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HANNIBAL WOODS: AN EASTERN DECIDUOUS FOREST
REMNANT IN HOWARD COUNTY, NEBRASKA

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ABSTRACT

Hannibal Woods is a small, oak-ash (*Quercus macrocarpa*/*Fraxinus pensylvanica*) forest relict located on the south and west sides of Dannebrog, Nebraska. The site was first studied in 1996 as part of a botanical survey of the Loup River Valley. Since the initial work, plant collections have been made several times each growing season through 2005, and an annotated list of plant species has been compiled. This study reports a total of 271 plant species representing 62 families including 86 species that are new records for Howard County. The mature bur oaks at this site average 84.0 cm in diameter. Species that are uncommon in central Nebraska include *Agastache nepetoides*, *Arabis hirsuta* var. *pyncocarpa*, *Botrychium virginicum*, *Bromus ciliatus*, *Bromus latiglumis*, *Carex grisea*, *Carex leavenworthii*, *Carex molesta*, *Elymus villosus*, and *Ulmus rubra*. Hannibal Woods is botanically significant in that it supports the growth of plant species which are more representative of sites further east, such as the lower Platte and Missouri River Valleys.

† † †

Hannibal Woods is a unique natural area located on the north side of Dannebrog, Howard County, Nebraska (S 1/2 of the SE 1/4 of the NW 1/4 SEC 11, T13N, R11W). It consists of a presettlement, relict stand of bur oak/green ash, interrupted by several grassy clearings and a walking trail that connects the village of Dannebrog with Hannibal Woods. Prominent associated species are *Cornus drummondii* (rough-leaved dogwood), *Juniperus virginiana* (eastern red cedar), *Morus alba* (white mulberry), and *Ulmus rubra* (slippery elm). This small temperate deciduous forest is associated with Oak Creek, a tributary of the Loup River that generally flows from the northwest to the southeast but meanders through the village of Dannebrog (Fig. 1). It joins the Loup

River approximately 0.8 km (0.5 mi) to the east. At one time, Oak Creek provided the energy necessary to power the town's mill. Hannibal Woods includes several spectacular examples of bur oak (*Quercus macrocarpa*) that exceed 150 years of age and an understory typical of temperate deciduous forest associations found farther east (Churchill 1979, Rothenberger 1985).

The forest is named for Lars Hannibal (1822-1882), the founder of Dannebrog, who first opened the area to Danish settlers in 1870 (Orr 1983). The ownership of this forest remnant has remained in the Hannibal Family and was protected from logging and exploitation, which likely would have occurred in east-central Nebraska where timber was relatively scarce. The Hannibal Woods area consists of approximately 16 Ha, but the forest remnant is only ~50% of this area which also contains sand prairie, grassy clearings, disturbed ground along the trail, and a water treatment facility for the village of Dannebrog.

This study documents 271 total plant species (228 herbaceous vascular plants, 39 woody plants and vines, 2 succulents, and 2 pteridophytes). A total of 62 plant families are represented which is approximately 45% of Nebraska's 136 plant families. Species diversity is relatively high in comparison to other sites documented from central Nebraska (Nagel and Kolstad 1987, Rothenberger 2000). Becker (1980) surveyed a comparable natural area, Hormel Park in Dodge County, Nebraska, and reported 289 plant species in an area of approximately 65 Ha. By comparison, Hormel Park contains relic stands of bur oak and *Tilia americana* (American linden) interspersed with green ash, *Populus deltoides* ssp. *monilifera* (eastern cottonwood), red mulberry, and *Ulmus americana* (American elm). Garabrandt (1988) documented 597 plant species at Neale Woods (Washington County) and Fontenelle Forest (Sarpy County). These sites are substantially larger (644 Ha) and more diverse than the Hannibal Woods natural area. Other examples of published county floras are

Banner with 432 species (Hardy 1991), Cumming with 499 species (Churchill 1979), Keith with 599 species (Sutherland and Rolfsmeier 1989), Seward with 599 species (Rolfsmeier 1988), and Dawes with 465 species

(Urbatsch and Eddy 1973). However, these numbers are often an indication of collecting intensity rather than species diversity (Kaul and Rolfsmeier 199

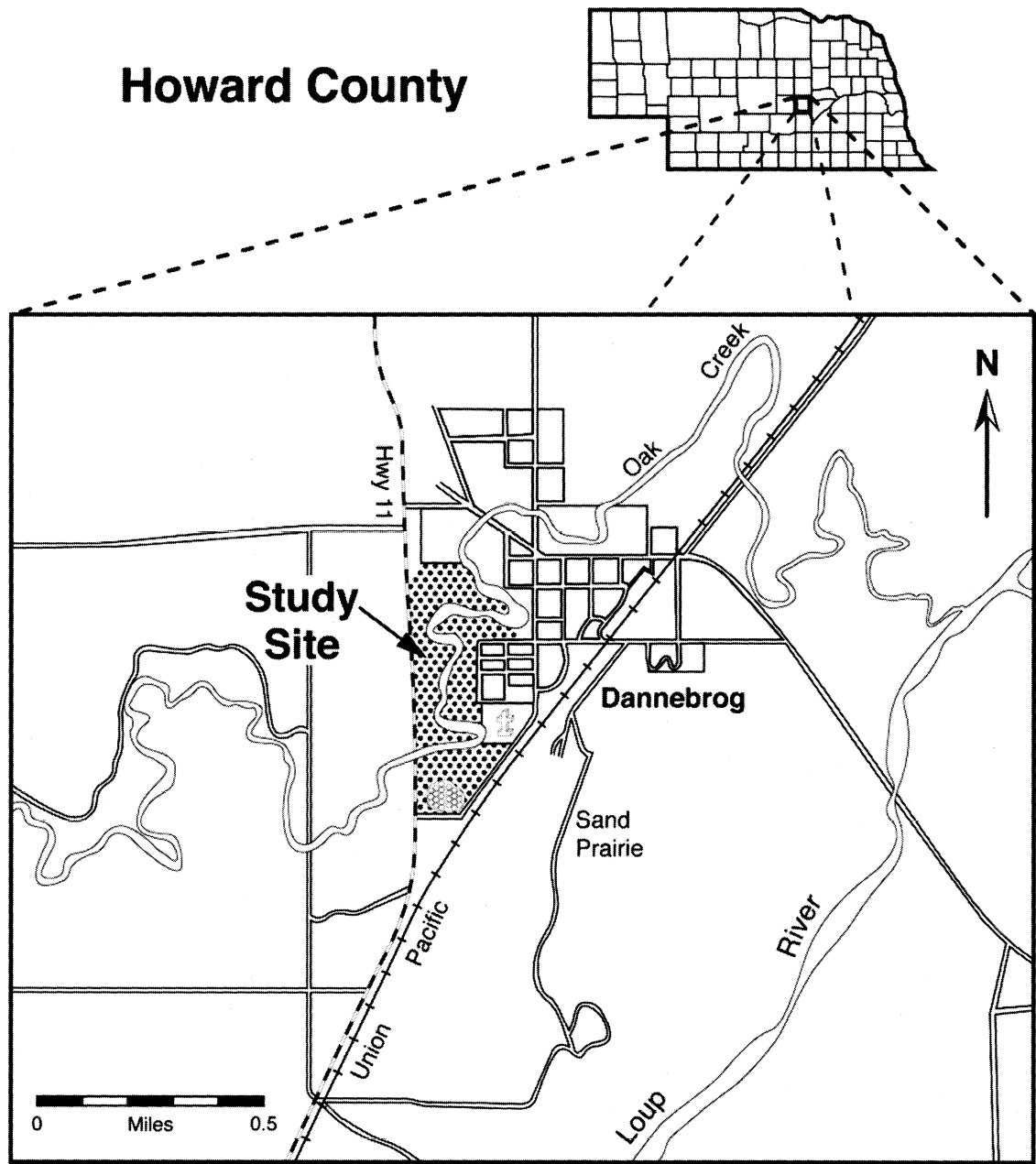


Figure 1. The Hannibal Woods Study Area, Howard County, Nebraska.

The Hannibal Woods site contains several vascular plants that are rare or uncommon in central Nebraska, including *Agastache nepetoides* (catnip giant hyssop), *Arabis hirsuta* var. *pyncocarpa* (rock cress), *Botrychium virginicum* (rattlesnake fern), *Bromus ciliatus* (fringed brome), *Bromus latiglumis* (ear-leaved brome), *Carex grisea* (inflated narrow leaf sedge), *Carex leavenworthii* (Leavenworth sedge), *Carex molesta* (troublesome sedge), *Elymus villosus* (hairy wild rye), and *Ulmus rubra* (slippery elm). An area of alluvial sand hills encroaches on the southeast side of the property, while Nebraska Highway 11 borders Hannibal Woods on the west. This border of sand prairie on the southeast, Nebraska Highway 11 on the west, and a low, drainage area or area of disturbance on the east allows for encroachment by weedy species and prairie plants not normally adapted to a forest environment. The original Dannebrog Danish cemetery (Oak Ridge Cemetery) was sited in the 1870's on the southeast side of Hannibal Woods where it remains in use today and contributes to the historical significance and diversity of the site.

METHODS

Hannibal Woods was originally surveyed botanically in 1996 and 1997 as part of a study of the Loup River Valley by the University of Nebraska - Kearney and the Nebraska Game and Parks Commission. Since that time, plant collections were made several times each year from 1998-2005. Maps and the original survey were obtained at the Howard County Register of Deeds Office in St. Paul. Historical information was provided by Mrs. Ray (Shirley) Johnson (Personal communication, 21 December 2005). A Richter diameter tape was used to measure diameter at breast height (dbh) of mature bur oak trees, and average size class was calculated. A voucher specimen of each collected plant species was placed in the University of Nebraska - Kearney Herbarium. Nomenclature follows the Great Plains Flora Association (1991) except where recent revisions (ex. the wheat grasses) have gained acceptance (Flora North America Editorial Committee, eds. 1993 et seq.).

RESULTS AND DISCUSSION

The Hannibal Woods site is botanically rich and relatively diverse in comparison to other floodplain forests of central and western Nebraska. As is typical in the Great Plains, Poaceae (the grass family) and Asteraceae (the aster family) contribute 36.4 % of the

total flora (Table 1). Cyperaceae (the sedge family) and Fabaceae (the pea family) are also significant combining for a total of 28 species from 13 genera. The soils that border the lower Oak Creek area are well-developed silt loams of the Hord-Hobbs Association (Mahnke et al. 1974), and they support the luxuriant growth of bur oak, green ash (*Fraxinus pennsylvanica*), and elm. The age and size class of the bur oaks indicate that this site was forested for several decades or more prior to settlement. The area likely resembled an oak-savanna maintained by frequent prairie fires that were reported by Danish settlers to have occurred in the Dannebrog area well into the 1880's (Orr 1983). As a result of fire suppression, understory vegetation becomes more dense and inhibits oak reproduction (Brudvig and Asbjornsen 2005). This helps to explain the present day species composition of Hannibal Woods where thickets of *Prunus virginiana* (chokecherry), rough-leaved dogwood, and red cedar border the area.

Even though the lower Oak Creek area was wooded, early Danish settlers in the area utilized cottonwood and willow from the nearby Loup River flood plain to construct rafters and roofing materials for their sod houses (Orr 1983). Over the years, continuous ownership and protection of the site by the Hannibal Family has been essential to the botanical integrity of this unique area.

Following the early years of settlement, the rapid population decline in the Dannebrog area could also have been a factor in the preservation of Hannibal Woods. Dannebrog's current population of 254 is significantly less than the Nebraska Census of 1910, which documented more than 1000 Danish immigrants in the Dannebrog area (Orr 1983). The Depression of the 1930's and numerous droughts and farm crises have contributed to a gradual human exodus from the area. Therefore, there has been little pressure to develop Hannibal Woods for housing or agricultural uses.

The average size class of mature bur oaks that were measured was 84.0 cm (dbh). This is especially remarkable when compared to a study in Seward County where the largest size class of mature bur oak trees was just 30 cm or greater (Beightol and Bragg 1993). Although the oaks appear to be reproducing, additional monitoring of Hannibal Woods should be made to determine if the mature oaks are replacing themselves or will ultimately be succeeded by other woody species.

Considering the frequency of severe windstorms in this area, it is also noteworthy that this mature stand of trees has survived for well over 100 years. Howard County lies in the "tornado alley" region of

south-central Nebraska and ranks 5th out of 93 Nebraska counties in actual density (tornadoes per 1000 sq. miles) of verified tornadoes (SNR-UNL 2005).

Thirty-five tornados were reported between 1950-2001 with 19 of those occurring after 1982.

Table 1. The ten major plant families at Hannibal Woods.

Families	Genera	Species
Poaceae	35	61
Asteraceae	24	38
Fabaceae	10	14
Cyperaceae	3	14
Polygonaceae	3	8
Chenopodiaceae	3	8
Brassicaceae	6	6
Rosaceae	4	6
Euphorbiaceae	2	5
Verbenaceae	2	5
Total Species = 165		
		(~61% of total flora)

ANNOTATED CHECKLIST

The majority of taxa in this list are documented by voucher specimens deposited in the University of Nebraska – Kearney Herbarium. Species collected and observed were classified, based on site location and estimated abundance, using the following abbreviations:

Site Descriptions

D = Disturbed (roadside/trailside) sites where the soil has been disturbed, including trails, the border area between Highway 11 and Hannibal Woods, roadsides, and areas that border the trail.

R = Runoff/drainage areas; wet areas that border the site.

S = Sand prairie; open grassland that borders the site on the southeast side.

W = Woodland; gallery forest and sites that are shaded by trees.

Rarity

1 = Rare (single isolated individuals)

2 = Infrequent (widely scattered)

3 = Occasional (small groups/clumps)

4 = Common (thick patches)

5 = Abundant (large patches; many individual plants)

It should be noted that abundance estimates are somewhat subjective by nature. Some plant populations reflect seasonal variations, while others are often subject to the effects of disease, herbivory, and disturbance.

* Denotes new county record

DIVISION CONIFEROPHYTA

CUPRESSACEAE (Cypress Family)

Juniperus virginiana L. (red cedar). Invasive in forest openings as well as in the sand prairie. D-3

DIVISION POLYPODIOPHYTA

OPHIOGLOSSACEAE (Adder's Tongue Family)

Botrychium virginianum (L.) Sw. (rattlesnake fern). Very shade tolerant, understory species; encountered only twice. W-1

POLYPODIACEAE (True Fern Family)

**Matteuccia struthiopteris* (L.) Todaro (ostrich fern). One colony of this species was noted along the trail on the northwest side of the woods. This is likely an introduction. W-2

DIVISION MAGNOLIOPHYTA

ACERACEAE (Maple Family)

Acer negundo L. (boxelder). Occurring as an understory tree in gallery forest. W-3

**Acer saccharinum* L. (silver maple). Uncommon here, but one large tree was observed on the north bank of Oak Creek. W-1

AMARANTHACEAE (Pigweed Family)

Amaranthus palmeri S. Wats. (Palmer's pigweed). Uncommon roadside species; northwest side of site. D-2

- Amaranthus retroflexus* L. (rough pigweed). Invasive species along the trail. D-3
Froelichia florida (Nutt.) Moq. (field snake-cotton). Widespread in the sand prairie. S-4
Froelichia gracilis (Hook.) Moq. (slender snake-cotton). Along the trail and in the sand prairie on the southeast side. S-3

ANACARDIACEAE (Cashew Family)

- **Rhus glabra* L. (smooth sumac). Disturbed trailside sites on the east side. D-4
Toxicodendron radicans (L.) O. Ktze. (poison ivy). Growing as a shrub on the edge of thickets and as a vine in wooded areas. D-3; W-4

APIACEAE (Parsley Family)

- Osmorhiza longistylis* (Torr.) DC. var. *longistylis* (anise root). Scattered throughout woodland understory. W-4
Sanicula canadensis L. (black snakeroot). A very common understory species. W-5

APOCYNACEAE (Dogbane Family)

- **Apocynum cannabinum* L. (Indian hemp dogbane). Common roadside species and along the trail on the south and west sides. D-5

ASCLEPIADACEAE (Milkweed Family)

- Asclepias arenaria* Torr. (sand milkweed). On sandy sites, southeast side. S-3
Asclepias sullivantii Engelm. (smooth milkweed). Uncommon; collected in sand prairie. S-1
Asclepias syriaca L. (common milkweed). Trailside/roadside species; open areas especially near Highway 11. D-4

ASTERACEAE (Sunflower Family)

- Achillea millefolium* L. (yarrow). In sandy soil along the road and trail on the east side. D-2
 **Ambrosia trifida* L. (giant ragweed). Near woody thickets on the west side and along the road that borders the Danish Cemetery. D-4
 **Arctium minus* Bernh. (common burdock). A common herbaceous understory species. W-3
 **Aster ericoides* L. (heath aster). A native aster, widespread in this region; more common in upland prairie. S-3
 **Aster lanceolatus* Willd. (white paniced aster). Frequently occurring in moist, low areas on the east side of the site. S-3
Aster praealtus Poir. (willowleaf aster). Infrequently encountered near the trail on the east side of the study area. D-2

- Bidens cernua* L. (nodding beggar's ticks). Scattered with *Bidens frondosa* in low, semi-shaded drainage area on the east side. R-2
Bidens frondosa L. (devil's pitchfork). In semi-shaded drainage area on the east side. R-2
Carduus nutans L. (musk thistle). Fortunately encountered only once along the trail on the west side. D-2
Cirsium altissimum (L.) Spreng. (tall thistle). Fairly common roadside species on the west side and along the edge of the woodland. D-3
 **Cirsium vulgare* (Savi) Ten. (bull thistle). Invasive species along the trail, rarely encountered. D-2
Conyza canadensis L. (horseweed). Common roadside and trailside species in a sandy or silty soils. D-4
Erigeron annuus (L.) Pers. (annual fleabane). Sporadic in disturbed areas on the trail (south side). D-2
Erigeron strigosus Muhl. ex Willd. (prairie fleabane). Occasional plants occur within stands of *Bromus inermis* in clearings on the west side. D-3
Eupatorium rugosum Houtt. (white snakeroot). A plant of shaded and semi-shaded areas. W-2
 **Galinsoga parviflora* Cav. (quickweed). Encountered mainly on the east side of the site along the road and near the cemetery. D-3
Galinsoga quadriradiata R. & P. (fringed quickweed). Semi-shaded habitat along the cemetery road on the east side. D-4
 **Gnaphalium obtusifolium* L. (fragrant cudweed). A common sand prairie species. S-3
Haplopappus spinulosus (Pursh) DC. (cutleaf ironplant). Scattered in the sand prairie on the southeast side. S-3
 **Helianthus annuus* L. (common sunflower). Along the trail on the southeast side. D-3
Helianthus petiolaris (plains sunflower). Scattered in sand prairie area. S-2
Helianthus rigidus (Cass.) Desf. (stiff sunflower). In the sand prairie that borders the site on the southeast side. S-3
 **Helianthus tuberosus* L. (Jerusalem artichoke). Common to semi-shaded areas along the road (east side) and near Oak Creek on the west side of the site. W-3
Heterotheca villosa (Pursh) Shinnars var. *villosa* (golden aster). Restricted to sandy, disturbed ground on the south side of the site. S-2
Kuhnia eupatoriodes L. (false boneset). Scattered between the trail and Highway 11 on the west side. D-3

Lactuca canadensis L. (wild lettuce). Uncommon here; an invasive species on the west side of Hannibal Woods along the trail. W-2

Lactuca serriola L. (prickly lettuce). Invasive species in disturbed soil along the trail and along Highway 11. D-4

Liatris aspera Michx. (rough gayfeather). Uncommon on sand prairie sites. S-2

**Liatris lancifolia* (Greene) Kittell (tall gayfeather). Occasionally encountered in the sand prairie. S-2

Liatris squarrosa (L.) Michx. var. *glabrata* (Rydb.) Gaiser. (scaly blazing star). The most common species of *Liatris* in this area. S-3

Ratibida columnifera (Nutt.) Woot. & Standl. (prairie coneflower). Common in the sand prairie and along the south side of the trail. S-3

Rudbeckia laciniatum L. (goldenglow). Uncommon plant found on the south banks of Oak Creek. R-2

Silphium integrifolium Michx. var. *laeve* T. & G. (rosin-weed). A roadside species on the west side. S-2

Solidago canadensis L. (Canada goldenrod). A common roadside species on the northeast side; trailside on the east side. D-4

**Solidago gigantea* Ait. (giant goldenrod). A trailside species on the south side. D-3

Solidago missouriensis Nutt. (Missouri goldenrod). Common in sand prairie on the south side of the site. S-3

**Tragopogon dubius* Scop. (goat's beard). Invasive along the trail (south side) and in the sand prairie. S-3

Vernonia baldwinii Torr. (western ironweed). Along Highway 11 and in disturbed, sandy prairie. S-3; D-3

BIGNONIACEAE (Bignonia Family)

**Catalpa speciosa* Warder (northern catalpa). In woody thicket near the trail; southwest side of the site. W-2

BORAGINACEAE (Borage Family)

Hackelia virginiana (L.) I.M. Johnst. (stickseed). Our most common stickseed inhabiting moist woods. W-3

Lithospermum carolinense (Walt.) MacM. (puccoon). Scattered within the sand prairie and in disturbed sandy soils on the south side. S-4

BRASSICACEAE (Mustard Family)

Arabis hirsuta (L.) Scop. var. *pyncocarpa* (Hopkins) Rollins (rock cress). Infrequently encountered in gallery forest understory. W-2

**Capsella bursa-pastoris* (L.) Medic. (shepherd's purse). A common weedy species along the trail. D-3

Hesperis matronalis L. (dame's rocket). A roadside introduction that has entered the area from the west side. D-3

Lepidium virginicum L. (pepper grass). This adaptable annual is especially common on disturbed, dry areas along the trail and the cemetery road. D-3

Sisymbrium loeselii L. (tall hedge mustard). Uncommon, weedy species along the trail and on disturbed ground. D-2

**Thlaspi arvense* L. (field pennycress). Another annual mustard common to roadsides and waste areas. D-3

CACTACEAE (Cactus Family)

**Opuntia fragilis* (Nutt.) Haw. (little prickly pear). Forming clumps or small colonies in the sand prairie. S-3

**Opuntia macrorhiza* Engelm. var. *macrorhiza* (plains prickly pear). A larger cactus typical of sandy or rocky prairie soils. Here it is common in the sand prairie. S-3

CAESALPINIACEAE (Caesalpinia Family)

**Gleditsia triacanthos* L. (honey locust). Collections from both the east and west sides of the Hannibal Woods site. D-3

CAMPANULACEAE (Bellflower Family)

**Campanula rapunculoides* L. (creeping or rover bellflower). Occasionally encountered understory species. W-2

CAPPARACEAE (Caper Family)

**Polanisia dodecandra* (L.) DC. ssp. *trachysperma* (T. & G.) Iltis (clammy-weed). Occasionally collected in the sand prairie near the trail on the southeast side. S-2

CAPRIFOLIACEAE (Honeysuckle Family)

**Lonicera tatarica* L. (Tatarian honeysuckle). Semi-shaded areas where the trail enters the mature forest. W-3

**Sambucus canadensis* L. (common elderberry). Along the edge of thickets and along the trail; southwest side. D-3; W-2

**Symphoricarpos orbiculatus* Moench (coralberry). Occasional understory species; trailside and bordering thickets. W-3

CARYOPHYLLACEAE (Pink Family)

- **Cerastium vulgatum* L. (common mouse-ear chickweed). Forming mats in in the trail; occasional in sunny forest openings. W-3
- **Saponaria officinalis* L. (bouncing bet). Roadside plant along Highway 11 and the trail on the west side. D-2
- **Stellaria media* (L.) Cyr. (common chickweed). East side near the cemetery road and trail. D-3

CELASTRACEAE (Staff Tree Family)

Celastrus scandens L. (bittersweet). Collected only in a trailside thicket on the west side. W-1

CHENOPODIACEAE (Goosefoot Family)

- **Chenopodium album* L. (lamb's quarters). Common roadside weed (along Highway 11) and along the trail on the south side. D-3
- Chenopodium berlandieri* Moq. (pitseed goosefoot). Less common; in disturbed soils. D-2
- **Chenopodium missouriense* Aellen. (Missouri goosefoot). In semi-shaded areas with *Agastache nepitoides* and *Urtica dioica* on the west side of Hannibal Woods. D-3
- Chenopodium pratericola* Rydb. (goosefoot). This fast-growing annual is mostly a trailside/roadside plant in this area. D-3
- **Chenopodium simplex* (Torr.) Raf. (maple-leaved goosefoot). Semi-shaded areas along the trail on the west side and along the cemetery road. W-3
- **Cycloloma atriplicifolium* (Spreng.) Coult. (tumble ringweed). Invasive species on sand prairie sites. S-3
- Salsola collina* Pall. (tumbleweed). A weedy species, infrequently encountered in the sand prairie. S-2
- **Salsola iberica* Senn. & Pau (Russian thistle). Scattered on disturbed, sandy sites on the southeast side. D-3

COMMELINACEAE (Spiderwort Family)

- Commelina communis* L. (dayflower). Shaded roadside area near the Danish Cemetery; understory species. R-2; W-3
- Tradescantia bracteata* Small. (spiderwort). A common prairie plant in sandy soil. S-3
- Tradescantia occidentalis* (Britt.) Smyth (spiderwort). Sandy area along the trail on the southwest side. S-2

CONVOLVULACEAE (Morning Glory Family)

- Calystegia sepium* (L.) R. Br. (hedge bindweed). On sunny or semi-shaded sites along the trail growing mainly on the southwest side. R-3

Convolvulus arvensis L. (Field bindweed). Roadside/trailside plant on both the west and east sides of the site. D-3

CORNACEAE (Dogwood Family)

Cornus drummondii C. A. May (rough-leaved dogwood). A common understory tree in the gallery forest and in trailside thickets. W-4

CYPERACEAE (Sedge Family)

- Carex blanda* Dew. (woodland sedge). Common understory sedge; gallery forest. W-4
- Carex brevior* (Dew.) Mack. ex Lunell (fescue sedge). With *Poa pratensis* and annual bromes along the trails. D-4
- Carex emoryi* Dew. (Emory's sedge). Scattered in low drainage area on the east side. R-3
- Carex gravida* Bailey var. *gravida* (heavy sedge). Along the road and trails on the east and west sides. D-3
- Carex grisea* Wahl. ex Willd. (inflated narrow leaf sedge). Several small patches; uncommon understory species. W-2
- Carex leavenworthii* Dew. (Leavenworth sedge). Surprisingly abundant in Hannibal Woods understory. W-4
- Carex molesta* Mack. ex Bright (troublesome sedge). A rare species here collected from the understory flora. W-1
- Carex pellita* Muhl. (wooly sedge). Fairly common sedge in low roadside habitats. R-3
- Carex vulpinoidea* Michx. (fox sedge). Scattered within wet, low sites along Highway 11, southwest side. R-3
- Cyperus lupulinus* (Spreng.) Marcks (Houghton flatsedge). A trailside sedge in dry clay or sandy soils. D-3
- Cyperus odoratus* L. (rusty flatsedge). A flatsedge occurring in low wet areas on the east side of the site. R-3
- Cyperus schweinitzii* Torr. (Schweinitz flatsedge). A common plant in the sand prairie. S-4
- Cyperus strigosus* L. (straw-colored flatsedge). Collected in low wet areas on the east side of the site. R-3
- Eleocharis palustris* (L.) R. & S. (spikerush). On the east side of the site in low, wet areas. R-3

EUPHORBIACEAE (Spurge Family)

- **Acalypha virginica* L. (three-seeded mercury). Understory herbaceous plant. W-3
- Euphorbia glyptosperma* Engelm. (ridge-seeded spurge). Scattered in sand along the trail on the south side. S-3

Euphorbia hexagona Nutt. (six-angled spurge). A common plant in the sand prairie on the southeastern side of the site. S-3

Euphorbia marginata Pursh (snow-on-the-mountain). Occasional in the sand prairie and along roadsides. D-2; S-3

Euphorbia missurica Raf. (Missouri spurge). Weedy trailside plant; south side. D-2

FABACEAE (Bean Family)

Amorpha canescens Pursh (leadplant). Plants are scattered in sandy soil. S-3

**Astragalus canadensis* J. Morris (Canada milkvetch). Occasionally found in the sand prairie area. S-2

Dalea villosa (Nutt.) Spreng. (silky prairie clover). Typical sand prairie species; occasional here. S-2

Lespedeza capitata Michx. (round-head lespedeza). Common on sandy soils along the trail on the south and southeast side. S-3

Medicago lupulina L. (black medic). Weedy plant; both trailside and roadside on the south and west. D-4

Melilotus alba Medic. (white sweet clover). A roadside plant near Highway 11. D-4

Melilotus officinalis (L.) Pall. (yellow sweet clover). Mixed with *Bromus inermis* mostly along the west side of the trail. D-3

Psoralea digitata Nutt. (palm-leaved scurf-pea). Common member of the sand prairie flora. S-3

**Psoralea lanceolata* Pursh (lemon scurf-pea). Collected at only two locations in the sand prairie. S-2

Robina pseudoacacia L. (black locust). In woody thicket near the trail; southwest side of the site. W-2

**Trifolium hybridum* L. (Alsike clover). Roadside plant between the trail and Highway 11 on the west side. D-2

Trifolium pratense L. (red clover). Trailside plant on the south side of the site. D-3

**Trifolium repens* L. (white clover). Trailside plant on the south and east sides of the site. D-3

Vicia villosa Roth (hairy vetch). Common roadside plant along Highway 11 and the west trail. D-4

FAGACEAE (Oak Family)

Quercus macrocarpa Michx. (bur oak). Elegant stands of this oak along with *Fraxinus pennsylvanica* dominate the Hannibal Woods overstory. Individual trees are likely over 150 years old. W-5

GROSSULARIACEAE (Currant Family)

Ribes americanum P.Mill. (wild black currant). Occasionally encountered in shrubby thickets and in the forest understory. W-3

Ribes missouriense Nutt. (Missouri gooseberry). A common shrub in shaded and semi-shaded understory habitat. W-4

HYDRANGEACEAE (Hydrangea Family)

Philadelphus coronarius L. (mock orange). Collected only once in a thicket with *Cornus drummondii*; possibly escaped. W-1

HYDROPHYLLACEAE (Waterleaf Family)

**Ellisia nyctelea* (L.) L. (waterpod). A weedy, roadside plant on the east side. D-3

JUGLANDACEAE (Walnut Family)

**Juglans nigra* L. (black walnut). Scarce; one small tree recorded in a shaded area along the trail. W-1

JUNCACEAE (Rush Family)

Juncus balticus Willd. (Baltic rush). Scattered in the low, drainage area on the east side. R-3

Juncus interior Wieg. (interior rush). Occasional clumps of this species occur in wet areas and sandy soil along the trail. R-3; D-3

**Juncus tenuis* Willd. (path rush). Moist, sandy area along the trail on the southeast side of the site. S-3

LAMIACEAE (Mint Family)

Agastache nepetoides (L.) O. Ktze. (catnip giant hyssop). Growing in disturbed ground, semi-shaded area along the west side of the trail and occasionally in forest openings. D-3; W-3

**Glechoma heteracea* L. (ground ivy). In grassy clearings along the trail. W-4

**Hedeoma hispida* Pursh (rough false pennyroyal). Sandy ground on the southwest side and in the sand prairie. S-4

**Leonurus cardiaca* L. (motherwort). Common along the trail in wooded areas. W-3

LILIACEAE (Lily Family)

**Asparagus officinalis* L. (asparagus). Escaped into trailside sites and clearings. D-3

**Convallaria majalis* L. (lily-of-the-valley). Introduction restricted to a single area on the west side of the forest. W-2

Polygonatum biflorum (Walt.) Ell. (Solomon's seal) Small colonies of this species were occasionally encountered on understory sites. W-2

Smilacina stellata (L.) Desf. (spikenard) A common understory species. W-3

LINACEAE (Flax Family)

**Linum rigidum* Pursh var. *rigidum* (stiffstem flax). Native flax in the sand prairie. S-3

MALVACEAE (Mallow Family)

Abutilon theophrasti Medic. (velvet leaf). This undesirable weed occasionally occurs along Highway 11. D-2

Callirhoe alchaeoides (Michx.) A. Gray. (pink poppy mallow). Collected in sandy soil along the trail on the south side. D-2

MOLLUGINACEAE (Carpetweed Family)

**Mollugo verticillata* L. (carpetweed). Scattered in sand on the southeast side. S-2

MORACEAE (Mulberry Family)

Morus alba L. (white mulberry). Occasional large trees along the trail and along fence lines. W-4

NYCTAGINACEAE (Four O'Clock Family)

**Mirabilis nyctaginea* (Michx.) MacM. (wild four-o'clock). Common near the cemetery road; along the trail and near Highway 11. D-4

OLEACEAE (Olive Family)

Fraxinus pennsylvanica Marsh (green ash). A dominant overstory species with *Quercus macrocarpa*. W-5

ONAGRACEAE (Evening Primrose Family)

Epilobium coloratum Biehler (purple-leaved willow-herb). An uncommon plant collected on the east side near the drainage area. R-2

**Gaura parviflora* Dougl. (velvety guara). Somewhat weedy; along the trail on the south and east sides. D-2

Oenothera biennis L. (common evening primrose) Scattered in sandy soil on the south side of the site. S-4

Oenothera rhombipetala Nutt. ex T. & G. (fourpoint evening primrose). Common on sandy sites along the trail on the east and southeast sides. S-3

OXALIDACEAE (Wood Sorrel Family)

Oxalis dillenii Jacq. (gray-green wood sorrel). A trailside plant most common on the east and south sides. D-3

Oxalis violacea L. (violet wood sorrel). A scarce understory plant in this area. W-2

Oxalis stricta L. (yellow wood sorrel). A typically common understory plant. W-3

PLANTAGINACEAE (Plantain Family)

**Plantago lanceolata* L. (buckhorn). Roadside/trailside species on the south and west sides. D-3

Plantago patagonica Jacq. var. *patagonica* (Patagonian plantain). A prominent species in the sand prairie. S-4

Plantago rugelii Dcne. (Rugel's plantain). Growing in the road and along the trail on the east side. D-3

POACEAE (Grass Family)

Agrostis stolonifera L. (redtop). Scattered in stands of *Bromus inermis* on the west side of the site. D-3

Andropogon hallii Hack. (sand bluestem). Occasional in disturbed sandy sites; southeast side. S-3

Andropogon gerardii Vitmann (big bluestem). Scattered between the trail and Highway 11 on the west side. D-3

Aristida basiramea Engelm. ex Vasey (forktip three-awn). Infrequent clumps growing on sandy, disturbed sites. S-2

**Aristida oligantha* Michx. (prairie three-awn). Occasionally encountered in the sand prairie. S-3

**Bouteloua curtipendula* (Michx.) Torr. (sideoats grama). Uncommon here, perhaps due to the dry nature of the sand prairie. S-4

**Bouteloua gracilis* (H.K.B.) Lag. ex Steud. (blue grama). A very adaptable prairie grass found here in the sand prairie. S-3

Bouteloua hirsuta Lag. (hairy grama). Growing in clumps in the sand prairie. S-3.

**Bromus ciliatus* L. (fringed brome). Another understory species that tolerates moist, shaded habitats. W-2

Bromus inermis Leyss. ssp. *inermis* (smooth brome). Introduced as a pasture grass, smooth brome dominates the roadside near Highway 11. D-5

Bromus japonicus Thunb. ex Murr. (Japanese brome). This species is one of the weedy invaders on the east side. It occasionally inhabits sandy, grassland sites. D-4

Bromus latiglumis (Schribn. ex Shear) Hitchc. (ear-leaved brome). A native brome on shaded understory sites. W-2

**Bromus squarrosus* L. (square brome). Roadside species, east side. D-3

Bromus tectorum L. (downy brome). A rapidly spreading annual brome scattered along roadsides and along the trail. D-4

Calamovilfa longifolia (Hook.) Scribn. (prairie sandreed). Along the fence line on the east side and in the sand prairie. S-3; D-2

- Cenchrus longispinus* (Hack.) Fern. (sandbur). In sandy disturbances along the walking trail; southeast side of the site. D-2
- **Chloris verticillata* Nutt. (windmill grass). Small "tumblegrass" that invades sandy sites. S-3
- Dactylis glomerata* L. (orchard grass). A roadside plant east of Highway 11 and an infrequent species along the trail. D-2
- Dichanthelium oligosanthes* (Sch.) Gould var. *scribnerianum* (Nash) Gould (Scribner dichanthelium). A low-growing species that is common in the sandy area on the west side. S-3
- **Digitaria cognata* (Schult.) Pilg. (fall witchgrass). Scattered along the trail and in the sand prairie on the southeast side. S-3
- Digitaria sanguinalis* (L.) Scop. (hairy crabgrass). A roadside/trailside invader on the northeast side. D-3
- Echinochloa crusgalli* (L.) Beauv. (barnyard grass). Collected along the trail and near Highway 11 on the west side of the site. D-3
- Echinochloa muricata* (Beauv.) Fern. var. *microstachya* Wiegand (barnyard grass). A weedy invasive plant on the east side. D-3
- **Eleusine indica* (L.) Gaertn. (goosegrass). Along the road in moist soil just south of the cemetery. D-3
- Elymus canadensis* L. (Canada wild rye). Common to low areas on the east side. R-3
- Elymus trachycaulus* (Link) Gould ex Shinners (slender wheatgrass). Infrequent in sandy areas on the south side. D-2
- Elymus villosus* Muhl. ex Willd. (hairy wild rye). Although infrequent, this understory graminoid is widely distributed. W-2
- Elymus virginicus* L. var. *virginicus* (Virginia wildrye). Roadside plant on the west side. D-3
- Elytrigia intermedia* (Host.) Nevski (intermediate wheatgrass). Along Highway 11 and the walking trail on the west side of the site. D-3
- Elytrigia repens* (L.) Nevski. (quack grass). Near the trail and Highway 11 on the west side. D-3
- **Eragrostis cilianensis* (All.) E. Mosher (stinkgrass). Scattered in the cemetery road on the east side, this species tolerates several soil types. D-3
- Eragrostis hypnoides* (Lam.) B.S.P. (teal lovegrass). In gravel and sand along the cemetery road on the east side. D-4
- Eragrostis pectinacea* Michx. (Carolina lovegrass). Common along the trail and the road on the east side of the site. D-3
- **Eragrostis spectabilis* (Pursh) Steud. (purple lovegrass). A trailside species in sandy soils on the southeast side. S-2
- Eragrostis trichodes* (Nutt.) Wood (sand lovegrass). Scattered within sandy sites on the southeast and south sides. S-3
- Festuca arundinacea* Schreb. (tall fescue). Roadside plant occurring with *Bromus inermis* and *Panicum virgatum*. D-3
- Hordeum jubatum* L. (foxtail barley). A roadside species along Highway 11. D-4
- Hordeum pusillum* Nutt. (little barley). Associated with *Lepidium* and *Thlaspi* on the south side of the trail. D-4
- Leersia virginica* Willd. (whitegrass). In semi-shaded low area on the east side; understory species on disturbed sites. R-3; W-4
- **Leptochloa fascicularis* (Lam.) A. Gray (bearded sprangletop). Very adaptable to the dry, sandy soils on the south and east sides of the study area. D-2; S-3
- Lolium perenne* L. var. *perenne* (perennial ryegrass). Mixed with *Bromus inermis* and *Phleum pratense* within grassy openings. D-3
- Muhlenbergia frondosa* (Poir.) Fern. (wirestem muhly). Roadside near Highway 11 and growing in semishaded locations on the east side of the site. D-3
- Muhlenbergia mexicana* (L.) Trin. (Mexicana muhly). Common in the shaded, understory of the old-growth forest. W-3
- **Muhlenbergia racemosa* (Michx.) B.S.P. (marsh muhly). This grass, found growing in clumps shaded by *Prunus pumila*, was collected in the sand prairie. S-2
- **Panicum capillare* L. (witchgrass). A weedy plant along the trail (south side) in both sandy and clay soils. D-3.
- **Panicum dichotomiflorum* Michx. (fall panicum). On disturbed sites along the cemetery road (East side) and the trail. D-3
- Panicum virgatum* L. (switchgrass). One of the more dominant species in the sand prairie. S-5
- Pascopyron smithii* (Rydb.) A. Love (western wheatgrass). Uniformly scattered prairie plant. S-4
- Paspalum setaceum* Michx. var. *stramineum* (Nash.) D. Banks (sand paspalum). A common annual grass on sandy soils. S-3
- Phalaris arundinacea* L. (reed canarygrass). This species has become established in a drainage area along Highway 11 on the southwest side of the site. R-4
- **Phleum pratense* L. (timothy). Scattered along the highway and the trail. D-3
- Poa compressa* L. (Canada bluegrass). Shaded areas near the cemetery and along the road. D-2

Poa pratensis L. (Kentucky bluegrass). Along trails and in roadside ditches; occasional forest understory plant. D-4; W-2

**Setaria glauca* (L.) Beauv. (yellow foxtail). Most often encountered on the south side in sandy soils and sunny openings along the trail. D-3

**Setaria viridis* (L.) Beauv. (green foxtail). Trailside species on the south side and along the cemetery road. D-4

**Sorghastrum nutans* (L.) Nash (Indian grass). Scattered between the trail and Highway 11 on the west side. S-3

Sporobolus cryptandrus (Torr.) A. Gray (sand dropseed). This species is not extremely abundant here but is typical of disturbed sites and sandy soils. D-3; S-4

Stipa spartea Trin. (porcupine grass). Bunch grass common to the sand prairie. S-3

**Thinopyrum elongatum* (Host) D.R. Dewey (tall wheatgrass). Occasionally encountered in the road ditch along Highway 11 on the west side. D-2

Triplasis purpurea (Walt.) Chapm. (sandgrass). Scattered along the trail and in the sand prairie on the southeast side. S-3

Vulpia octoflora Walt. (sixweeks fescue). Widely scattered in sandy soil, this species is often overlooked later in the growing season. S-4

POLEMONIACEAE (Polemonium Family)

**Phlox paniculata* L. (fall phlox). Uncommon understory species, often flowering in late summer or fall in this area. W-2

POLYGONACEAE (Buckwheat Family)

Eriogonum annuum Nutt. (annual eriogonum). Occasionally encountered in the sand prairie. S-3

Polygonum aerenastrum Jord. ex Bor. (knotweed). Weedy plant on the south side of the site. D-3

Polygonum coccinium Muhl. (water smartweed). Large patches of this species were found between the trail and Highway 11 on the west side. R-3

Polygonum lapathifolium L. (pale smartweed). In low, wet drainage area on the south side of the site. R-3

Polygonum pennsylvanicum L. (Pennsylvania smartweed). Collected in low, wet areas on the west side of the site. R-2

**Polygonum scandens* L. (false buckwheat). Trailside plant on the southwest side and occasional in forest openings. W-2; D-3

Rumex crispus L. (curly dock). Along Highway 11 on the west side of the site. D-3

Rumex altissimus Wood. (pale dock). Uncommon roadside weed in this area. D-2

PORTULACACEAE (Purslane Family)

Talinum parviflorum Nutt. (prairie fameflower). Uncommon plant in the disturbed sand prairie on the west side of the site. S-2

RANUNCULACEAE (Buttercup Family)

Clematis virginiana L. (virgin's bower). In thickets of small shrubs and trees; uncommon. W-2

**Ranunculus abortivus* L. (early wood buttercup). Common understory herbaceous plant; best observed in spring. W-4

Ranunculus sceleratus L. var. *sceleratus* (cursed crowfoot). In low, wet drainage area on the south side of the site. R-3

ROSACEAE (Rose Family)

**Geum canadense* Jacq. (white avens). A common understory species. W-3

Prunus americana Marsh (wild plum). Common in bordering thickets and on disturbed sites. D-4; W-4

Prunus pumila L. var. *besseyi* (Bailey) Gl. (sand cherry). Occasionally encountered in shrubby thickets. W-2

Prunus virginiana L. (choke cherry). Forming thickets with *Cornus drummondii* and *Prunus americana*. W-4

Rosa arkansana Porter (prairie wild rose). Quite common in the sand prairie. S-4

Rubus occidentalis L. (black raspberry). Understory species; roadside on the east side. W-3; D-3

RUBIACEAE (Madder Family)

Galium aparine Nutt. (catchweed bedstraw). Somewhat aggressive understory plant. W-3

**Galium trifidum* L. (small bedstraw). Uncommon understory plant. W-2

Galium triflorum Michx. (sweet-scented bedstraw). Occasionally occurring understory species with *Carex leavenworthii*. W-2

SALICACEAE (Willow Family)

Populus deltoides Michx. ssp. *monilifera* (Ait.) Eckenw. (eastern cottonwood). Several trees occur near the roadside on the southwest side of the site. D-4

Salix amygdaloides Anderss. (peachleaf willow). Occasional examples occur on the south and west sides of the site. D-3

**Salix exigua* Nutt. subsp. *interior* (Rowlee) Cronq. (coyote willow). Scattered on low sites on the south and west sides and in sandy soil along the abandoned railroad line. D-3

SCROPHULARIACEAE (Figwort Family)

- Penstemon grandiflorus* Nutt. (shell-leaf penstemon). Very common to sandy sites in this area; infrequent here. S-2
- **Verbascum thapsus* L. (common mullein). Especially common on sandy sites south of the trail; south side. S-4
- Veronica arvensis* L. (corn speedwell). Near the trail on the south side. D-2
- **Veronica perigrina* L. var *xalapensis* (H.K.B.) St.J. & War. (purslane speedwell). Weedy species in sandy soil and along the trail on the south side. D-3

SIMAROUBACEAE (Quassia Family)

- **Ailanthus altissima* (P. Mill.) Swingle (tree of heaven). Along roadside near cemetery; disturbed drainage area. R-1

SMILACACEAE (the Catbrier Family)

- **Smilax hispida* Muhl. (bristly greenbrier). Common understory vine. W-3

SOLANACEAE (Nightshade Family)

- Physalis heterophylla* Nees (clammy ground cherry). Roadside plant on the west side and intermixed in the sand prairie to the southeast. D-3; S-4
- **Solanum carolinense* L. (Carolina horse-nettle). Scattered between the trail and Highway 11 on the west side. D-2
- Solanum interius* Rydb. (plains black nightshade). Along the trail on the south side and occasional between the trail and Highway 11 on the west side. D-3
- Solanum ptycanthum* Dun. ex DC. (black nightshade). Collected along the cemetery road and in the sand prairie. D-3; S-3

TYPHACEAE (Cat-tail Family)

- **Typha latifolia* L. (broad-leaved cat-tail). A roadside species, in a low wet area on the west side. D-2

ULMACEAE (Elm Family)

- **Celtis occidentalis* L. (hackberry). A common tree in Hannibal Woods but not a dominant species. W-3
- Ulmus americana* L. (American elm). Once common, Dutch elm disease limits its distribution. A few large American elms still persist here. W-2
- Ulmus pumila* L. (Siberian elm). This tree is occasionally encountered along the trail on the east side and is invasive on the west side. It is uncommon within the actual forest. D-3

- Ulmus rubra* Muhl. (slippery elm). This species is uncommon in central and western Nebraska, but several thickets of slippery elm occur on the west side of Hannibal Woods. W-4

URTICACEAE (Nettle Family)

- **Laportea canadensis* (L.) Wedd. (wood nettle). Uncommon understory species. W-2
- Parietaria pennsylvanica* Muhl. ex Willd. (Pennsylvania pellitory). A shade-tolerant understory species also found in openings along the trail. W-3; D-3
- Pilea pumila* (L.) A. Gray (clearweed). Uncommon in the low areas on the east side of the site. R-2
- Urtica dioica* L. (stinging nettle). Invasive species in shaded and semi-shaded areas along the trail. W-3

VERBENACEAE (Vervain Family)

- Phryma leptostachya* L. (lopseed). Typically inhabits shaded understory sites. W-2
- Verbena bracteata* Lag. & Rodr. (prostrate vervain). In sandy soils on the south side of the site and along the road on the east side. D-3
- Verbena hastata* L. (blue vervain). Collected only from the semi-shaded drainage area on the east side of the site. D-2
- Verbena stricta* Vent. (hoary vervain). Common in the sandy area which encroaches along the south trail. S-4
- Verbena urticifolia* L. (nettle-leaved vervain). Collected along the trail on the west side of Hannibal Woods and also within the woodland. W-2

VIOLACEAE (Violet Family)

- Viola pratincola* Greene (blue prairie violet). Most noticeable in open areas along the trail and in the woodland understory. W-3
- Viola sororia* Willd. (downy blue violet). The common understory violet in this area. W-4

VITACEAE (Grape Family)

- Parthenocissus vitacea* (Kner) Hitchc. (woodbine). In association with *Fraxinus pennsylvanica* and *Ulmus spp.* along the trail on the west side. W-3
- Vitis riparia* Michx. (river-bank grape). A common vine in sunny and shaded locations. W-4

CONCLUSION

This project was initiated as part of a botanical survey that extended throughout the middle Loup River Valley. However, subsequent studies at the Hannibal Woods site indicate that its botanical value and natural beauty are very significant. A combination of soils, topography, and species interactions plus the prominence of Oak Creek, a permanent stream, have contributed to the formation of a diverse plant community that is atypical for this part of Nebraska. The resulting discovery of 86 new county records in such a small area (16 Ha) is extremely noteworthy (D. Sutherland et al. 2006 personal communication). Although the amount of interest and plant collecting intensity in Nebraska has increased in recent years, it is encouraging that many botanical discoveries have yet to be made. As future taxonomic studies are considered, Hannibal Woods deserves to be included among those unique natural sites that significantly enhance and contribute to the flora of the state.

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LITERATURE CITED

- Becker, D.A. 1980. Floristic analysis of a natural area on the lower Platte River flood plain. *Transactions of the Nebraska Academy of Sciences* 8:15-30.
- Beightol, D.A. and T.B. Bragg. 1993. Woody vegetation of a disjunct bur oak (*Quercus macrocarpa*) forest in east-central Nebraska. *Transactions of the Nebraska Academy of Sciences* 20:41-46.
- Brudvig, L.A. and H. Asbjornsen. 2005. Oak regeneration before and after initial restoration efforts in a tall grass oak savanna. *American Midland Naturalist* 153(1):180-186.
- Churchill, S.P. 1979. A botanical survey of Cuming County: Part II, the Bryophytes: with additions to part I, the vascular plants. *Transactions of the Nebraska Academy of Sciences* 7:61-64.
- Flora North America Editorial Committee, eds. 1993 et seq. *Flora of North America North of Mexico* 8+ vols. Oxford University Press, New York and Oxford.
- Garabrandt, M.M. 1988. An annotated list of the vascular plants of Fontenelle Forest and Neale Woods in eastern Nebraska. *Transactions of the Nebraska Academy of Sciences* 16:31-49.
- Great Plains Flora Association. 1991. *Flora of the Great Plains*, 2nd ed. Lawrence, University Press of Kansas: 1402 pp.
- Hardy, J.P. 1991. The vascular flora of Banner County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 18:109-126.
- Kaul, R.B. and S.B. Rolfsmeier. 1994. Diversity of vascular plants and intensity of plant collecting in Nebraska. *Transactions of the Nebraska Academy of Sciences* 21:13-20.
- Mahnke, C. F., C. L. Hammond, and L. E. Brown. 1974. *Soil survey of Howard County, Nebraska*. U.S. Government Printing Office, Washington, DC. 89 pp.
- Nagel, H.A. and O.A. Kolstad. 1987. Comparison of plant species composition of Mormon Island Crane Meadows and Lillian Annette Rowe Sanctuary in Central Nebraska. *Transactions of the Nebraska Academy of Sciences* 15:37-48.
- Orr, W.J. (ed.). 1983. Danish pioneers on the Nebraska Prairie: recollections of Peter Ebbesen. *Nebraska History* 64(1):96-127.
- Rolfsmeier, S.B. 1988. The vascular flora and plant communities of Seward County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 16:91-113.
- Rothenberger, S.J. 1985. Community analysis of the forest vegetation in the lower Platte River Valley, eastern Nebraska. *The Prairie Naturalist* 17(1):1-14.
- Rothenberger, S.J. 2000. A floristic study and species checklist for the Republican River Valley in Nebraska, with emphasis on plants of concern for conservation. *Transactions of the Nebraska Academy of Sciences* 26:1-15.
- SNR – UNL (School of Natural Resources, University of Nebraska Lincoln). 2005. *High Plains Regional Climate Center Home Page*. <http://hprcc.unl.edu/nebraska/> Retrieved from the Internet 14 November 2005.

Sutherland D.M. and S.B. Rolfsmeier. 1989. An annotated list of the vascular plants of Keith County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 17:83-101.

Sutherland, D., R. Kaul, and S. Rolfsmeier. 2006. Personal communication. (19 May 2006)

Urbatsch, L.E. and R. Eddy. 1973. A floristic study of Dawes County, Nebraska. *Transactions of the Nebraska Academy of Sciences* 2:190-204.