were collected, habitat data for each taxon were determined, and the plant communities were delineated. The material collected was identified and deposited in the herbarium of the Illinois Natural History Survey (ILLS), Champaign, Illinois. Criteria for designating native and non-native taxa followed Fernald (1950), Steyermark (1963), Mohlenbrock (1986), and Gleason and Cronquist (1991).

In late October of 2001, a woody overstory survey was undertaken on five sites (each 4 ha in size, 400 m x 100 m) of the dry sand savanna and one site (1 ha in size, 100 m x 100 m) of the sand flatwoods at the HBSNP. Figure 1 gives the approximate locations of the permanent markers. A total of 80 quadrats, 50 m on a side, were established within the dry sand savanna and a total of 4 quadrats, 50 m on a side were established within the sand flatwoods. In each quadrat, all living and dead-standing woody individuals 10 cm dbh (diameter at breast height, 1.4 m above the ground) and above were identified and their diameters recorded. From these data, density (stems/ha), basal area (m<sup>2</sup>/ha), relative density, relative dominance, importance value (IV), and average diameter (cm) were calculated for each species. Determinations of the IV follows the procedure used by McIntosh (1957), and is the sum of the relative density and relative dominance of a given species. Density (stems/ha) of woody understory species was determined using nested circular plots 0.0001, 0.001, and 0.01 ha in size. At each study site twenty points were located approximately 25 m apart along a randomly placed transect located the length of each site. At each point the circular plots were established. Four additional 0.0001 ha circular plots were located 6 m from each center along the cardinal compass directions. In the 0.0001 ha circular plots tree seedlings ( $\leq 50$  cm tall) and all shrubs were counted. In the 0.001 ha circular plots small saplings ( $>50$  cm tall and  $<2.5$  cm dbh) were counted, and in the 0.01 ha circular plots large saplings (2.5 to 9.9 cm dbh) were counted.

In early October of 2001, a ground layer species (including woody species  $\leq 50$  cm tall) survey was undertaken on the five sites of the dry sand savanna and the one sand flatwoods. A total of 250 quadrats, 1 m on a side, were established within the dry sand savanna and 50 quadrats, 1 m on a side, were established within the sand flatwoods. Quadrats were located along the permanent center transect line established for sampling the woody overstory in each of the study sites. Starting north (transects 1 and 5) or east (transects 2, 3, and 4) at 50 m intervals, 5 of the 9 potential points were selected using a random numbers table (single digit, 0 to 8). In the sand flatwood, plots were randomly placed along the center line of the central transect (Figure 1). At each of the 5 points, 10 plots 1 m<sup>2</sup> were located right (odd-numbered meters) or left (even-numbered meters) of a 10 m long segment from the transect point. Direction of the 10 m segment was established using a compass and a random numbers table (single digit, 0. to 7) where 1 was north, 2-northeast, 3-east, 4-southeast, etc. The cover of each species rooted in a quadrat was determined using Daubenmire (1959) cover classes as modified by Bailey and Poulton (1968) (class 1 = 0 to 1%, class 2 =  $>1$  to 5%, class 3 =  $>5$  to 25%, class 4 =  $>25$  to 50%, class 5 =  $>50$  to 75%, class 6 =  $>75$  to 95%, class 7 =  $>95$  to 100%). From these data, cover (%), relative cover, frequency (%), relative frequency, and importance value of each species were calculated. Nomenclature follows Mohlenbrock (1986).

## DESCRIPTION OF THE STUDY AREA

The study area, located about 9 kilometer northeast of Beaverville, Iroquois County, Illinois, was recognized as a high quality dry to dry-mesic sand savanna by the Illinois Natural Areas Inventory (White & Madany 1978). It was dedicated as an Illinois Nature Preserve in 1985 (most of Sec 13 T29N R11W). This 195 ha tract of sand savanna, sand prairie, sand flatwoods, and successional communities, is north and adjacent to the Iroquois County Conservation Area. The sand savanna remnant, mostly dry sand savanna with patches of dry-mesic sand savanna, is about 144 ha in size and occurs on dunes and swales. The sand flatwoods, 5 ha in size, is located in the southeast corner of the HBSNP and the remaining 46 ha includes small patches of high quality sand prairie, degraded sand prairie, and successional communities. An east-west access road transverses this area dividing it into two nearly equal parts. The elevation at the HBSNP varied from 201 to 212 m above sea level. Before dedication as a nature preserve, the area had been grazed, lightly logged, occasionally burned, and had its hydrology altered (Glass 1985). Like the black oak savanna community the sand flatwoods community has been affected by various land use practices such as logging, burning (obvious at the time of this survey with many downed logs heavily fire damaged), and altering hydrology. A large ditch runs along the east and much of the north boundary of the sand flatwoods. A levee has been positioned between the levee and the sand flatwoods to prevent excess runoff, however a large breach in this levee is presently located at the southeast corner of the sand flatwoods.

The soil is of the Gilford-Chelsea-Watseka association (Kiefer 1982). These soils are formed in glacial outwash and in wind- or water-deposited sand. They range from excessively drained soils which are slightly acidic, light colored, and that have little organic matter (savanna communities) to very poorly drained soils which are neutral, black, and loamy (flatwoods communities).

The climate of east-central Illinois is continental with cool winters, hot summers, and little or no water deficit in any season of the year (Page 1949, Fehrenbacher et al. 1967, Schwegman et al. 1973). According to the Midwest Climate Center (2002), nearest station (32 km to the south-southwest) at Watseka, Illinois, the mean annual precipitation is 100.2 cm with the month of July having the highest rainfall (10.5 cm) and the mean annual temperature is 9.6°C with the hottest month being July (average of 22.9°C) and the coldest month being January (average of -6.1°C). The number of frost free days is 160 to 170 (Page 1949).

## RESULTS AND DISCUSSION

Vascular Plant Species Present: The documented flora in the HBSNP consisted of 334 species and subspecific taxa within 209 genera and 66 families. Of these taxa, 30 (9%) were not native to Illinois. Pteridophytes were poorly represented at HBSNP, accounting for only 9 taxa (2.7% of all taxa) while Spermatophytes accounted for the remainder. Among the Spermatophytes, monocots accounted for 90 taxa in 52 genera and 8 families (26.9% of all taxa), while dicots accounted for 235 taxa in 150 genera and 52 families (70.4% of all taxa). Genera with the most taxa were: *Carex* (sedge) 13, *Polygonum* (smartweed) 8, *Asclepias* (milkweed) 5, *Aster* (aster) 5, *Hypericum* (shore St. John's-wort) 5, *Panicum* (panic grass) 5, *Rubus* (blackberry) 5, *Solidago* (goldenrod) 5, and *Viola* (violet) 5. Families with the most taxa were: Poaceae (grass family) 52, Asteraceae (aster family) 46, (Cyperaceae) sedge family 21, Fabaceae (pea

family) 17, Rosaceae (rose family) 13, Caryophyllaceae (pink family) 11, Polygonaceae (smartweed family) 11, Scrophulariaceae (figwort family) 11, and Lamiaceae (mint family) 10. Four species listed by the Illinois Endangered Species Protection Board (1999) as endangered were recorded, *Hypericum adpressum* Bart. (shore St. John's wort), *Polygonum careyi* Olney (Carey's heartease), *Rubus setosus* Bigel. [= *R. schneideri* Bailey (bristly blackberry), and *Viola primulifolia* L. (primrose violet), and their locations mapped (Figure 2). For a complete list of taxa and the natural communities where the species were observed see Appendix 1. For a brief discussion on tree and large shrub encroachment at HBSNP see Appendix II.

**Woody Overstory of the Dry Sand Savanna:** The canopy layer densities were similar at the five sites surveyed (Figure 1), with an average of 157 stems/ha, ranging from 122.9 stems/ha at Site 4 to 187.5 stems/ha at Site 3 (Table 1). The dominant species was black oak, with an average IV of 178.8, ranging from 151.0 at Site 4 to 194.7 at Site 3. White oak, black cherry, and pin oak were the only other tree species encountered. White oak was the next most commonly encountered tree, with an average IV of 20.4, where it was most commonly encountered in Site 4 (IV 48.2), Site 1 (IV 26.0), and Site 5 (IV 15.6). These sites were at slightly lower elevations or contained small inclusions of lower elevated areas where the savanna was locally more mesic than at Sites 2 and 3. Black cherry and pin oak were both represented by a few scattered individuals. Average diameter of black oak (27.2 cm) and white oak (24.4 cm) was similar at all 5 sites indicating a similar age throughout the HBSNP (Table 1). Size class distributions (Table 1) of black oak varied somewhat between the 5 sites, but the majority of the trees were less than 40 cm dbh (78% at Site 1; 80% at Site 2; 93% at Site 3; 79% at site 4; 86% at Site 5) indicating that all sites have a similar developmental history.

Site 2 and 3 (each 4 ha in size) from the present study (Figure 1) correspond closely to the locations of two sites (each 3 ha in size) studied at the HBSNP by Johnson & Ebinger (1992). Black oak in the present study (field work completed in October 2001) at sites 2 and 3 had an average IV of 192.4 while black oak in the Johnson & Ebinger (1992) study (field work completed in October 1989) had an average IV of 199. Presently both white oak and black cherry have made minor increases in IV since 1989, 0.7 to 6.1 and 0.3 to 1.5 respectively. The total number of stems/ha also increased from 136 to 170.4 primarily by black oak that has increased from 135.2 stems/ha in 1989 to 163.2 stems/ha in 2001. Most of this increase of black oak is in the 10 - 19 cm diameter class where the number of stems has increased from 47.9 stems/ha in 1989 to 80.5 stems/ha in 2001. As a result, the average diameter of black oak has decreased from an average of 26 cm in 1989 to 24.5 cm in 2001.

Dead-standing individuals are a common feature of these savannas, with an average of 23.3 stems/ha or 12.9% of all standing stems (Table 2). Dead-standing individuals were most common in Site 4 (35 stems/ha), Site 5 (31.8 stems/ha), and Site 3 (26.8 stems/ha). Individuals of dead-standing black oak were the most frequent dead-standing tree species at all sites and comprised the greatest basal area at each site (Site 1, 97%; Site 2, 97.6%, Site 3, 99.5%, Site 4, 97%, Site 5, 95.5%). Presently the density of dead-standing stems (Table 2) at Sites 2 and 3 (11.4 stems/ha and 26.8 stems/ha) was slightly higher to much higher than that reported by Johnson & Ebinger in 1989 (8.7 stems/ha and 9.3 stems/ha). Site 2 has not been burned very often while Site 3 is generally burned at least every other year. The increase in dead-standing individuals was predicted by Johnson & Ebinger (1992), greater tree mortality was expected from the continued use of burning as a common management practice.



Coppice trees are relatively common in the savannas, averaging 20.5 trees/ha and ranging from 9.6 to 30 trees/ha, at HBSNP (Table 3). Coppice stems were found at all 5 sites and both black oak and white oak produced coppice stems. Black oak accounted for most of the coppice trees/ha (81% at Site 1; 89% at Site 2; 95% at Site 3; 77% at Site 4; 90% at Site 5). These multiple stemmed trees could be the result of past cutting, but many are likely the result of fire which kills the above ground parts of saplings and small trees with the resulting sprouts developing into forest trees.

Woody Understory of the Dry Sand Savanna: All shrubs and all woody seedlings ( $\leq 50$  cm tall) densities averaged 51,380 stems/ha. Site 4 had the greatest density with 75,900 stems/ha and Site 5 had the lowest density with 37,900 stems/ha (Table 4). *Rosa carolina* L. (pasture rose) had the greatest density (stems/ha) in four of the five sites, followed by black oak, *Rubus allegheniensis* Porter (common blackberry), and *Rhus copallina* L. (dwarf sumac). Site 5 had the greatest diversity with 11 species. Regular burns probably enhance the growth of some shrub species (pasture rose and common blackberry), while less frequent burns were important for the establishment and continued success of others, especially seedlings of black oak and white oak. Densities of woody seedlings at Sites 2 & 3 are similar to those reported by Johnson and Ebinger (1992). Pasture rose was the most important species for both studies with black oak, dwarf sumac, and common blackberry also common.

Small Saplings of the Dry Sand Savanna: Small saplings ( $>50$  cm tall  $<2.5$  cm dbh) densities averaged 1,280 stems/ha. Site 1 had the greatest density with 1800 stems/ha and the greatest diversity with 3 species encountered (Table 4). Black oak small saplings were encountered at all five sites and had the greatest density of stems/ha at each site. The results for stems/ha of small saplings at Sites 2 & 3 are slightly lower than those reported previously. Johnson and Ebinger (1992) reported an average of 1583 stems/ha of small saplings (86.8% black oak) while in the present study at Sites 2 & 3 averaged 950 stems/ha of small saplings (97.4% black oak). The difference is probably the result of recent burns, particularly at Site 3.

Large Saplings of the Dry Sand Savanna: Large saplings (2.5 to 9.9 cm dbh) densities averaged 27 stems/ha. Site 1 had the greatest density with 50 stems/ha and Site 5 did not have any large saplings within the 4 ha sample site (Table 4). Large saplings of black oak dominated 4 of the 5 sites. Other large saplings recorded were white oak (Site 4) and black cherry (Sites 3 & 4). The results for stems/ha of large saplings at Sites 2 & 3 are much lower than those reported previously. Johnson and Ebinger (1992) reported an average of 361.5 stems/ha of large saplings (98.6% black oak) while in the present study, Sites 2 & 3 averaged 27.5 stems/ha of large saplings (81.8% black oak). Again, the use of fire as a management tool is probably responsible for much of this decrease.

Ground Layer Species of the Dry Sand Savanna: Ground layer species (including woody species  $\leq 50$  cm tall) were diverse, 80 taxa were recorded in the plots. Of these, three were naturalized, *Achillea millefolium* L. (common yarrow), *Poa pratensis* L. (Kentucky bluegrass), and *Rumex acetosella* L. (sour dock). *Carex pensylvanica* Lam. (Pennsylvania sedge), with an average IV of 62.8 (42.3 at Site 1; 49.3 at Site 2; 75.7 at Site 3; 48.9 at Site 4; 97.7 at Site 5), was the dominant species in the ground layer (Tables 5, 6, 7, 8, 9). Two additional graminoid species, *Schizachyrium scoparium* (Michaux) Nash (little blue stem) and *Sporobolus clandestinus* (Biehler) Hitchc. (dropseed), were common. Prominent forbs included *Cassia fasciculata* Michaux (partridge pea), *Cassia nictitans* L. (wild sensitive plant), and *Euphorbia corollata* L. (flowering spurge). The common woody species was black oak. The most common

shrubs were dwarf sumac, pasture rose, and common blackberry. Bare ground had an average cover of 38.59% and ranged from 25.84% (Site 1) to 55.45% (Site 5). The high percentage of bare ground in the sand savannas at HBSNP is clearly related to the limited availability of moisture in these dry uplands.

**Woody Overstory of the Sand Flatwoods:** The sand flatwoods, located in the southeast corner of HBSNP (Figure 1), is dominated by pin oak with an IV of 188.6 (Table 10). The size class distribution (Table 10) of pin oak clearly shows that the majority of the trees were <50 cm dbh (>96%) with the majority of the individuals in the 20 - 29 cm (29.7%) and 30 - 39 cm (32.6%) diameter classes. *Nyssa sylvatica* Marsh (sour gum), white oak, and *Quercus coccinea* Muenchh. (scarlet oak) were the only other tree species encountered in the plots. Sour gum was best represented, 84.2% of its total stems/ha, in the smallest size class (10 - 19 cm) and like white oak had only one individual in the 30 - 39 cm size class. Scarlet oak was only observed within this community and not represented in the area surveyed.

Dead-standing individuals were occasionally encountered and had an average of 23 stems/ha or 7.6% of all standing stems. Dead-standing individuals were all pin oak and had a basal area of 0.974 m<sup>2</sup>/ha with an average diameter of 22.3 cm. Coppice trees were relatively common in the sand flatwoods with 23 trees/ha (Table 11). Coppice trees were recorded for all species in the flatwoods. However, pin oak accounted for 82.6% of the density (trees/ha) and 91.5% of the basal area (m<sup>2</sup>/ha) of the coppice trees in the sand flatwoods.

**Woody Understory of the Sand Flatwoods:** All shrubs and all woody seedlings (≤50 cm tall) densities were 41,800 stems/ha (Table 12). Pin oak had the highest density of stems/ha, 35,000 or 83.7% of all the shrubs and woody seedlings ≤50 cm tall. *Ilex verticillata* (L.) Gray (winterberry) had the highest density of stems/ha for shrubs. Seven additional species were recorded in this strata, *Sassafras albidum* (Nutt.) Nees (sassafras), sour gum, black cherry, common blackberry, *Rubus occidentalis* L. (black raspberry), *Spiraea tomentosa* L. (hardhack), and *Toxicodendron radicans* (L.) Kuntze (poison ivy). No small saplings (>50 cm tall <2.5 cm dbh) were recorded within the area surveyed. Large saplings (2.5 - 9.9 cm dbh) densities totaled 35 stems/ha (Table 12). Three species were recorded, pin oak (15 stems/ha), sour gum (10 stems/ha), and black cherry (10 stems/ha). The present drainage situation and burning through this area is most likely responsible in part for the lack of small saplings and very low numbers of large saplings.

**Ground Layer Species of the Sand Flatwoods:** Ground layer species (including woody ≤50 cm tall) were not very diverse, 40 taxa were recorded in the plots. Of these, one was naturalized, *Taraxacum officinale* Weber (dandelion). *Carex haydenii* (Hayden's sedge) and *Calamagrostis canadensis* (Michaux) Beauv. (bluejoint grass) were the dominant herbaceous species with IV's of 50.8 and 26.7 respectively (Table 13). Pin oak was the dominant woody species with an IV of 34.2. The three most common shrubs recorded were *Rubus hispidus* L. (swampy dewberry), winterberry, and common blackberry. Two forbs, *Aster umbellatus* Mill. (flat-top aster) and *Apios americana* Medic. (groundnut) were locally common. Bare ground had an average cover of 70.8%. The high percentage of bare ground in the sand flatwoods at HBSNP is clearly related to the seasonally high water table. During winter and spring this area is frequently ponded.

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Table 1. Density by diameter class (stems/ha), basal area (m<sup>2</sup>/ha), relative density, relative dominance, importance value, and average diameter of the woody species recorded for the five savanna sites studied at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois.

Species	Diameter Classes (cm)							Total stems/ha	Basal Area			AV. Diam. (cm)	
	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70+		Area m <sup>2</sup> /ha	Rel. Den.	Rel. Dom.		I.V.
<b>Site # 1</b>													
<i>Quercus velutina</i>	60.0	21.5	20.0	14.5	12.3	1.8	0.3	130.4	9.629	85.7	88.0	173.7	26.7
<i>Quercus alba</i>	14.0	3.5	0.3	1.5	1.3	0.5	0.5	21.6	1.297	14.1	11.9	26.0	22.6
<i>Prunus serotina</i>	0.3	-	-	-	-	-	-	0.3	0.007	0.2	0.1	0.3	18.2
Totals	74.3	25.0	20.3	16.0	13.6	2.3	0.8	152.3	10.933	100.0	100.0	200.0	
<b>Site # 2</b>													
<i>Quercus velutina</i>	71.5	25.8	17.8	14.5	12.8	2.3	-	144.7	9.985	94.6	95.5	190.1	25.8
<i>Quercus alba</i>	5.8	0.5	0.3	0.3	1.3	-	-	8.2	0.461	5.2	4.4	9.6	22.7
<i>Prunus serotina</i>	0.3	-	-	-	-	-	-	0.3	0.005	0.2	0.1	0.3	15.1
Totals	77.6	26.3	18.1	14.8	14.1	2.3	-	153.2	10.451	100.0	100.0	200.0	
<b>Site # 3</b>													
<i>Quercus velutina</i>	89.5	51.5	27.0	7.5	3.8	1.5	0.8	181.6	9.425	96.9	97.8	194.7	23.2
<i>Quercus alba</i>	1.8	1.0	-	0.3	-	-	-	3.1	0.105	1.6	1.1	2.7	19.6
<i>Prunus serotina</i>	1.5	1.0	0.3	-	-	-	-	2.8	0.105	1.5	1.1	2.6	20.6
Totals	92.8	53.5	27.3	7.8	3.8	1.5	0.8	187.5	9.635	100.0	100.0	200.0	
<b>Site # 4</b>													
<i>Quercus velutina</i>	21.3	26.5	27.3	14.5	2.8	2.3	0.5	95.2	8.139	77.6	73.4	151.0	30.5
<i>Quercus alba</i>	11.5	4.8	3.3	2.0	2.5	1.3	1.5	26.9	2.931	21.8	26.4	48.2	31.0
<i>Prunus serotina</i>	0.5	-	-	-	-	-	-	0.5	0.006	0.4	0.1	0.5	12.4
<i>Quercus palustris</i>	0.3	-	-	-	-	-	-	0.3	0.003	0.2	0.1	0.3	15.9
Totals	33.6	31.3	30.6	16.5	5.3	3.6	2.0	122.9	11.079	100.0	100.0	200.0	
<b>Site # 5</b>													
<i>Quercus velutina</i>	29.0	51.3	53.5	15.8	4.5	0.5	0.7	155.3	12.077	91.7	92.7	184.4	29.6
<i>Quercus alba</i>	6.3	4.3	1.0	1.0	1.3	0.3	-	14.2	0.949	8.3	7.3	15.6	26.0
Totals	35.3	55.6	54.5	16.8	5.8	0.8	0.7	169.5	13.026	100.0	100.0	200.0	

Table 2. Density (stems/ha), basal area (m<sup>2</sup>/ha), and average diameter (cm) of dead-standing individuals recorded for the five study sites in the oak sand savanna at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois

Species	Density (stems/ha)	Basal Area (m <sup>2</sup> /ha)	Average Diameter (cm)
Site # 1			
<i>Quercus velutina</i>	9.5	0.717	26.3
<i>Quercus alba</i>	0.8	0.008	11.7
<i>Prunus serotina</i>	1.3	0.013	11.2
Totals	11.6	0.738	
Site # 2			
<i>Quercus velutina</i>	10.3	0.566	21.9
<i>Quercus alba</i>	0.8	0.008	11.7
<i>Prunus serotina</i>	0.3	0.004	13.5
Totals	11.4	0.578	
Site # 3			
<i>Quercus velutina</i>	26.3	1.421	26.6
<i>Prunus serotina</i>	0.5	0.007	13.5
Totals	26.8	1.428	
Site # 4			
<i>Quercus velutina</i>	32.0	1.376	20.7
<i>Quercus alba</i>	3.0	0.042	13.2
Totals	35.0	1.418	
Site # 5			
<i>Quercus velutina</i>	30.0	1.428	21.6
<i>Quercus alba</i>	1.5	0.065	21.2
<i>Prunus serotina</i>	0.3	0.003	12.8
Totals	31.8	1.496	

Table 3. Density (trees/ha), coppice stems per tree, basal area (m<sup>2</sup>/ha), and average diameter (cm) of coppice trees recorded for the five study sites in the oak sand savanna at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois

Species	Density (trees/ha)	Coppice (stems/tree)	Basal Area (m <sup>2</sup> /ha)	Average Diameter (cm)
Site # 1				
<i>Quercus velutina</i>	7.8	2.25	1.237	28.2
<i>Quercus alba</i>	1.8	2.43	0.089	15.9
Totals	9.6	--	1.326	
Site # 2				
<i>Quercus velutina</i>	18.8	1.96	1.340	38.8
<i>Quercus alba</i>	2.0	1.88	0.071	28.8
<i>Prunus serotina</i>	0.3	1.00	0.005	15.1
Totals	21.1	--	1.416	
Site # 3				
<i>Quercus velutina</i>	26.0	2.21	3.355	27.5
<i>Quercus alba</i>	1.0	2.50	0.068	17.9
<i>Prunus serotina</i>	0.3	2.00	0.026	25.4
Totals	27.3	--	3.449	
Site # 4				
<i>Quercus velutina</i>	11.0	2.25	2.235	32.2
<i>Quercus alba</i>	3.3	2.00	0.615	31.0
Totals	14.3		2.850	
Site # 5				
<i>Quercus velutina</i>	27.0	2.25	5.551	31.9
<i>Quercus alba</i>	3.0	2.00	0.308	22.3
Totals	30.0		5.859	

Table 4. Density (stems/ha), of the seedlings and shrubs, small saplings, and large saplings at the five savanna sites in the oak sand savanna at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois

Seedlings ( $\leq 50$  cm tall) and all shrubs.

Species	Site # 1	Site # 2	Site # 3	Site # 4	Site # 5
<i>Quercus velutina</i>	11300	6600	5600	9000	8900
<i>Quercus alba</i>	100	--	100	5100	500
<i>Prunus serotina</i>	200	200	300	900	100
<i>Sassafras albidum</i>	100	--	--	--	1500
<i>Prunus americana</i>	--	--	400	--	--
<i>Rosa carolina</i>	24400	23900	31300	31400	6100
<i>Rubus alleghiensis</i>	3900	6200	7300	12300	3300
<i>Rhus copallina</i>	2900	3000	6500	9700	16000
<i>Rhus glabra</i>	2300	3000	500	1000	300
<i>Amorpha canescens</i>	1400	1400	200	--	800
<i>Corylus americana</i>	--	--	--	5400	200
<i>Salix humilis</i>	--	--	--	700	200
<i>Vaccinium angustifolium</i>	--	--	--	400	--
Totals	46600	44300	52200	75900	37900

Small Saplings ( $>50$  cm tall  $<2.5$  cm dbh).

Species	Site # 1	Site # 2	Site # 3	Site # 4	Site # 5
<i>Quercus velutina</i>	1350	1350	500	1000	800
<i>Quercus alba</i>	100	--	--	500	400
<i>Prunus serotina</i>	--	--	50	--	--
<i>Sassafras albidum</i>	350	--	--	--	--
Totals	1800	1350	550	1500	1200

Large Saplings (2.5 - 9.9 cm dbh).

Species	Site # 1	Site # 2	Site # 3	Site # 4	Site # 5
<i>Quercus velutina</i>	50	20	25	15	--
<i>Quercus alba</i>	--	--	--	10	--
<i>Prunus serotina</i>	--	--	10	5	--
<i>Sassafras albidum</i>	--	--	--	--	--
Totals	50	20	35	30	--



Table 5. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in an oak sand savanna (Site # 1) at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I. V.
<i>Carex pensylvanica</i>	96	18.13	10.5	31.8	42.3
<i>Schizachyrium scoparium</i>	66	6.41	7.2	11.3	18.5
<i>Cassia fasciculata/nictitans</i>	74	4.56	8.1	8.0	16.1
<i>Rhus glabra</i>	34	3.98	3.7	7.0	10.7
<i>Quercus velutina</i>	48	2.10	5.3	3.7	9.0
<i>Sporobolus clandestinus</i>	34	2.12	3.7	3.7	7.4
<i>Amorpha canescens</i>	20	2.44	2.2	4.3	6.5
<i>Solidago nemoralis</i>	24	2.11	2.6	3.7	6.3
<i>Euphorbia corollata</i>	42	0.86	4.6	1.5	6.1
<i>Rubus allegheniensis</i>	18	1.66	2.0	2.9	4.9
<i>Koeleria cristata</i>	26	1.06	2.8	1.9	4.7
<i>Rosa carolina</i>	22	1.28	2.4	2.2	4.6
<i>Helianthus divaricatus</i>	18	1.26	2.0	2.2	4.2
<i>Panicum oligosanthes</i>	30	0.35	3.3	0.6	3.9
<i>Lithospermum carolinense</i>	20	0.79	2.2	1.4	3.6
<i>Conyza canadensis</i>	20	0.59	2.2	1.0	3.2
<i>Liatris aspera</i>	18	0.68	2.0	1.2	3.2
<i>Phlox bifida</i>	22	0.46	2.4	0.8	3.2
<i>Helianthemum spp.</i>	22	0.36	2.4	0.6	3.0
<i>Lespedeza capitata</i>	24	0.17	2.6	0.3	2.9
<i>Aureolaria pedicularia</i>	10	0.78	1.1	1.4	2.5
<i>Viola pedata</i>	16	0.38	1.8	0.7	2.5
<i>Euthamia graminifolia</i>	16	0.28	1.8	0.5	2.3
<i>Panicum villosissimum</i>	16	0.28	1.8	0.5	2.3
<i>Rumex acetosella</i>	16	0.18	1.8	0.3	2.1
<i>Apios americana</i>	10	0.20	1.1	0.4	1.5
<i>Comandra umbellata</i>	12	0.11	1.3	0.2	1.5
<i>Sporobolus cryptandrus</i>	8	0.33	0.9	0.6	1.5
<i>Tephrosia virginiana</i>	6	0.42	0.7	0.7	1.4
<i>Prunus serotina</i>	6	0.37	0.7	0.6	1.3
<i>Monarda punctata</i>	6	0.32	0.7	0.6	1.3
<i>Stipa spartea</i>	6	0.37	0.7	0.6	1.3
<i>Rhus copallina</i>	8	0.14	0.9	0.2	1.1
<i>Cyperus filiculmis</i>	8	0.09	0.9	0.2	1.1
<i>Poa pratensis</i>	8	0.14	0.9	0.2	1.1
Others (23 species)			8.7	2.2	10.9
Totals			100.0	100.0	200.0
Average bare ground		25.84			

Table 6. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in an oak sand savanna (Site # 2) at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I. V.
<i>Carex pensylvanica</i>	100	17.55	12.9	36.4	49.3
<i>Schizachyrium scoparium</i>	46	6.47	5.9	13.4	19.3
<i>Quercus velutina</i>	52	2.79	6.7	5.8	12.5
<i>Rubus allegheniensis</i>	30	3.46	3.9	7.2	11.1
<i>Sporobolus clandestinus</i>	46	2.32	5.9	4.8	10.7
<i>Rhus copallina</i>	34	2.79	4.4	5.8	10.2
<i>Cassia fasciculata/nictitans</i>	60	0.70	7.7	1.5	9.2
<i>Tephrosia virginiana</i>	16	2.32	2.1	4.8	6.9
<i>Aureolaria pedicularia</i>	14	2.10	1.8	4.4	6.2
<i>Rumex acetosella</i>	20	1.56	2.6	3.2	5.8
<i>Helianthemum spp.</i>	36	0.33	4.6	0.7	5.3
<i>Euphorbia corollata</i>	32	0.51	4.1	1.1	5.2
<i>Rhus glabra</i>	10	1.50	1.3	3.1	4.4
<i>Monarda punctata</i>	28	0.34	3.6	0.7	4.3
<i>Conyza canadensis</i>	28	0.19	3.6	0.4	4.0
<i>Lespedeza capitata</i>	26	0.23	3.3	0.5	3.8
<i>Panicum villosissimum</i>	24	0.17	3.1	0.4	3.5
<i>Rosa carolina</i>	20	0.40	2.6	0.8	3.4
<i>Amorpha canescens</i>	16	0.23	2.1	0.5	2.6
<i>Lithospermum carolinense</i>	12	0.40	1.5	0.8	2.3
<i>Panicum oligosanthes</i>	12	0.16	1.5	0.3	1.8
<i>Comandra umbellata</i>	10	0.15	1.3	0.3	1.6
<i>Physalis virginiana</i>	12	0.06	1.5	0.1	1.6
<i>Gnaphalium obtusifolium</i>	10	0.10	1.3	0.2	1.5
<i>Phlox bifida</i>	10	0.05	1.3	0.1	1.4
<i>Stipa spartea</i>	10	0.05	1.3	0.1	1.4
<i>Koeleria cristata</i>	8	0.09	1.0	0.2	1.2
<i>Viola pedata</i>	8	0.09	1.0	0.2	1.2
Others (16 species)			6.1	2.2	8.3
Totals			100.0	100.0	200.0
Average bare ground		43.46			

Table 7. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in an oak sand savanna (Site # 3) at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I. V.
<i>Carex pensylvanica</i>	100	33.85	17.7	58.0	75.7
<i>Quercus velutina</i>	44	4.44	7.8	7.6	15.4
<i>Rhus copallina</i>	48	3.69	8.5	6.3	14.8
<i>Rubus flagellaris</i>	20	4.35	3.5	7.5	11.0
<i>Schizachyrium scoparium</i>	30	3.06	5.3	5.2	10.5
<i>Cassia fasciculata/nictitans</i>	50	0.80	8.9	1.4	10.3
<i>Helianthemum spp.</i>	40	0.75	7.1	1.3	8.4
<i>Tephrosia virginiana</i>	20	2.73	3.5	4.7	8.2
<i>Rosa carolina</i>	36	0.68	6.4	1.2	7.6
<i>Euphorbia corollata</i>	34	0.62	6.0	1.1	7.1
<i>Liatris aspera</i>	12	0.74	2.1	1.3	3.4
<i>Panicum virgatum</i>	18	0.14	3.2	0.2	3.4
<i>Lespedeza capitata</i>	16	0.28	2.8	0.5	3.3
<i>Panicum villosissimum</i>	12	0.11	2.1	0.2	2.3
<i>Aureolaria pedicularia</i>	6	0.66	1.1	1.1	2.2
<i>Sporobolus clandestinus</i>	8	0.09	1.4	0.2	1.6
<i>Polygala polygama</i>	8	0.09	1.4	0.2	1.6
<i>Lespedeza virginica</i>	8	0.04	1.4	0.1	1.5
<i>Rumex acetosella</i>	8	0.04	1.4	0.1	1.5
<i>Desmodium obtusum</i>	6	0.18	1.1	0.3	1.4
<i>Aristida purpurascens</i>	6	0.08	1.1	0.1	1.2
<i>Leptoloma cognatum</i>	6	0.08	1.1	0.1	1.2
<i>Hieracium scabrum</i>	6	0.03	1.1	0.1	1.2
Others (9 species)			4.0	1.2	5.2
Totals			100.0	100.0	200.0
Average bare ground		31.28			

Table 8. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in an oak sand savanna (Site # 4) at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I.V.
<i>Carex pensylvanica</i>	98	17.32	17.3	31.6	48.9
<i>Quercus velutina</i>	64	7.79	11.3	14.2	25.5
<i>Quercus alba</i>	32	8.66	5.6	15.8	21.4
<i>Rubus allegheniensis</i>	46	5.36	8.1	9.8	17.9
<i>Rubus hispidus</i>	18	6.21	3.2	11.3	14.5
<i>Schizachyrium scoparium</i>	40	3.59	7.0	6.5	13.5
<i>Sorghastrum nutans</i>	34	0.95	6.0	1.7	7.7
<i>Cassia fasciculata/nictitans</i>	34	0.62	6.0	1.1	7.1
<i>Rosa carolina</i>	28	0.73	4.9	1.3	6.2
<i>Rhus copallina</i>	16	1.20	2.8	2.2	5.0
<i>Hieracium scabrum</i>	16	0.28	2.8	0.5	3.3
<i>Euphorbia corollata</i>	16	0.18	2.8	0.3	3.1
<i>Panicum villosissimum</i>	14	0.17	2.5	0.3	2.8
<i>Desmodium obtusum</i>	10	0.49	1.8	0.9	2.7
<i>Rumex acetosella</i>	12	0.16	2.1	0.3	2.4
<i>Euthamia graminifolia</i>	10	0.05	1.8	0.1	1.9
<i>Antennaria plantaginifolia</i>	8	0.24	1.4	0.4	1.8
<i>Aster linariifolius</i>	8	0.14	1.4	0.3	1.7
<i>Potentilla simplex</i>	8	0.09	1.4	0.2	1.6
<i>Krigia biflora</i>	8	0.09	1.4	0.2	1.6
<i>Helianthemum spp.</i>	8	0.04	1.4	0.1	1.5
<i>Prunus serotina</i>	6	0.13	1.1	0.2	1.3
<i>Panicum virgatum</i>	6	0.13	1.1	0.2	1.3
<i>Comandra umbellata</i>	6	0.03	1.1	0.1	1.2
Others (8 species)			3.7	0.4	4.1
Totals			100.0	100.0	200.0
Average bare ground		36.90			

Table 9. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in an oak sand savanna (Site # 5) at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I.V.
<i>Carex pensylvanica</i>	100	32.35	24.5	73.2	97.7
<i>Quercus velutina</i>	52	6.09	12.7	13.8	26.5
<i>Rhus copallina</i>	32	1.53	7.8	3.5	11.3
<i>Cassia fasciculata/nictitans</i>	34	0.27	8.3	0.6	8.9
<i>Rosa carolina</i>	30	0.35	7.4	0.8	8.2
<i>Panicum villosissimum</i>	22	0.31	5.4	0.7	6.1
<i>Schizachyrium scoparium</i>	16	0.38	3.9	0.9	4.8
<i>Helianthemum spp.</i>	18	0.09	4.4	0.2	4.6
<i>Lithospermum caroliniense</i>	10	0.49	2.5	1.1	3.6
<i>Euphorbia corollata</i>	12	0.11	2.9	0.5	3.4
<i>Hieracium scabrum</i>	12	0.06	2.9	0.1	3.0
<i>Rubus flagellaris</i>	6	0.42	1.5	1.0	2.5
<i>Quercus alba</i>	4	0.60	1.0	1.4	2.4
<i>Rubus allegheniensis</i>	6	0.18	1.5	0.4	1.9
<i>Lespedeza capitata</i>	6	0.08	1.5	0.2	1.7
<i>Solidago nemoralis</i>	6	0.08	1.5	0.2	1.7
<i>Ambrosia artemisiifolia</i>	6	0.03	1.5	0.1	1.6
<i>Smilacina stellata</i>	4	0.07	1.0	0.2	1.2
<i>Aureolaria pedicularia</i>	2	0.30	0.5	0.7	1.2
<i>Phlox bifida</i>	4	0.02	1.0	0.1	1.1
<i>Lespedeza virginica</i>	4	0.02	1.0	0.1	1.1
<i>Panicum oligosanthes</i>	4	0.02	1.0	0.1	1.1
Others (9 species)			4.3	0.1	4.4
Totals			100.0	100.0	200.0
Average bare ground		55.45			

Table 10. Density by diameter class (stems/ha), basal area (m<sup>2</sup>/ha), relative density, relative dominance, importance value, and average diameter of the woody species recorded for a sand flatwoods studied at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois.

Species	Diameter Classes (cm)						Total stems/ha	Basal			Av. Diam. (cm)	
	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 +		Area m <sup>2</sup> /ha	Rel. Den.	Rel. Dom.		I.V.
<i>Quercus palustris</i>	35	82	90	59	9	1	276	25.015	91.4	97.2	188.6	32.2
<i>Nyssa sylvatica</i>	16	2	1	-	-	-	19	0.436	6.3	1.7	8.0	15.9
<i>Quercus alba</i>	3	3	1	-	-	-	7	0.295	2.3	1.1	3.4	22.2
Totals	54	87	92	59	9	1	302	25.746	100.0	100.0	200.0	

Table 11. Density (trees/ha), coppice stems per tree, basal area (m<sup>2</sup>/ha), and average diameter (cm) of coppice trees recorded for a sand flatwoods studied at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois

Species	Density (trees/ha)	Coppice (stems/tree)	Basal Area (m <sup>2</sup> /ha)	Average Diameter (cm)
<i>Quercus palustris</i>	19	1.95	3.228	32.0
<i>Quercus alba</i>	2	2.00	0.219	25.6
<i>Nyssa sylvatica</i>	2	2.00	0.079	15.8
Totals	23	--	3.526	--

Table 12. Density (stems/ha) of seedlings and shrubs, small saplings, and large saplings in the sand flatwoods at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois

Species	Seedlings and Shrubs	Small Saplings	Large Saplings
<i>Quercus palustris</i>	35000	--	15
<i>Sassafras albidum</i>	2300	--	--
<i>Nyssa sylvatica</i>	900	--	10
<i>Prunus serotina</i>	100	--	10
<i>Ilex verticillata</i>	2100	--	--
<i>Spiraea tomentosa</i>	500	--	--
<i>Rubus occidentalis</i>	500	--	--
<i>Rubus allegheniensis</i>	200	--	--
<i>Toxicodendron radicans</i>	200	--	--
Totals	41800	--	35



Table 13. Frequency (%), average cover, relative frequency, relative cover, and importance values (IV) of the ground layer species encountered in a sand flatwoods studied at the Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois. Species with an IV of 1.0 or less are not included.

Species	Frequency %	Average Cover	Relative Frequency	Relative Cover	I.V.
<i>Carex haydenii</i>	62	9.22	15.7	35.1	50.8
<i>Quercus palustris</i>	68	4.43	17.3	16.9	34.2
<i>Calamagrostis canadensis</i>	30	5.02	7.6	19.1	26.7
<i>Aster umbellatus</i>	10	1.42	2.5	5.4	7.9
<i>Erechtites hieracifolia</i>	24	0.17	6.1	0.6	6.7
<i>Sassafras albidum</i>	16	0.47	4.1	1.8	5.9
<i>Rubus hispidus</i>	14	0.61	3.6	2.3	5.9
<i>Quercus alba</i>	10	0.73	2.5	2.8	5.3
<i>Ilex verticillata</i>	10	0.68	2.5	2.6	5.1
<i>Apios americana</i>	10	0.54	2.5	2.1	4.6
<i>Rubus allegheniensis</i>	8	0.67	2.0	2.5	4.5
<i>Eupatorium serotinum</i>	14	0.17	3.6	0.6	4.2
<i>Solidago canadensis</i>	6	0.66	1.5	2.5	4.0
<i>Bidens frondosa</i>	12	0.21	3.0	0.2	3.2
<i>Panicum lanuginosum</i>	10	0.15	2.5	0.6	3.1
<i>Boehmeria cylindrica</i>	10	0.05	2.5	0.2	2.7
<i>Conyza canadensis</i>	10	0.05	2.5	0.2	2.7
<i>Polygonum punctatum</i>	8	0.04	2.0	0.2	2.2
<i>Potentilla simplex</i>	6	0.08	1.5	0.3	1.8
<i>Nyssa sylvatica</i>	6	0.08	1.5	0.3	1.8
<i>Vaccinium angustifolium</i>	2	0.30	0.5	1.1	1.6
<i>Lycopus sp.</i>	6	0.03	1.5	0.1	1.6
<i>Rubus flagellaris</i>	4	0.12	1.0	0.5	1.5
<i>Rubus occidentalis</i>	4	0.12	1.0	0.5	1.5
<i>Agrostis scabra</i>	4	0.02	1.0	0.1	1.1
Others (15 species)	--	--	8.0	1.4	9.4
Totals			100.0	100.0	200.0
Average bare ground		70.80			

## APPENDIX 1

The vascular taxa encountered and collected at the Hooper Branch Savanna Nature Preserve are listed below by major groups, Pteridophytes (ferns and fern-allies) and Spermatophytes (seed plants), the latter divided into Monocots and Dicots. The families, genera, and species are alphabetically arranged within each group. Non-native species are indicated by an asterisk (\*). After the binomial and authority, the communities where the species was observed is given (1 = sand flatwoods, 2 = dry-mesic sand prairie, 3 = dry sand prairie, 4 = dry-mesic sand savanna, 5 = dry sand savanna, 6 = cultural). Following the community number(s), collecting numbers preceded by the initial of the collector's name are given (E for John E. Ebinger, Ev for Robert A. Evers, F for Mary A. Feist, and P for Loy R. Phillippe).

### PTERIDOPHYTES

#### ASPLENIACEAE

*Athyrium filix-femina* (L.) Mertens var. *angustum* (Willd.) G. Lawson: 6; P 33691  
*Onoclea sensibilis* L.: 1, 6; F 1137

#### DENNSTAEDTIACEAE

*Pteridium aqualinum* (L.) Kuhn var. *latiusculum* (Desv.) Underw.: 4, 6; F 952

#### EQUISETACEAE

*Equisetum arvense* L.: 6; P 32922  
*Equisetum laevigatum* A. Br.: 4, 5; P 33118

#### OPHIOGLOSSACEAE

*Botrychium dissectum* Sprengel: 6; F 1160

## OSMUNDACEAE

*Osmunda cinnamomea* L.: 1; P 32915

*Osmunda regalis* L. var. *spectabilis* (Willd.) Gray: 1; P 32901

## THELYPTERIDACEAE

*Thelypteris palustris* Schott.: 1, 6; F 1140

## SPERMATOPHYTES: ANGIOSPERMS

## MONOCOTS

## ALISMACEAE

*Alisma plantago-aquatica* L. var. *parviflora* (Pursh) Torrey: 6; F 1148

## COMMELINACEAE

*Commelina erecta* L.: 4, 5; P 33222, P 33518

*Tradescantia ohiensis* Raf.: 2, 3, 4, 5; P 33113

## CYPERACEAE

*Carex bebbii* Olney: 6; P 33137

*Carex bicknellii* Britton in Britton & Brown: 4; P 33146

*Carex cumulata* (L. Bailey) Mackenzie: 6; F 1156

*Carex emmonsii* Dewey: 1, 4, 5, 6; P 32902

*Carex haydenii* Dewey: 1; P 32907

*Carex meadii* Dewey: 4; P 32890

*Carex muhlenbergii* Schk.: 4, 5; P 32885

*Carex pensylvanica* Lam.: 2, 3, 4, 5; P 32873

*Carex scoparia* Schkuhr in Willd.: 6; F 951, F 962, F 1143

*Carex suberecta* (Olney) Britton: 1; P 33243

*Carex swanii* (Fernald) Mackenzie: 1, 4, 6; P 33131

*Carex tetanica* Schk.: 1; P 32940

*Carex umbellata* C. Schkuhr. ex Willd.: 4, 6; P 32936

*Cyperus filiculmis* Vahl: 3, 4, 5; P 33129

*Cyperus filiculmis* Vahl ssp. *filiculmis* X *C. schweinitzii* Torrey: 4; P 33259

*Cyperus schweinitzii* Torrey: 4, 5; P 33510

*Cyperus strigosus* L.: 6; F 1147

*Rhynchospora capitellata* (Michx.) Vahl: 6; P 33426

*Scleria triglomerata* Michx.: 2, 3; P 33492

*Scirpus cyperinus* (L.) Kunth.: 6; P 33685

*Scirpus tabernaemontanii* K.C. Gmel.: 6; Ev 102868

## IRIDACEAE

- Iris germanica* L.: 1, 6; P 33032  
*Sisyrinchium albidum* Raf.: 4, 5; P 32872

## JUNCEAE

- Juncus acuminatus* Michx.: 6; P 33423  
*Juncus dudleyi* Wieg.: 4, 5, 6; P 33228, P 33415  
*Juncus marginatus* Rostk.: 6; P 33427  
*Juncus tenuis* Willd.: 1, 4, 6; P 33229

## LILIACEAE

- Asparagus officinalis* L.: 6; F 965  
*Hypoxis hirsuta* (L.) Coville: 4, 5; P 32910  
*Lilium michiganense* Farw.: 1, 6; P 32900  
*Polygonatum commutatum* (Schult.) A. Dietr.: 4, 5; F 948  
*Smilacina racemosa* (L.) Desf.: 4, 5; P 33756, P 33031  
*Smilacina stellata* (L.) Desf.: 4, 5; P 32880, F 1174

## ORCHIDACEAE

- Platanthera lacera* (Michx.) G. Don: 1, 6; P 33246  
*Spiranthes cernua* (L.) Rich.: 6; P 33762

## POACEAE

- Agropyron repens* (L.) Beauv.: 6; P 33253  
*Agrostis alba* L.: 1, 6; P 33252  
*Agrostis hyemalis* (Walt.) BSP.: 4, 5, 6; P 33120  
*Agrostis scabra* Willd.: 1, 4, 5, 6; F 1169  
*Alopecurus carolinianus* Walt.: 6; P 32937  
*Andropogon gerardii* Vitman: 2, 3, 4, 5, 6; P 33496  
*Aristida intermedia* Scribn. & Ball: 3, 6; F 1134  
*Aristida purpurascens* Poir. in Lam.: 4, 5; P 33516  
*Aristida tuberculosa* Nuttall: 3, 4; F 1122  
*Boutelous curtipendula* (Michx.) Torrey: 4; F 1164  
 \**Bromus inermis* Leyss.: 6; P 33133  
 \**Bromus japonicus* Murray: 6; P 33134  
 \**Bromus tectorum* L.: 6; P 32881  
*Calamagrostis canadensis* (Michx.) Beauv.: 1; P 33239  
*Cenchrus longispinus* (Hack.) Fernald: 6; P 33432  
 \**Dactylis glomerata* L.: 6; F 957  
*Digitaria filiformis* (L.) Koel.: 5, 6; P 33678  
*Digitaria ischaemum* (Schreber) Muhl.: 6; F 1161  
*Echinochloa muricata* (P. Beauv.) Fernald var. *muricata*: 6; F 1166  
*Elymus canadensis* L.: 3, 4, 5; P 33512  
*Eragrostis spectabilis* (Pursh) Steud.: 3, 4, 6; P 33507  
 \**Festuca elatior* L.: 6; P 33132

- Glyceria septentrionalis* Hitchcock: 6; F 950  
*Koeleria cristata* (L.) Pers.: 2, 3, 4, 5; P 33067  
*Leersia virginica* Willd.: 1; P 33499  
*Leptoloma cognatum* (Schult.) Chase: 3, 4, 5, 6; P 33409  
*Muhlenbergia mexicana* (L.) Trin.: 1; P 33498  
*Panicum lanuginosum* Ell. var. *lindheimeri* (Nash) Fernald: 1, 6; P 33241  
*Panicum oligoanthes* Schult. var. *oligoanthes*: 2, 3, 4, 5; P 33068  
*Panicum perlongum* Nash: 4; P 33147  
*Panicum villosissimum* Nash: 4, 5, 6; P 33024  
*Panicum virgatum* L.: 2, 3, 4, 5, 6; P 33410  
*Paspalum ciliatifolium* Michx. var. *muhlenbergii* (Nash) Fernald: 6; F 1181  
*Paspalum bushii* Nash in Britton: 2, 3, 4, 5, 6; P 33517  
*Phalaris arundinacea* L.: 6; P 33138  
*\*Poa annua* L.: 6; P 32938  
*\*Poa compressa* L.: 4, 5, 6; P 33143  
*\*Poa pratensis* L.: 2, 3, 4, 5, 6; P 32893  
*Schizachyrium scoparium* (Michx.) Nash: 2, 3, 4, 5; site record only  
*\*Setaria faberi* Herrm.: 6; P 33445  
*\*Setaria viridis* (L.) Beauv. var. *major* (Goudin) Pospichal: 4, 6; P 33513.2  
*\*Setaria viridis* (L.) Beauv. var. *viridis*: 4, 6; P 33513.1  
*Sorghastrum nutans* Nash: 2, 3, 4, 5, 6; F 1153  
*Spartina pectinata* Link.: 1; P 33695  
*Sphenopholis obtusata* (Michx.) Scribn. var. *major* (Torrey) Erdman: 6; P 33139  
*Sporobolus clandestinus* (Biehler) A. Hitchcock: 2, 3, 4, 5; F 1127  
*Sporobolus cryptandrus* (Torrey) Gray: 3, 4, 5; F 1123, P 33679  
*Sporobolus heterolepis* (Gray) Gray: 4; F 1163  
*Stipa spartea* Trin.: 2, 4, 5; P 33066  
*Tridens flavus* (L.) Hitchcock: 2, 3, 4, 5; P 33490  
*Triplasis purpurea* (Walt.) Chapm.: 4, 5; P 33508  
*Vulpia octoflora* (Walter) Rydb.: 4, 5, 6; P 32877

## DICOTS

### AMARANTHACEAE

- Froelichia floridana* (Nuttall) Moq.: 2, 3, 4, 5, 6; P 33418

### ANACARDIACEAE

- Rhus copallina* L.: 1, 4, 5, 6; P 33444  
*Rhus glabra* L.: 2, 3, 4, 5; P 33672  
*Rhus typhina* L.: 2, 3, 4, 5, 6; F 966

### APIACEAE

- \*Daucus carota* L.: 6; F 1145  
*Eryngium yuccifolium* Michx.: 2; P 33442  
*Sanicula canadensis* L.: 6; F 1179

## APOCYNACEAE

*Apocynum sibiricum* Jacq.: 1, 6; P 33238

## AQUIFOLIACEAE

*Ilex verticillata* (L.) Gray: 1; P 33249

## ASCLEPIADACEAE

*Asclepias amplexicaulis* Sm.: 4; P 33123

*Asclepias incarnata* L.: 6; P 33424

*Asclepias syriaca* L.: 6; F 1171

*Asclepias tuberosa* L.: 4; P 33236

*Asclepias verticillata* L.: 4; P 33227

## ASTERACEAE

\**Achillea millefolium* L.: 2, 3, 4, 5, 6; P 33114

*Ambrosia artemisiifolia* L.: 1, 2, 3, 4, 5, 6; P 33506

*Ambrosia trifida* L.: 6; F 1178

*Antennaria plantaginifolia* (L.) Richardson: 1, 2, 3, 4, 5; P 32879

*Aster dumosus* L.: 4, 5; P 33766

*Aster linariifolius* L.: 3, 4, 5; F 1126

*Aster oolentangiensis* Riddell: 4, 5; P 33755

*Aster pilosus* Willd.: 2, 3, 4, 5, 6; P 33759

*Aster umbellatus* Mill.: 1; P 33500

*Bidens frondosa* L.: 1; site record only

*Cirsium discolor* (Muhl.) Spreng.: 4, 6; F 1154

*Conyza canadensis* (L.) Cronq.: 1, 2, 3, 4, 5, 6; F 1132

*Coreopsis lanceolata* L.: 4, 5, 6; F 971

*Coreopsis palmata* Nuttall: 4, 5, 6; P 33223

*Coreopsis tripteris* L.: 3, 4, 6; F 1180

*Erechtites hieracifolia* (L.) Raf.: 1, 6; F 1168

*Erigeron annuus* (L.) Pers.: 1, 6; P 33144

*Erigeron strigosus* Muhl.: 2, 3, 4, 5; P 33121

*Eupatorium altissimum* L.: 4, 5, 6; P 33758

*Eupatorium perfoliatum* L.: 1, 6; P 33686

*Eupatorium serotinum* Michx.: 1, 6; F 1128

*Euthamia graminifolia* (L.) Salisb.: 2, 3, 4, 5; P 33765

*Galinsoga quadriradiata* R. & P.: 6; P 33693

*Gnaphalium obtusifolium* L.: 4, 5, 6; F 1130

*Helianthus divaricatus* L.: 2, 3, 4, 5; P 33437

*Helianthus mollis* Lam.: 3, 4; P 33489

*Hieracium gronovii* L.: 4, 5, 6; P 33414

*Hieracium scabrum* Michx.: 3, 4, 5; F 1162

*Hymenopappus scabiosaeus* L' Hér: 4, 6; P 33023

*Krigia biflora* (Walt.) Blake: 2, 4, 5; P 32894

*Krigia virginica* (L.) Willd.: 4, 5; P 32875

*Lactuca canadensis* L.: 1, 3, 4, 6; F 1158

*Liatris aspera* Michx.: 2, 3, 4, 5; P 33677

*Liatris spicata* (L.) Willd.: 6; F 1152  
*Parthenium integrifolium* L.: 1, 4, 5; P 33240  
*Rudbeckia hirta* L.: 2, 3, 4, 5, 6; F 946  
*Senecio plattensis* Nuttall: 6; P 32918  
*Solidago canadensis* L.: 1, 2, 3, 4, 5, 6; P 33754  
*Solidago gigantea* Aiton: 1, 6; P 33683  
*Solidago missouriensis* Nuttall: 6; P 33435  
*Solidago nemoralis* Aiton: 2, 3, 4, 5, 6; P 33671  
*Solidago speciosa* Nuttall: 4; P 33752  
*Sonchus arvensis* L. var. *glabrescens* (Guenther) Grab. & Wimmer: 6; P 33429  
 \**Taraxacum officinale* Weber: 1, 4, 12; P 32896  
*Tragopogon pratensis* L.: 3, 6; P 33130  
*Vernonia gigantea* (Walter) Trel.: 1, 4, 5, 6; P 33440, P 33764

## BETULACEAE

*Corylus americana* Walt.: 4, 5, 6; P 33443

## BORAGINACEAE

*Hackelia virginiana* (L.) I.M. Johnston: 6; P 33681  
*Lithospermum carolinense* (Walter) MacMillan: 3, 4, 5; P 32876

## BRASSICACEAE

*Arabis glabra* (L.) Bernh.: 4, 6; F 967  
*Arabis lyrata* L.: 4; P 33125  
*Capsella bursa-pastoris* (L.) Medik.: 6; P 32932  
*Cardamine parviflora* L.: 6; P 32934  
*Cardamine pensylvanica* Muhl.: 1; P 33026  
*Draba reptans* (Lam.) Fernald: 6; P 32933  
*Lepidium virginicum* L.: 2, 3, 4, 5, 6; P 32895  
*Rorippa islandica* (Oeder) Borbas var. *fernaldiana* Butt. & Abbe: 6; P 33140

## CAMPANULACEAE

*Lobelia inflata* L.: 4, 5, 6; F 1151  
*Lobelia spicata* Lam. var. *leptostachys* (A. DC.) Mack. & Bush: 4, 5; P 33258  
*Triodanis perfoliata* (L.) Nieuwl. var. *perfoliata*: 4, 5; P 33116

## CAPRIFOLIACEAE

\**Lonicera maackii* (Rupr.) Maxim.: 6; P 32926  
*Sambucus canadensis* L.: 6; F 959  
*Viburnum opulus* L.: 6; P 32925

## CARYOPHYLLACEAE

- \**Arenaria serpyllifolia* L.: 6; P 32912
- \**Cerastium vulgatum* L.: 6; P 32917
- \**Dianthus armeria* L.: 6; P 33235
- \**Holosteum umbellatum* L.: 6; P 32883
- \**Lychnis alba* Mill.: 6; F 945
- Paronychia canadensis* (L.) Wood: 1, 4, 6; P 33505
- \**Saponaria officinalis* L.: 6; P 33257
- Silene antirrhina* L.: 6; P 32927
- \**Silene cserei* Baumg.: 6; P 33218
- Silene stellata* (L.) Aiton f.: 4, 5; P 33434
- \**Stellaria media* (L.) Vill.: 6; P 32930

## CHENOPODIACEAE

- Chenopodium desiccatum* A. Nels.: 2, 3, 4, 5; P 33514
- Cycloloma atriplicifolium* (Spreng.) Coult.: 6; F 1184

## CISTACEAE

- Helianthemum bicknellii* Fernald: 4, 5; P 33689
- Helianthemum canadense* (L.) Michx.: 4, 5; P 33021, P 33763
- Lechea minor* L.: 2, 4; P 33494, P 33757.2
- Lechea pulchella* Raf.: 2; P 33495
- Lechea villosa* Ell.: 3, 4; F 1131, P 33757.1

## CLUSIACEAE

- Hypericum adpressum* Barton: 6; P 33422
- Hypericum gentianoides* (L.) BSP: 3, 6; F 1129
- Hypericum majus* (Gray) Britt.: 6; P 33421
- Hypericum mutilum* L.: 6; F 1135
- \**Hypericum perforatum* L.: 6; P 33255

## CONVOLVULACEAE

- Calystegia sepium* (L.) R. Br.: 6; P 33145

## CORNACEAE

- Cornus obliqua* Raf.: 6; F 960

## ELAEAGNACEAE

- Elaeagnus umbellata* Thunb.: 6; P 32921



## ERICACEAE

- Gaylussacia baccata* (Wang.) K. Koch: 1, 4; P 32906  
*Vaccinium angustifolium* Aiton: 1, 4; P 32905  
*Vaccinium corymbosum* L.: 6; P 33141

## EUPHORBIACEAE

- Acalypha gracilens* Gray: 1, 4; P 33816  
*Acalypha rhomboidea* Raf.: 6; P 33692  
*Chamaesyce geyeri* (Engelman & Gray) Small: 3, 4; F 1120  
*Chamaesyce maculata* (L.) Small: 6; P 33675  
*Chamaesyce nutans* (Lag.) Small: 6; P 33676  
*Croton glandulosus* L.: 4; P 33509  
*Euphorbia corollata* L.: 2, 3, 4, 5; P 33122, P 33493  
*Poinsettia dentata* (Michx.) Kl. & Garcke: 4, 5, 6; P 33511

## FABACEAE

- Amorpha canescens* Pursh: 2, 3, 4, 5; P 33232  
*Apios americana* Medic.: 1, 4, 5; P 33753  
*Baptisia lactea* (Raf.) Thieret: 4; P 33237  
*Baptisia leucophaea* Nuttall: 4; P 33228  
*Cassia fasciculata* Michx.: 2, 3, 4, 5, 6; P 33416  
*Cassia nictitans* L.: 2, 3, 4, 5, 6; P 33408  
*Desmodium obtusum* (Muhl.) DC.: 3, 4; F 1124, P 33673  
*Desmodium paniculatum* (L.) DC.: 6; P 33687  
*Desmodium sessilifolium* (Torrey) Torrey & Gray: 3, 4; F 1121  
*Lespedeza capitata* Michx.: 2, 3, 4, 5, 6; F 1119  
*Lespedeza hirta* (L.) Hornem.: 3, 4; F 1183  
*Lespedeza x longifolia* DC.: 4; F 1173  
*Lespedeza virginica* (L.) Britt.: 4, 5, 6; F 1157  
*Medicago lupulina* L.: 6; F 970  
*Melilotus alba* Medik.: 6; P 33219  
*Tephrosia virginiana* (L.) Pers.: 3, 4, 5; P 33226  
*Vicia villosa* Roth: 6; F 944

## FAGACEAE

- Quercus alba* L.: 1, 4, 5; P 33674  
*Quercus coccinea* Muenchh.: 1; P 33248  
*Quercus palustris* Muenchh.: 1; site record only  
*Quercus velutina* Lam.: 2, 3, 4, 5, 6; F 1159

## GENTIANACEAE

- Bartonia virginica* (L.) BSP. 1; P 33439  
*Gentiana saponaria* L.: 2; P 33818

## LAMIACEAE

- Lycopus americanus* Muhl.: 1; P 33502  
*Lycopus uniflorus* Michx.: 6; F 1136  
*Monarda fistulosa* L.: 4; P 33438  
*Monarda punctata* L.: 2, 3, 4, 5, 6; P 33413  
*Nepeta cataria* L.: 6; P 33694  
*Physostegia virginiana* (L.) Benth.: 6; P 33611  
*Prunella vulgaris* L.: 6; P 33612  
*Pycnanthemum virginianum* (L.) Dur. & Jacks.: 1, 6; P 33441  
*Scutellaria leonardii* Eplene: 4, 5; F 956  
*Stachys tenuifolia* Willd. var. *hispida* (Pursh) Fernald: 6; F 1142

## LAURACEAE

- Sassafras albidum* (Nuttall) Nees: 1, 4, 5, 6; P 32923

## MALVACEAE

- \**Abutilon theophrastii* Medik.: 6; F 1125

## MELASTOMATACEAE

- Rhexia virginica* L.: 6; P 33419

## MOLLUGINACEAE

- Mollugo verticillatus* L.: 4, 5, 6; P 33412

## NYSSACEAE

- Nyssa sylvatica* Marshall: 1; P 33245

## ONAGRACEAE

- Circaea lutetiana* L. ssp. *canadensis* (L.) Aschers & Magnus: 1; P 33497  
*Epilobium coloratum* Biehler: 6; F 1146, F 1177  
*Ludwigia alternifolia* L.: 6; F 1141  
*Oenothera biennis* L.: 6; F 1150  
*Oenothera laciniata* Hill: 6; F 953  
*Oenothera rhombipetala* Nuttall: 4, 5, 6; P 33433

## OXALIDACEAE

- Oxalis dillenii* Jacq.: 4, 5, 6; P 32884

## PHYTOLACCACEAE

*Phytolacca americana* L.: 4, 5, 6; F 1175

## PLANTAGINACEAE

*Plantago aristata* Michx.: 6; P 33250  
*Plantago patagonica* Jacq.: 4, 6; F 973.1  
*Plantago rugelii* Decne.: 4, 6; P 33436

## POLEMONIACEAE

*Phlox bifida* Beck: 2, 3, 4, 5; P 32874  
*Phlox glaberrima* L.: 1; P 33251

## POLYGALACEAE

*Polygala polygama* Walt.: 2, 3, 4, 5; P 33115  
*Polygala sanguinea* L.: 6; P 33420

## POLYGONACEAE

*Polygonella articulata* (L.) Meisn.: 4, 6; P 33767  
*Polygonum careyi* Olney: 6; F 1138, F 1185  
*Polygonum hydropiper* L.: 6; F 1149  
*Polygonum lapathifolium* L.: 6; F 1165  
*Polygonum opelousanum* Riddell: 1; P 33501  
*Polygonum pensylvanicum* L.: 6; F 1155  
*Polygonum punctatum* Ell.: 1, 6; F 1139  
*Polygonum scandens* L.: 6; P 33682  
*Polygonum tenue* Michx.: 4, 5; P 33417  
*\*Rumex acetosella* L.: 2, 3, 4, 5, 6; P 32919  
*\*Rumex crispus* L.: 6; P 33254

## PORTULACACEAE

*Claytonia virginica* L.: 4, 5; P 32891  
*Talinum rugospermum* Holz.: 4, 5; P 33411, P 33519, F 1133, F 1133.1, F 1172

## PRIMULACEAE

*Lysimachia quadriflora* Sims: 6; P 33431

## PYROLACEAE

*Monotropa hypopithys* L.: 1; F 1182

## RANUNCULACEAE

- Anemone cylindrica* Gray: 4, 5; P 33117  
*Ranunculus abortivus* L.: 1, 4, 5, 6; P 32928  
*Ranunculus sceleratus* L.: 6; F 963

## RHAMNACEAE

- Ceanothus americanus* L.: 4; P 33234

## ROSACEAE

- Aronia melanocarpa* (Michx.) Ell.: 6; P 32898  
*Fragaria virginiana* Duchesne: 4, 6; P 32892  
*Malus pumila* Mill.: 6; P 33680  
*Potentilla simplex* Michx.: 1, 4, 5, 6; P 32904  
*Prunus americana* Marsh.: 4, 5; site record only  
*Prunus serotina* Ehrh.: 1, 2, 3, 4, 5, 6; P 32882  
*Rosa carolina* L.: 2, 3, 4, 5; P 33119  
*Rubus allegheniensis* Porter: 1, 2, 3, 4, 5, 6; P 32920  
*Rubus flagellaris* Willd.: 1, 2, 3, 4, 5, 6; P 32903  
*Rubus hispidus* L.: 1, 4, 6; P 33127  
*Rubus occidentalis* L.: 1, 4, 6; P 32899  
*Rubus schneideri* Bailey: 1; F 969  
*Spiraea tomentosa* L.: 1, 6; P 33430

## RUBIACEAE

- Galium aparine* L.: 1, 6; P 32916  
*Galium circaezans* Michx.: 4, 5, 6; F 961  
*Galium pilosum* Aiton: 4, 5; P 33224  
*Hedyotis caerulea* (L.) Hook: 1; P 32909

## SALICACEAE

- Salix discolor* Muhl.: 6; P 32935  
*Salix exigua* Nuttall: 6; P 32924  
*Salix humilis* Marshall: 2, 3, 4, 5, 6; P 32911  
*Salix nigra* Marshall: 6; P 33135

## SANTALACEAE

- Comandra umbellata* (L.) Nuttall: 2, 3, 4, 5; P 32889

## SCROPHULARIACEAE

- Aureolaria flava* (L.) Farw.: 1; P 33696  
*Aureolaria pedicularia* L.: 3, 4, 5; P 33407

*Linaria canadensis* (L.) Dum.-Cours.: 2, 3, 4, 5; P 32886  
*Lindernia dubia* (L.) Pennell: 1, 6; F 1167  
*Mimulus ringens* L.: 1, 6; F 1144  
*Pedicularis canadensis* L.: 4, 5, 6; P 32897  
*Scrophularia lanceolata* Pursh: 4, 5; P 33029  
 \**Verbascum thapsus* L.: 6; F 1170  
 \**Veronica arvensis* L.: 6; P 32929  
*Veronica peregrina* L.: 6; P 32931  
*Veronicastrum virginicum* (L.) Farw.: 1, 2; P 33491

## SOLANACEAE

*Physalis virginiana* Mill.: 4, 5, 6; P 33124, P 33690  
*Solanum carolinense* L.: 6; F 972  
 \**Solanum dulcamara* L.: 1, 6; F 958  
*Solanum ptycanthum* Dunal: 1, 4, 5, 6; P 33515

## URTICACEAE

*Boehmeria cylindrica* (L.) Sw.: 1; P 33503  
*Parietaria pensylvanica* Muhl.: 1, 4, 5, 6; F 964, P 33504  
*Pilea pumila* (L.) Gray: 1; site record only  
*Urtica dioica* L.: 6; F 1176

## VERBENACEAE

*Verbena hastata* L.: 6; P 33428

## VIOLACEAE

*Viola lanceolata* L.: 1, 6; P 32908  
*Viola pedata* L.: 3, 4, 5; P 32887  
*Viola primulifolia* L.: 1, 6; P 32939, P 33425  
*Viola rafinesquii* Greene: 6; P 33022  
*Viola sagittata* Aiton: 4; P 32878

## VITACEAE

*Parthenocissus quinquefolia* (L.) Planch.: 4, 5, 6; P 33761  
*Vitis riparia* Michx.: 1, 4, 5, 6; P 33760

**APPENDIX II. TREE AND LARGE SHRUB ENCROACHMENT AT HOOPER BRANCH  
SAVANNA NATURE PRESERVE, IROQUOIS COUNTY, ILLINOIS**

Aerial photographs from 1940, 1954, 1988, and 1999 were digitized to demonstrate woody encroachment (tree & large shrub) at the Hooper Branch Savanna Nature Preserve (HBSNP), Iroquois County, Illinois. These aerial photographs were borrowed from the University of Illinois Map Library and scanned with a Microtek ScanMaker. Four stratified random 5 hectare sites, approximately 10.256% of the HBSNP (Figure 3), were interpreted and then digitized using ARC/INFO (Table 14).

Data interpretation was difficult depending on the quality and resolution of the original photos, problems with registering the photos, and problems with the interpretation of the data, specifically differentiating between trees and other features which show up as black or dark gray such as shadows and wet areas. The 1940 and 1954 aerial photographs were flown in July while the 1988 and 1999 aeriels were flown in April.

In 1940 approximately 63.9 ha or 32.75% of the present area was covered by trees and large shrubs (Table 14). These species have increased dramatically, in 1954 there was approximately 88.53 ha or 45.4% cover, in 1988 approximately 105.39 ha or 54.15%, and in 1999 approximately 113.49 ha or 58.2%. This is a dramatic increase of 49.63 ha in 59 years. Trees and large shrubs, from 1940 (32.75% cover) to 1999 (58.2% cover), have significantly increased at the HBSNP.

Table 14. Cover (ha) of trees and large shrubs within 15, 5 hectare, stratified random sites digitized from aerial photography during four years (1940, 1954, 1988, & 1999) within Hooper Branch Savanna Nature Preserve, Iroquois County, Illinois.

5 hectare sites	1940 (ha)	1954 (ha)	1988 (ha)	1999 (ha)
1	1.56	1.49	3.93	3.29
2	2.43	2.77	1.54	2.39
3	0.95	2.37	2.28	3.25
4	1.61	2.45	3.08	2.71
Totals	6.55	9.08	10.83	11.64

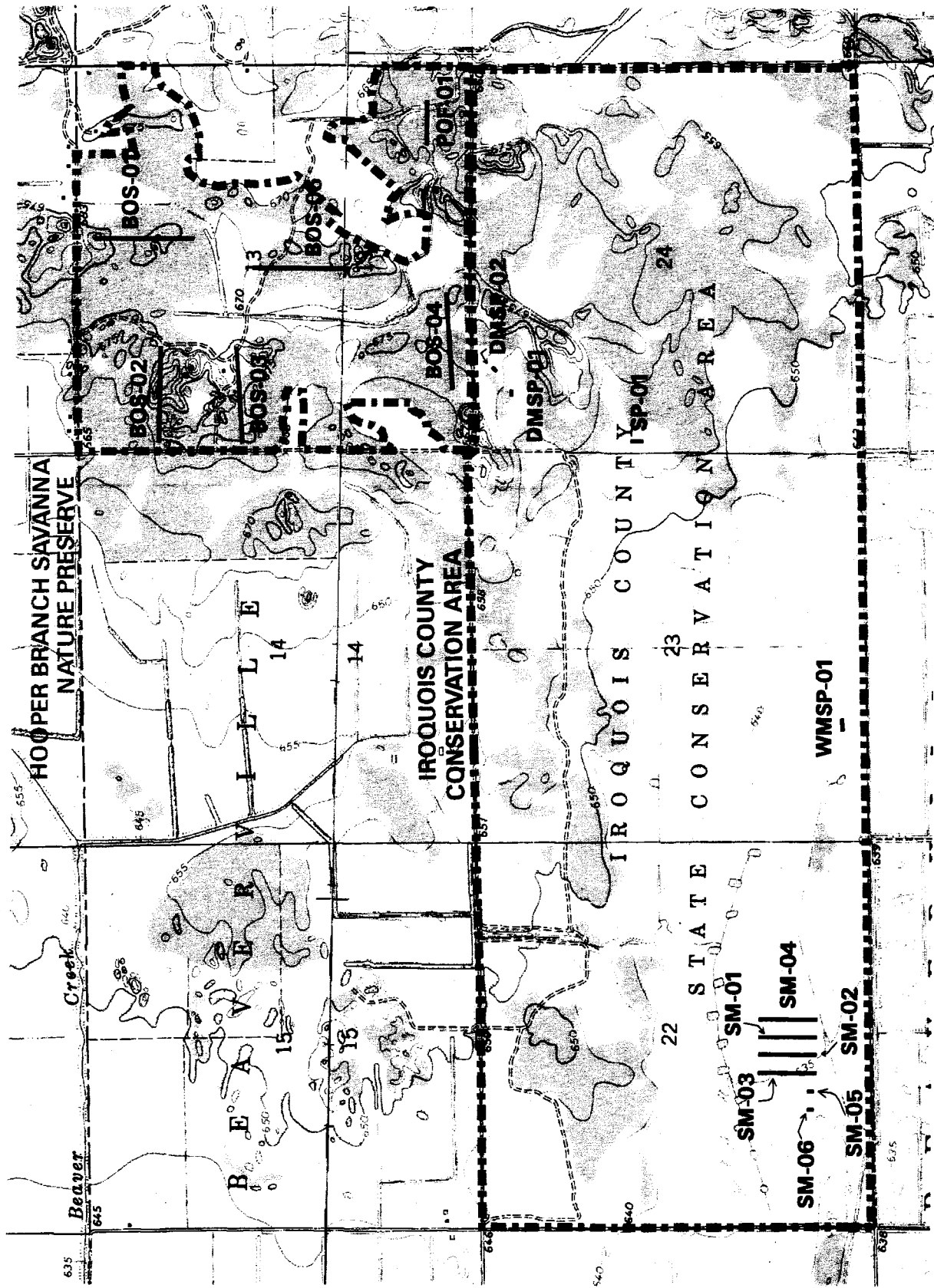


Figure 1. Iroquois County Conservation Area and Hooper Branch Savanna NP, Iroquois County, Illinois  
 Location of transect lines.



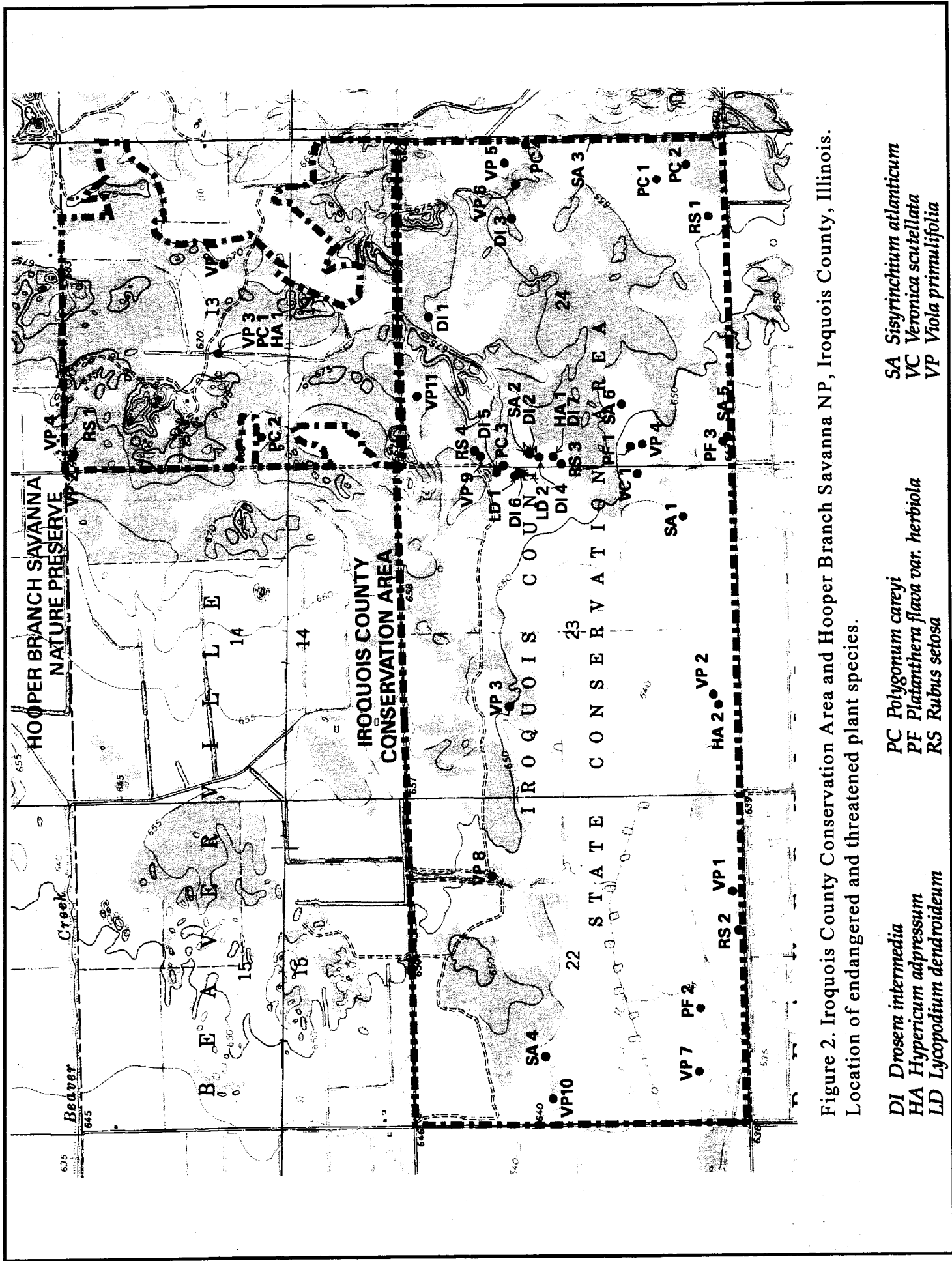


Figure 2. Iroquois County Conservation Area and Hooper Branch Savanna NP, Iroquois County, Illinois.  
 Location of endangered and threatened plant species.

- |    |                               |    |   |    |                                |
|----|-------------------------------|----|---|----|--------------------------------|
| DI | <i>Drosera intermedia</i>     | PC | <i>Polygonum careyi</i>                       | SA | <i>Sisyrinchium atlanticum</i> |
| HA | <i>Hypericum adpressum</i>    | PF | <i>Platanthera flava</i> var. <i>herbiola</i> | VC | <i>Veronica scutellata</i>     |
| LD | <i>Lycopodium dendroideum</i> | RS | <i>Rubus setosa</i>                           | VP | <i>Viola prunifolia</i>        |

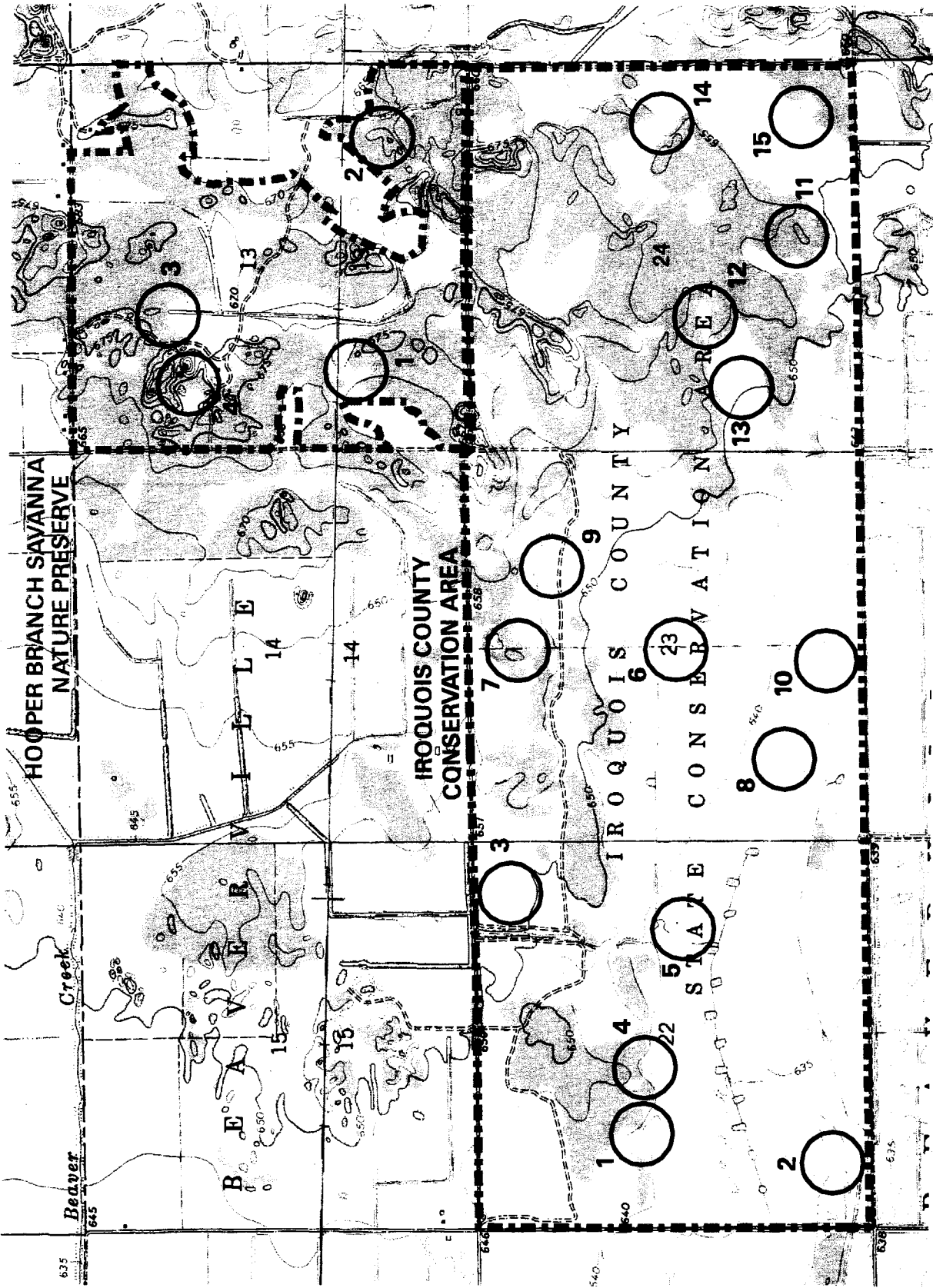
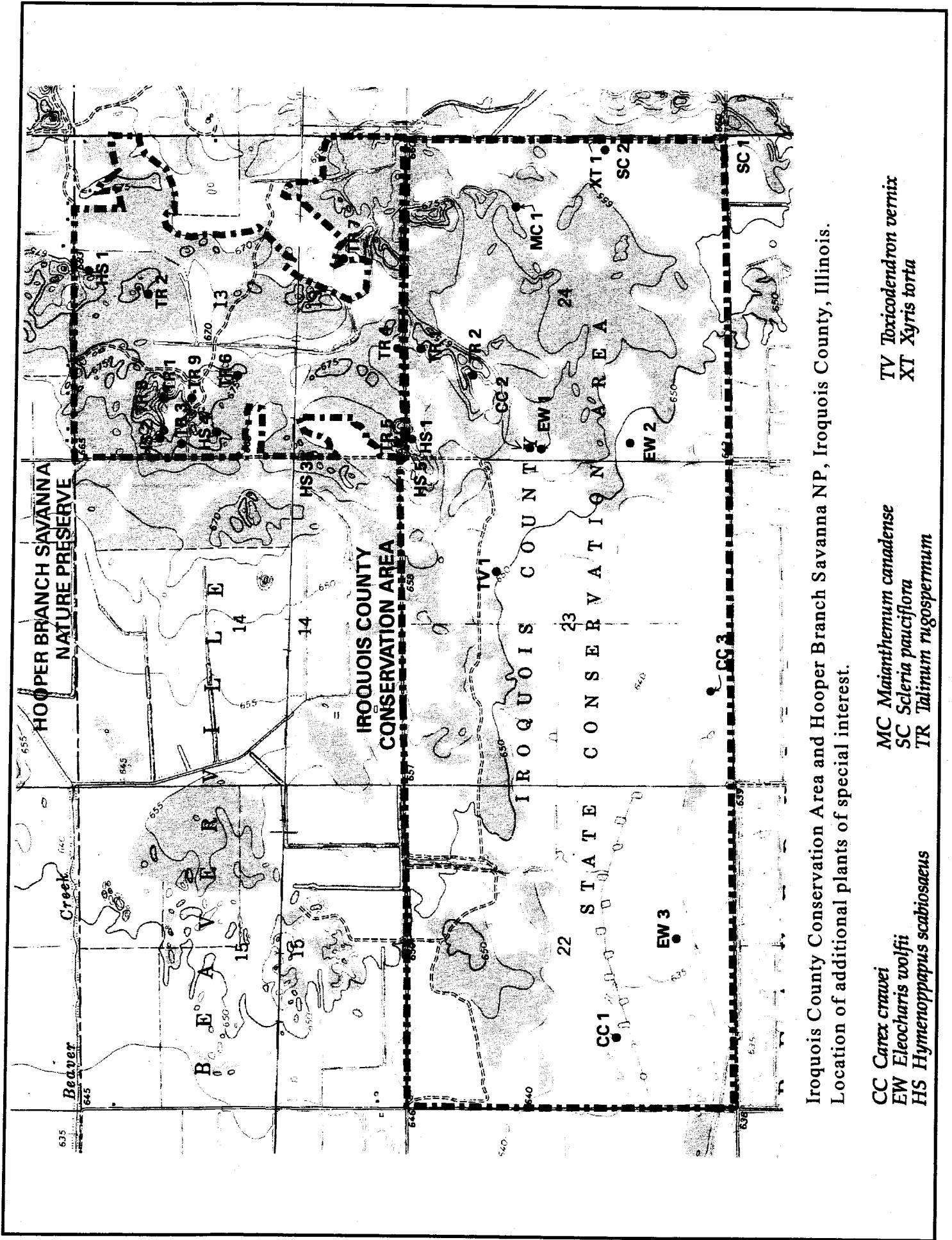


Figure 3. Iroquois County Conservation Area and Hooper Branch Savanna NP, Iroquois County, Illinois  
 Location of 5 hectare sampling sites.



Iroquois County Conservation Area and Hooper Branch Savanna NP, Iroquois County, Illinois.  
 Location of additional plants of special interest.

- |    |                                 |    |                              |    |                             |
|----|---------------------------------|----|------------------------------|----|-----------------------------|
| CC | <i>Carex crawei</i>             | MC | <i>Maianthemum canadense</i> | TV | <i>Toxicodendron vernix</i> |
| EW | <i>Eleocharis wolffi</i>        | SC | <i>Scleria pauciflora</i>    | XT | <i>Xyris torta</i>          |
| HS | <i>Hymenopappus scabiosaeus</i> | TR | <i>Talinum rugospernum</i>   |    |                             |

Hooper Branch Savanna Nature Preserve  
Approximate Location of Transects

Black Oak Savannas

Transect #	Latitude & Longitude				Transect Length	Relative Position
BOS-01.	41°	00'	33"	North	400 meters	North
	-087°	33'	03"	West		
BOS-02	41°	00'	20"	North	400 meters	West
	-087°	33'	03"	West		
BOS-03	41°	00'	24"	North	400 meters	West
	-087°	33'	39"	West		
BOS-04	41°	00'	24"	North	400 meters	West
	-087°	33'	22"	West		
BOS-05	41°	00'	13"	North	400 meters	West
	-087°	33'	39"	West		
BOS-06	41°	00'	14"	North	400 meters	West
	-087°	33'	22"	West		
BOS-07	40°	59'	45"	North	400 meters	West
	-087°	33'	29"	West		
BOS-08	40°	59'	46"	North	400 meters	West
	-087°	33'	12"	West		
BOS-09	41°	00'	12"	North	400 meters	North
	-087°	33'	08"	West		
BOS-10	40°	59'	59"	North	400 meters	South
	-087°	33'	08"	West		
Pin Oak Flatwoods						
POF-01	40°	59'	49"	North	200 meters	West
	-087°	32'	46"	West		
POF-02	40°	59'	49"	North	200 meters	East
	-087°	32'	38"	West		

Vascular Flora of the Iroquois County Conservation Area,  
Iroquois County, Illinois

Loy R. Phillippe, Mary Ann Feist, Richard L. Larimore, Dan Busemeyer  
Paul Marcum, Connie Carroll, Katherine J. Hunter, & John E. Ebinger

ABSTRACT

The vascular flora of the Iroquois County Conservation Area, Iroquois County, Illinois was studied during the 2001 growing season. A total of 553 taxa were found: 15 fern and fern-allies, one gymnosperm, 153 monocots, and 384 dicots. The families with the largest number of taxa included the Asteraceae with 78 taxa, the Poaceae with 66 taxa, and the Cyperaceae with 48 taxa, of which 26 were members of the genus *Carex*. A survey of the ground layer vegetation was conducted on a Grade C sedge meadow, a Grade B shrub sand prairie, a Grade B wet-mesic sand prairie, and a Grade B dry sand prairie. In the Grade C sedge meadow *Carex haydenii/stricta* [*C. haydenii* Dewey (Hayden's sedge) and *C. stricta* Lam. (tussock sedge)] ranked first with an importance value (I.V.) of 113.4 (out of 200). Unlike the sedge meadow where only two taxa dominated, in the Grade B communities six to eight taxa were important in each community. The most important taxa in the shrub sand prairie (I.V. >10) were two shrubs, *Spiraea tomentosa* L. (hardhack) and *Rubus hispidus* L. (swampy dewberry), two sedges, Hayden's sedge and tussock sedge, one grass, *Schizachyrium scoparium* Michaux (little bluestem), and three forbs, *Potentilla simplex* Michaux (common cinquefoil), *Euthamia graminifolia* (L.) Salisb. (grass-leaved goldenrod), and *Liatris aspera* Michaux (rough blazing-star). The wet-mesic sand prairie and the dry sand prairie also had shrubs as important components of their structure. The most important taxa in the wet-mesic sand prairie (I.V. >10) were two shrubs, swampy dewberry, and *Rubus setosus* Bigel (bristly blackberry), one sedge, *Carex* sp. (sedge), two grasses, *Sorghastrum nutans* (L.) Nash (Indian grass) and little bluestem, and three forbs, grass-leaved goldenrod, common cinquefoil, and *Solidago canadensis* L. (tall goldenrod). The most important taxa in the dry sand prairie (I.V. >10) were two shrubs, swampy dewberry and *Vaccinium angustifolium* Ait. (low-bush blueberry), one sedge, *Carex pennsylvanica* Lam. (Pennsylvania sedge), two grasses, little bluestem and Indian grass, and one forb, *Aster simplex* Willd. (hairy aster).

INTRODUCTION

Iroquois County Conservation Area (ICCA), Iroquois County, Illinois, is located in the Kankakee Sand Area Section of the Grand Prairie Division (Schwegman, et al. 1973). It is within the eastern edge of the former Lake Watseka, a glacial lake formed approximately 14,000 years ago during the Kankakee Torrent (Willman & Frye 1970). Lake Watseka was eventually drained, due to incising of the Illinois and Kankakee rivers, exposing large areas of sand deposits along its shoreline. Wind action sorted these sand deposits into sand dunes and swales, largely on terraces along the Kankakee River Valley. In response to hypsithermal climatic stress, about 8300 A.D., prairie vegetation began replacing deciduous forest in Illinois (King 1981). In 1820, prairie vegetation covered 92% of Iroquois County (Hedborn 1984, Iverson, et al. 1989). Regular fires that swept across the prairies were a major factor in the development and maintenance of the communities at ICCA. The present study was undertaken to develop a vouchered flora, locate Illinois threatened and endangered species on the ICCA, and determine the structure and composition of the sedge meadow and prairie communities.

Location of Illinois Plants of Special Interest  
Hooper Branch Savana Nature Preserve  
Iroquois County, Illinois

Voucher specimen collections are by: F (Mary Ann Feist), G (Sophia M. Gehlhausen), and P (Loy R. Phillippe). Populations not vouchered are designated by n.v.

Scientific Name Common Name Voucher #'s

Hymenopappus scabiosaeus L'Hér

Old Plainsman

01.	41°	00'	33.00"	North Latitude		n.v.
	-087°	33'	01.00"	West Longitude		
02.	41°	00'	21.00"	North Latitude		P 33128
	-087°	33'	36.42"	West Longitude		
03.	40°	59'	57.24"	North Latitude		P 33023
	-087°	33'	41.70"	West Longitude		
04.	41°	00'	12.00"	North Latitude		n.v.
	-087°	33'	35.00"	West Longitude		
05.	40°	59'	42.00"	North Latitude		n.v.
	-087°	33'	35.00"	West Longitude		

Talinum rugospermum Holzinger

Flower-Of-An-Hour

01.	41°	00'	20.46"	North Latitude		P 33684
	-087°	33'	28.01"	West Longitude		
02.	41°	00'	23.42"	North Latitude		P 33688
	-087°	33'	05.88"	West Longitude		
03.	41°	00'	17.52"	North Latitude		P 33411
	-087°	33'	37.56"	West Longitude		
04.	40°	59'	43.68"	North Latitude		P 33519
	-087°	33'	16.74"	West Longitude		
05.	40°	59'	43.00"	North Latitude		G 46
	-087°	33'	37.00"	West Longitude		
06.	41°	00'	09.00"	North Latitude		G 52
	-087°	33'	23.00"	West Longitude		
07.	40°	59'	52.62"	North Latitude		F 1172
	-087°	32'	57.96"	West Longitude		

08.	41°	00'	20.40"	North	Latitude	F 1333.1
	-087°	33'	34.74"	West	Longitude	
09.	41°	00'	16.02"	North	Latitude	F 1333.2
	-087°	33'	27.78"	West	Longitude	