

PRAIRIE REMNANTS ALONG THE STILLWATER RIVER IN MIAMI COUNTY, OHIO

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Whether described as noncontiguous outliers of Transeau's great triangle or botanical archipelagos amidst beech—maple and oak—hickory associations, the Stillwater Prairies are unique prairie remnants. These small "islands" of prairie communities are prime examples of sites that may not have exceeded 12-16 ha (30-40 acres) in historic time. These prairies were frequently referred to as "nice bottom," "thin broken land," "broken bushy land," and "wet bushy prairie" in survey notes recorded by Colonel Ludlow (1801). The frequency of such observations in his notes suggests that at postsettlement time, open prairie lands occurred with regularity throughout the northern reaches of the river. Until recently, however, local people had nearly forgotten that these prairies were part of the native landscape.

The Stillwater River, located in west-central Ohio (Fig. 1), traverses the counties of Darke, Miami, and Montgomery along its approximately 80 km (50 miles) course and terminates at the Great Miami River in Dayton. Passing through Wisconsin glacial till plains, slightly less than half of its course is in a east-southeast direction until reaching a point just north of Covington where, owing to previous glacial blockage, the river abruptly shifts to the south traversing a deeply cut valley of preglacial times. Included in the state's scenic rivers system, the Stillwater River remains one of Ohio's least disturbed streams, supporting excellent populations of great blue heron and outstanding smallmouth bass fisheries.

This paper discusses three prairie sites which occur along a 5.6 km (3.5 miles) section of the Stillwater River (Fig. 2). It highlights the Stillwater Prairie Preserve, an area administered by the Miami County Park District. The discussion is based on preliminary investigations.

DESCRIPTIONS OF THE PRAIRIES

Site 1, Hoary Puccoon Prairie

Location. NE¼ of the NW¼ of Section 11, Newberry Township.

Size. Approximately 0.08 ha (0.20 acres).

Exposure. The Hoary Puccoon Prairie occupies the extreme edge of a southwest-facing 15-18 m (50-60 ft) bluff, at a point where the river splits into two distinctive channels during high water. The land immediately above the bluffs to the north has virtually no relief.

Soils. The soil is Miamian-Hennepin silt loam of the type located on slopes of 25-50 percent incline along rivers and their tributaries. These soils were formed from medium-textured calcareous glacial till and have a well-drained shallow to medium root zone. Surface runoff is rapid, and the hazard of erosion and slumping is very severe (Lehman and Bottrell, 1978).

Vegetation. With the exception of several large *Juniperus virginiana*, this site is dominated by *Andropogon scoparius* on the drier upper reaches, with *A. gerardii* interspersed more frequently downhill toward the wetter portions of the slope. Forbs and woody prairie species, such as *Ceanothus americana*, *Asclepias tuberosa*, *Spiranthes cernua*, *Cassia fasciculata*, and *Ratibida pinnata*, make up approximately 50 percent of the remaining vegetation. The population of *Lithospermum canescens* has spread over the slumping and eroding slope, and has increased in abundance over the past three years. Its spreading possibly will continue southerly to other known sites along the river where presently it does not occur. At the base of the slope, several specimens of *Silphium terebinthinaceum* occur near the river's edge. Vegetation surrounding the prairie includes wooded ravines and a field of primarily *Bromus inermis* to the north.

Discussion. While the present owner has been quite appreciative and protective of the plants at the Hoary Puccoon Prairie, the future of the site is in question. The xeric nature of the upper flat and southwest-

facing slope, apparently prohibits invasion of woody plants; however, the undercutting of this small area by the slumping slopes might destroy this delicately balanced hillside prairie. Natural migration of the prairie into the *Bromus inermis* field to the north appears improbable. Virtually no invasion by prairie species has occurred to the stand of *B. inermis* that was established 15-20 years ago. Destructive management of the *B. inermis* cover would, of course, allow movement of prairie species into that area. Prairie dominants and selected associated species in Hoary Puccoon Prairie are listed in Table 1.

Site 2, Pentz Prairie

Location. NW¼ of the SE¼ of Section 11, Newberry Township.

Size. Approximately 0.1 ha (0.25 acre).

Exposure. The Pentz Prairie is composed of two parts: the first facing directly west, approximately 7.5 m (25 ft) above the river, and the second, separated from the former by invading woody species, more to the southwest and only 3-4.5 m (10-15 ft) above the river.

Soils. The soil is Eldean loam, a soil generally present on slopes of 2-6 percent incline along river courses and their tributaries. It is formed on high stream terraces, kames, or eskers (Lehman and Bottrell, 1978). This site, underlain with sand and gravel, is moderately eroded, tends to be droughty during summer months, and becomes warmer earlier than surrounding areas. Wet years, however, produce high water tables in adjacent poorly drained soils which "seep" at their interface with the prairie (Fig. 3).

Vegetation. The soil pattern present at the Pentz Prairie has resulted in vegetation quite unlike that at the Hoary Puccoon Prairie and Stillwater Prairie Preserve, as evidenced by the presence of numerous hydrophytic species such as *Carex* spp., *Juncus* spp., *Impatiens*

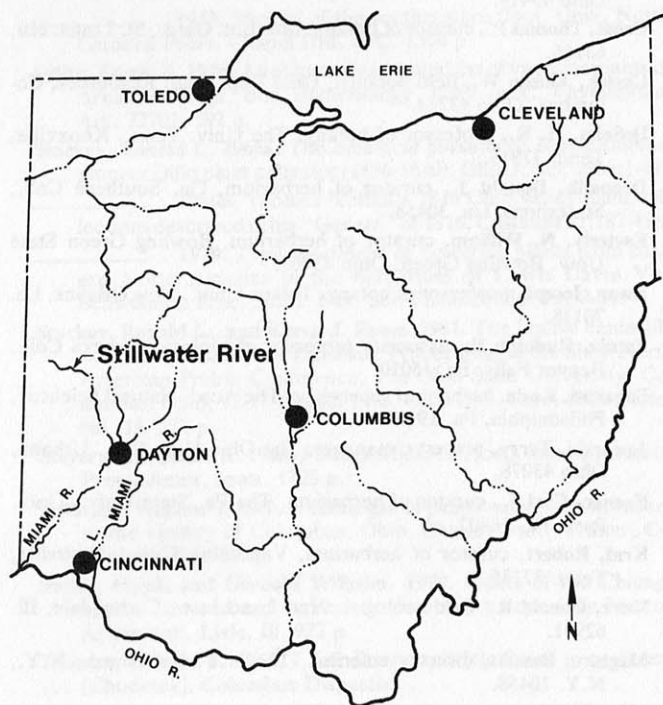


Figure 1. Location of the Stillwater River in Ohio.

biflora, *Asclepias incarata*, and *Thalictrum polygamum*. These species are interspersed throughout with typical prairie species such as *Allium cernuum*, *Andropogon scoparius*, *A. gerardii*, *Monarda fistulosa*, and *Ratibida pinnata*. In addition, woody species such as *Ulmus americana* and *Fraxinus americana*, usually not exceeding 20 cm (8 inches) in diameter, occupy approximately 15-20 percent of the vegetation.

Discussion. The mixture of hydrophytic and prairie species at the Pentz Prairie is believed to result from a long-term fluctuation of available soil moisture within and surrounding the prairie site. During long droughty periods the source of water from well-drained upland soils may have ceased to flow over the exposed xeric site and prairie species were established. Periodically during wetter periods, the soil

became recharged and hydrophytic species became established and interspersed with the previously established prairie species. The wetter periods probably never prevailed long enough to create true forest conditions, which would have eliminated the prairie element, and during ensuing dry periods the prairie once again flourished. These reoccurring cycles, if patterned appropriately, would have adversely affected forest succession much more than prairie continuance because of the greater tolerance of prairie plants to the wide range of fluctuating soil moisture conditions.

Prairie dominants and selected associates. The present owner has ceased to allow study of the Pentz Prairie; hence, no updating of this list has been made since 1976. Prairie dominants and selected associated species in Pentz Prairie are given in Table 1.

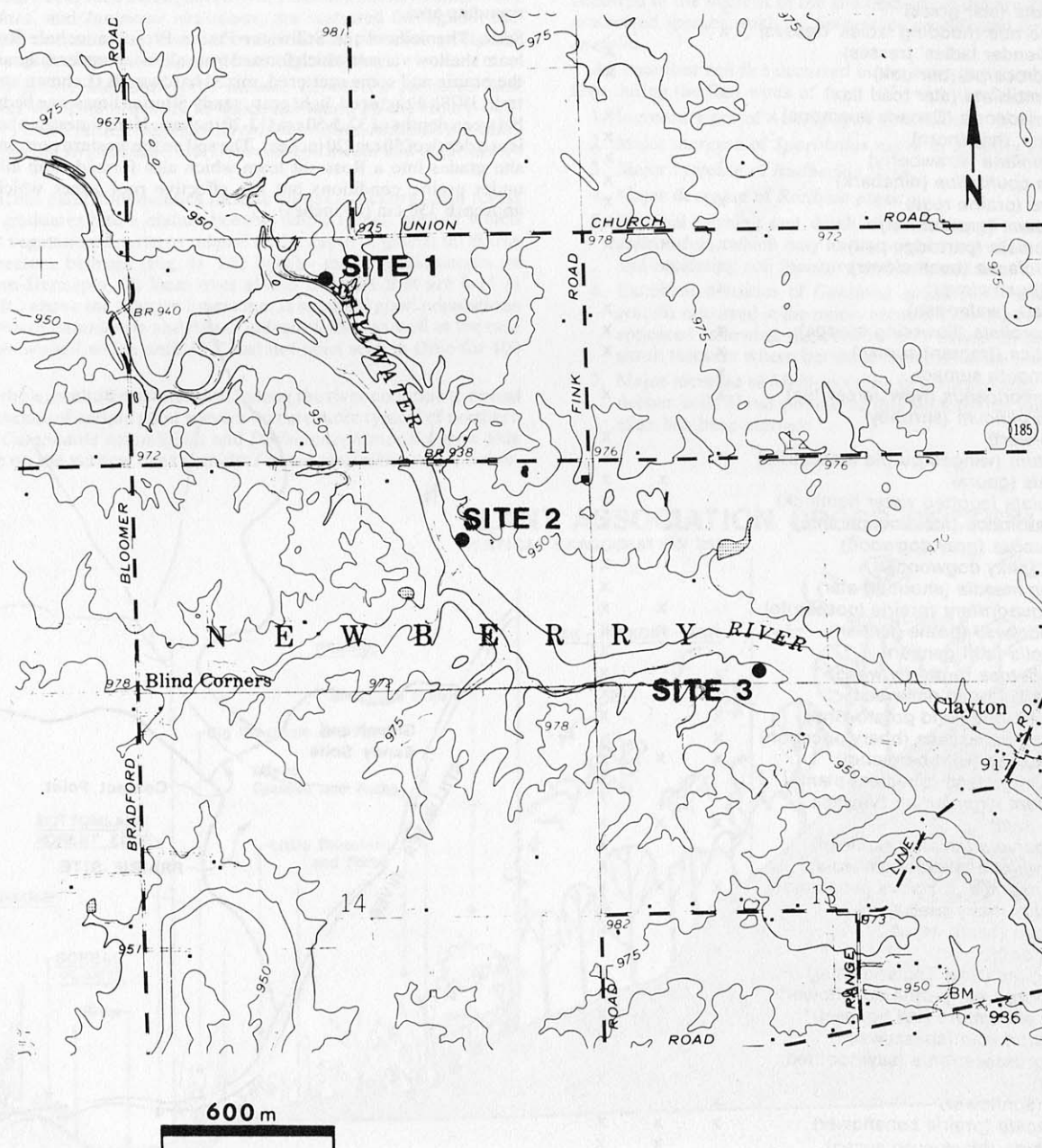


Figure 2. Location of the three Stillwater River prairie sites in Newberry Township, Miami County, Ohio: Hoary Puccoon Prairie (1), Pentz Prairie (2), and Stillwater Prairie Reserve (3).

Table 1. Prairie dominants and selected associated species in three prairie remnant sites along the Stillwater River: Hoary Puccoon Prairie (1), Pentz Prairie (2), and Stillwater Prairie Reserve (3).

| | Sites | | |
|--|-------|---|---|
| | 1 | 2 | 3 |
| <i>Andropogon gerardii</i> (big bluestem) | x | x | x |
| <i>A. scoparius</i> (little bluestem) | x | x | x |
| <i>Sorghastrum nutans</i> (Indian grass) | | | x |
| <i>Sporobolus asper</i> (dropseed) | | | x |
| <i>Allium cernuum</i> (nodding onion) | x | x | x |
| <i>Camassia scilloides</i> (wild hyacinth) | | | x |
| <i>Lilium michiganense</i> (Michigan lily) | | | x |
| <i>Hypoxis hirsuta</i> (star grass) | x | | |
| <i>Spiranthes cernua</i> (nodding ladies' tresses) | x | | |
| <i>S. gracilis</i> (slender ladies' tresses) | | | x |
| <i>Quercus macrocarpa</i> (bur oak) | | | x |
| <i>Comandra umbellata</i> (star toad flax) | x | | |
| <i>Anemone canadensis</i> (Canada anemone) | | | x |
| <i>Crataegus</i> spp. (hawthorn) | | | x |
| <i>Fragaria virginiana</i> (strawberry) | x | | x |
| <i>Physocarpus opulifolius</i> (ninebark) | | | x |
| <i>Rosa setigera</i> (prairie rose) | x | | x |
| <i>Apios americana</i> (ground nut) | | | x |
| <i>Cassia fasciculata</i> (partridge pea) | x | x | x |
| <i>Lespedeza violacea</i> (bush clover) | x | x | |
| <i>L. virginica</i> (bush clover) | x | | |
| <i>Ptelea trifoliata</i> (wafer-ash) | | | x |
| <i>Euphorbia corollata</i> (flowering spurge) | x | | x |
| <i>Rhus aromatica</i> (fragrant sumac) | x | | x |
| <i>R. glabra</i> (smooth sumac) | x | | |
| <i>Ceanothus americanus</i> (New Jersey tea) | x | | x |
| <i>Hypericum prolificum</i> (shrubby St. John's-wort) | | | x |
| <i>Lythrum alatum</i> (winged purple loosestrife) | | | x |
| <i>Gaura biennis</i> (gaura) | | x | x |
| <i>Cicuta maculata</i> (spotted water hemlock) | | | x |
| <i>Thaspium barbinode</i> (meadow parsnip) | | | x |
| <i>Cornus racemosa</i> (gray dogwood) | x | | |
| <i>C. amomum</i> (silky dogwood) | | | x |
| <i>Dodecatheon meadia</i> (shooting star) | | | x |
| <i>Lysimachia quadriflora</i> (prairie loosestrife) | | x | x |
| <i>Gentiana andrewsii</i> (bottle gentian) | | x | x |
| <i>G. quinquefolia</i> (stiff gentian) | | | x |
| <i>Asclepias tuberosa</i> (butterfly weed) | x | | x |
| <i>A. verticillata</i> (whorled milkweed) | | | x |
| <i>Ipomoea pandurata</i> (wild potato-vine) | x | | x |
| <i>Lithospermum canescens</i> (hoary puccoon) | x | | |
| <i>Monarda fistulosa</i> (wild bergamot) | x | x | x |
| <i>Physostegia virginiana</i> (obedient plant) | | | x |
| <i>Pycnanthemum virginianum</i> (Virginia mountain-mint) | x | x | x |
| <i>Scutellaria parvula</i> (smaller skullcap) | | | x |
| <i>Gerardia tenuifolia</i> (slender gerardia) | | | x |
| <i>Penstemon digitalis</i> (foxglove penstemon) | x | x | x |
| <i>Ruellia humilis</i> (hairy ruellia) | | | x |
| <i>Aster ericoides</i> (heath aster) | | | x |
| <i>A. laevis</i> (smooth aster) | x | | |
| <i>A. novae-angliae</i> (New England aster) | | | x |
| <i>Echinacea purpurea</i> (purple coneflower) | | | x |
| <i>Eupatorium altissimum</i> (tall boneset) | | | x |
| <i>Helenium autumnale</i> (sneezeweed) | | | x |
| <i>Helianthus grosseserratus</i> (saw-toothed sunflower) | | | x |
| <i>H. hirsutus</i> (sunflower) | x | | |
| <i>Ratibida pinnata</i> (prairie coneflower) | x | x | x |
| <i>Rudbeckia hirta</i> (black-eyed susan) | | x | x |
| <i>R. triloba</i> (thin-leaved coneflower) | x | | x |
| <i>Silphium terebinthinaceum</i> (prairie-dock) | x | | x |
| <i>S. trifoliatum</i> (whorled rosinweed) | | | x |

Site 3, Stillwater Prairie Preserve

Location. SE¼ of the SW¼ of Section 12, Newberry Township.

Size. Approximately 2 ha (5 acres).

Exposure. The Stillwater Prairie Preserve occurs on both sides of the Stillwater River in a generally east-west direction and has full westerly exposure on the eastern portion which rises approximately 3 m (10 ft) above the water's edge. The western portion does not possess sufficient relief to manifest an extreme topographic exposure; however, it occurs in a bowl-like depression having winter temperatures considerably lower than the surrounding area. Summer westerly winds are virtually nonexistent on the Stillwater Prairie Preserve due to a large block of forest immediately to the west, resulting in higher daytime summer and autumn temperatures there than in the surrounding area.

Soils. The soils of the Stillwater Prairie Preserve include Ross silt loam shallow variant which formed from alluvium under tallgrasses of the prairie and some scattered, mixed hardwoods (Lehman and Bottrell, 1978). Fractured, light gray, sandy Silurian limestone bedrock is between depths of 32.5-50 cm (13-20 inches). Hard limestone bedrock is at a depth of 50 cm (20 inches). The soil on the western portion of the site grades into a Ross silt loam which also formed from alluvium under prairie conditions but has effective root zones which may approach 150 cm (60 inches).

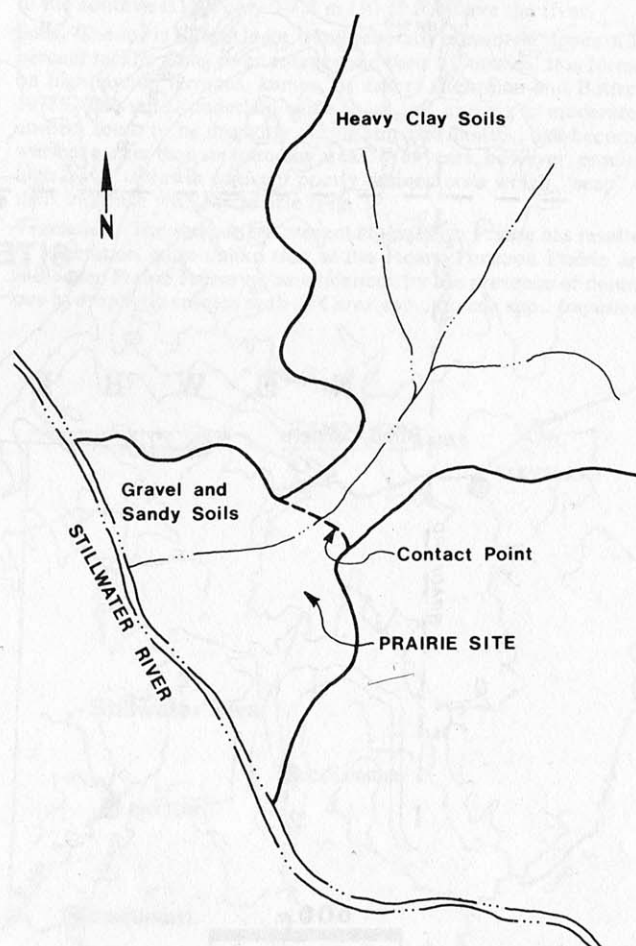


Figure 3. Soils of the Pentz Prairie (2) in Miami County, Ohio.

Vegetation. A screen of bottomland forest lies between the river and the Stillwater Prairie Preserve. Beyond these trees lies a mosaic of grasses, forbs, trees, vines, and shrubs which hardly resemble a western prairie. Depth of glacial till ranging from 15 to 150 cm (6 to 60 inches) above limestone bedrock directly influences the composition of plant community zones within the prairie itself (Fig. 4). These communities can be described as follows:

1. *Andropogon gerardii* and forbs.
2. *Andropogon scoparius* and forbs.
3. *Andropogon gerardii*, *A. scoparius*, *Sorghastrum nutans*, *Sporobolus asper*, and forbs.
4. Shrubland prairie.

Shrub thickets of *Physocarpus opulifolius* and *Rhus aromatica*, and individual trees, such as *Juglans nigra*, *Fraxinus pennsylvanica* var. *lanceolata*, and *Juniperus virginiana*, are scattered throughout the grassland communities listed above in areas possessing slightly deeper soil pockets with higher percentages of clay.

Good prairie indicator forbs include *Echinacea purpurea* and *Asclepias verticillata* neither of which are found on the Hoary Puccoon or Pentz Prairies. *Silphium terebinthinacium*, *Ratibida pinnata*, *Pycnanthemum virginianum*, and *Dodecatheon media* add to the diversity.

Adjacent plant communities include an oak—hickory—ash forest which graduates into a mature beech—maple forest, both of which exhibit vegetational patterns related to the depth of glacial till above the limestone bedrock (Fig. 4). The beech—maple forest occurs on Miamian-Hennepin silt loam over glacial deposits that are 6-15 m (20-50 ft.) above the Silurian limestone. It supports good populations of *Hydrastis canadensis* and *Panax quinquefolium* as well as the rare *Veratum woodii* which until 1977 had not been seen in Ohio for 100 years.

Nearby exposed limestone banks along the river continue to reveal the presence of certain plant species that are more typical of northern areas. *Campanula rotundifolia* and *Dodecatheon media* grow side by side on the vertical banks amidst *Prunus virginiana* and *Amelan-*

chier spicata. *Aralia racemosa* has been recently located 4.8 km (3 miles) from this site on Greenville Creek, a tributary of the Stillwater River which also supports many aspects of relict prairie.

Discussion. The Stillwater Prairie Preserve was purchased in 1977 by the Miami County Park District as part of what is now a 217-acre reserve. It enjoys perpetual protection and will receive the finest management available to increase its quality and expand its limits.

Although the tract was included as a part of a larger property north of the river since the time of the original land grant in 1812, access for farming purposes was difficult because of high spring flood water; as a result, no major exploitation of the prairie has occurred. A few minor efforts at plowing were attempted in the past and some historical evidence exists that a small melon patch was established on the deeper soils sometime in the 1930's. It is believed that no plowing has occurred in the nucleus of the site because of the presence of easily eradicated species, such as *Spiranthes gracilis* and *Gentiana quinquefolia*.

An unauthorized fire occurred in the xeric grassland zones of the area during the first week of June 1977 with the following results:

1. Increase vigor of *Andropogon gerardii* and *A. scoparius*.
2. Major increase of *Sporobolus asper* in quantity and vigor.
3. Major increase of *Rudbeckia hirta*.
4. Major decrease of *Ratibida pinnata*.
5. Physical burning and death of a species of moss, *Thuidium delicatulum*, which may have an important effect in stabilizing and regulating soil moisture and temperature.
6. Excellent densities of *Gentiana quinquefolia* and *Spiranthes gracilis* occurred in the mossy areas in 1976; however, no plants appeared following the burn in 1977 except in areas near the shrub thickets where burnable materials were less dense.
7. Major increase of *Melilotus alba* in a burned area with slightly deeper soil. Hand pulling of this undesirable and aggressive alien has been started.

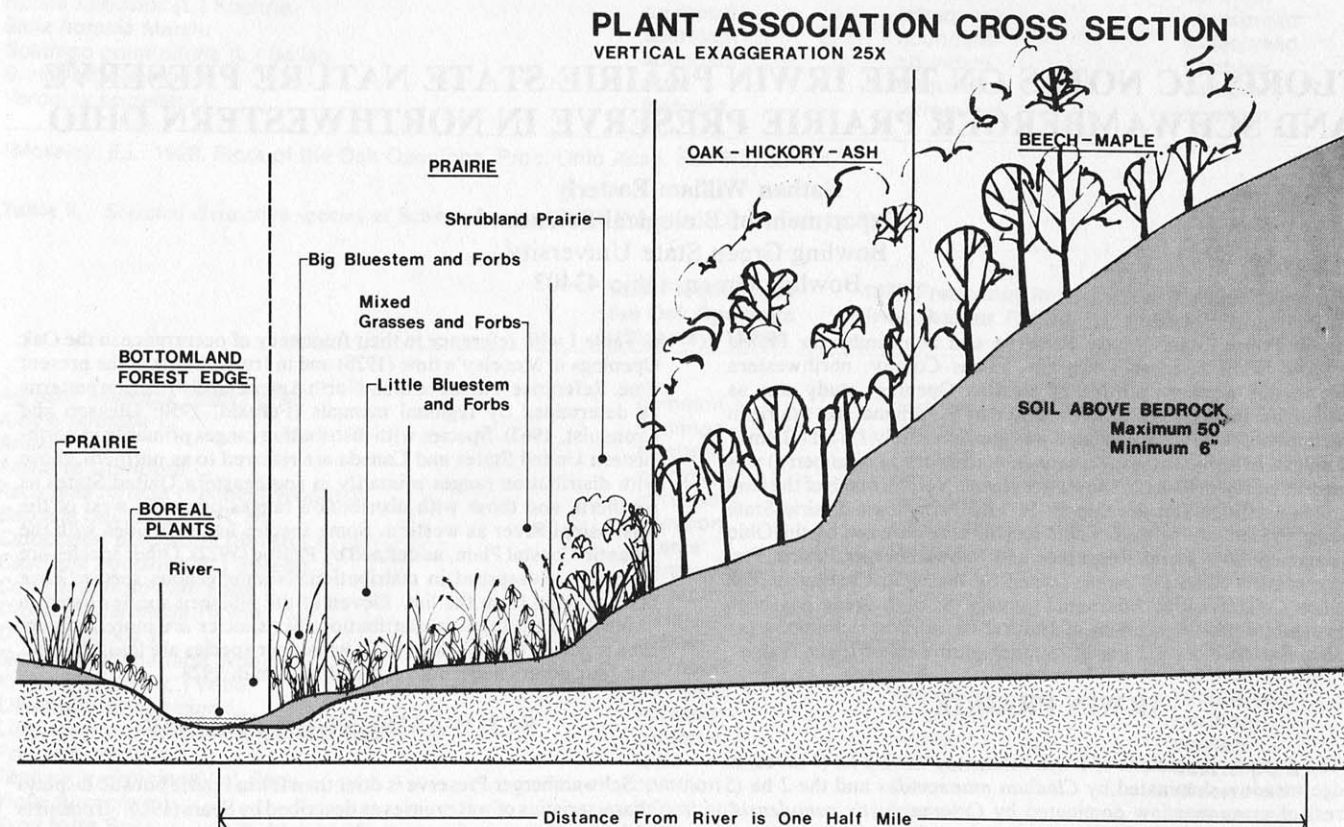


Figure 4. Plant communities and their relationships to depth of limestone bedrock at the Stillwater Prairie Preserve in Miami County, Ohio.

8. Prior to the burn, only three blooming stations of *Echinacea purpurea* were noticed. In 1978 at least 50 stations were observed.

While woody plants are selectively controlled on portions of the site with deeper soils, complete elimination will not be attempted as it is believed that these woody associates are a natural component of this prairie site. Widely scattered trees on the site rarely exceed 25.4 cm (10 inches) dbh, and these exhibit clear signs of decline and lack of vigor. Increment borings of trees averaging 15 cm (6 inches) dbh indicate an age range of 30-50 years. Therefore, woody plant succession is not considered a major threat to the prairie.

In less than three years, indelible foot paths were being established with only four to five individuals visiting the site three or four times a year. To control this damage, a 50 cm (20 inch) wide, white oak planked boardwalk was constructed through and around the site in 1978. Boards 5 x 15 cm (2 x 6 inches) and 2.4-3.6 m (3-12 ft.) long were spiked to 15 x 15 cm (6 x 6 inches) treated pine headers to form the walk that passes by main features of the site.

It is anticipated that the existing 2 ha (5 acres) tract will ultimately be expanded to its estimated postsettlement size of 6-8 ha (15-20 acres) by allowing prairie species to migrate into newly acquired Park District lands and by upgrading, through woody plant control, marginal prairie communities occurring on adjacent sites.

Prairie dominants and selected associates. Species in Stillwater Prairie Preserve are listed in Table 1.

CONCLUSION

The foregoing discussion has shown that prairie and forest plant species coexist as a result of slight differences in site characteristics. The species soils, for example, of the Hoary Puccoon Prairie, are the same as those of the beech-maple community 1.6 km (1 mile) downstream, except that the former is on a southwest-facing slope and the latter on a north-facing slope. An excellent way to illustrate this intermingling of plant communities is to describe a short, transect

(Fig. 4) through the Stillwater Prairie Preserve covering a distance of approximately 0.8 km (0.5 mile). Starting in the prairie east of the river, *Allium cernuum* and *Andropogon scoparius* grow on thin soil that barely covers the bedrock. Nearby, on exposed limestone, *Lysimachia quadrifolia* and *Campanula rotundifolia* live only centimeters apart in small depressed pockets of soil. Across the river on an elevated sandy bar next to a tree-lined bank, *Trillium nivale* and *Jeffersonia diphylla* bloom in spring a mere 6 m (20 ft) from the late summer *Silphium terebinthinaceum* and *Monarda fistulosa*. *Sorghastrum nutans* mingles with *Ptelea trifoliata*; on higher ground *Quercus alba* and *Sassafras albidum* is found in association with *Carya cordiformis*. Proceeding still upward, *Fagus americana* stands over the prairie below and equally shares with *Andropogon gerardii* the grandeur of antiquity.

ACKNOWLEDGEMENTS

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FLORISTIC NOTES ON THE IRWIN PRAIRIE STATE NATURE PRESERVE AND SCHWAMBERGER PRAIRIE PRESERVE IN NORTHWESTERN OHIO

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Irwin Prairie State Nature Preserve and Schwamberger Prairie Preserve lie in Spencer Township, Lucas County, northwestern Ohio, in the northern portion of the Oak Openings study area as outlined by Moseley (1928). He stated that the original wet prairie in which these preserves are located was approximately 1.6 x 11.2 km (7 x 1 miles). In former times, *Vaccinium macrocarpon* (cranberry) was grown as a crop in many of the wetter places. Today, much of the land has been drained and developed. In July 1978, Irwin Prairie State Nature Preserve consisted of 58.8 ha (147 acres) owned by the Ohio Department of Natural Resources and Schwamberger Prairie Preserve totaled 12 ha (30 acres) owned by the Ohio Chapter of The Nature Conservancy. Additional acreage at both areas has been surveyed by the Department of Natural Resources. Schwamberger Prairie Preserve lies 1.2 km (0.75 mile) southwest of Irwin Prairie.

IRWIN PRAIRIE

The primary attractions of Irwin Prairie are the 1.2 ha (3 acres) of sedge meadow dominated by *Cladium mariscoides* and the 2 ha (5 acres) of grass meadow dominated by *Calamagrostis canadensis*. Other plant communities are an aspen community, a shrub swamp, a dense stand of pin oak, and a mixed oak community (Tryon and Easterly, 1975). Selected distinctive species at Irwin Prairie are listed

in Table 1 with reference to their frequency of occurrence in the Oak Openings in Moseley's time (1928) and in Irwin Prairie at the present time. Reference is made to their North American distribution patterns as determined by regional manuals (Fernald, 1950; Gleason and Cronquist, 1963). Species with distribution ranges primarily in north-eastern United States and Canada are referred to as northern, those with distribution ranges primarily in southeastern United States as southern, and those with distribution ranges primarily west of the Mississippi River as western. Some species have affinities with the Atlantic Coastal Plain, as defined by Peattie (1922). Other species are generally widespread in distribution. Nonindigenous species have been omitted from the list. Eleven of the nineteen species listed in Table 1 are northern in distribution. Six species are more frequent than reported by Moseley (1928) while four species are less frequent, and four others were not recorded by him in 1928.

SCHWAMBERGER PRAIRIE

Schwamberger Preserve is drier than Irwin Prairie but still displays characteristics of wet prairies as described by Sears (1926). It consists of 1.6 ha (4 acres) of open sand area with *Krigia virginica*, *Convolvulus spithameus*, and *Asclepias tuberosa*; 8 ha (20 acres) of open wet area with *Aletris farinosa*, *Hypericum spathulatum*, *Agrostis*