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The Bryophytes of Kickapoo State Park

Vermilion County, Illinois

(TITLE)

BY

Kevin Jon Lyman

THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF

Master of Science

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY
CHARLESTON, ILLINOIS

1988

YEAR

I HEREBY RECOMMEND THIS THESIS BE ACCEPTED AS FULFILLING
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

June 8, 1988
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June 21, 1988
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The Bryophytes of Kickapoo State Park
Vermilion County, Illinois

By

Kevin J. Lyman

Abstract of a Thesis
Submitted in partial fulfillment of the requirements of the
degree of Master of Science in Botany at the Graduate School
of Eastern Illinois University

Charleston, Illinois
1988

ABSTRACT

A bryological **survey** of Kickapoo State Park, Vermilion county, Illinois, revealed a **total** of 45 bryophyte species. Of these, 42 are mosses and 3 are **liverworts**. The habitat and frequency for each species were recorded.

As a result of **this survey**, the following pleurocarpi are reported for the **first time** in Vermilion County: Amblystegium riparium (Hedw.) BSG, Amblystegium trichopodium (Schultz) Hartm., Amblystegium serpens (Hedw.) BSG var. juratzkanum (Schimp.) Rau & Herv., Thuidium recognitum (Hedw.) Lindb., Brachythecium rivulare BSG, Bryoandersonia illicebra (Hedw.) Robins., Campylium chrysophyllum (Brid.) J. Lange, and Campylium hispidulum (Brid.) Mitt. The following acrocarpi represent new records for Vermilion County: Fissidens taxifolius Hedw., Mnium affine Bland. ex Funck var. ciliare C.M., Mnium affine Bland. ex Funck var. rugicum (Laur.) BSG, Encalypta ciliata Hedw., Desmatodon obtusifolius (Schwaegr.) Schimp., Weissia controversa Hedw., Pohlia wahlenbergii (Web. & Mohr), Orthotrichum pusillum Mitt., Orthotrichum strangulatum P.-Beauv., and Anomodon attenuatus (Hedw.) Hub. The liverwort, Frullania eboracensis Gottsche. is a new report for Vermilion County. Specimens are deposited in the Stover Herbarium at Eastern Illinois University (EIU), Charleston, Illinois.

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INTRODUCTION

Kickapoo State Park is located in the Wabash Border Division in east-central Illinois, 6 miles west of Danville, (T19N & T20N, R12W) in Vermilion county (Schwegman, 1973). The region had two coal beds, the Danville Bed, which is about 80 feet above the Grape Creek Bed (McDougall, 1925). The park was initially created in 1939 when 1,290 acres (522 hectares) of abandoned strip mined land were purchased from the United Electric Coal Company. Additional purchases and land trades have since brought the total acreage to 2,843 (1150.6 hectares). Prior to the strip mining, the majority of the area consisted of a mixed mesophytic to riparian forest on glacial drift from the Wisconsin period. Extensive underground and strip mining occurred on a vast majority of the area before the state acquired the land for park purposes. This area is a good example of how nature is capable of regenerating the land. The park offers a variety of habitats, ranging from dry, steep hillsides, to low moist depressions. Included within the park are 22 ponds as well as the Middle Fork of the Vermilion River, which runs through the west edge.

This area reflects the mining history of Vermilion county, and to a large degree, the mining of the nation. The first documented coal diggings were in 1853, when "dog hole" mines were dug into the hillsides and followed the exposed coal seams. Excavation was done by horse drawn scrapers.

Mechanical stripping began in 1885 in the Missionfield area south of Route 150. A converted steam dredge was employed in the

strip mining operations. At that time, this mining operation was only the second in the United States to utilize steam power.

The Missionfield Number One Mine was excavated in the early 1900s. Today, this area consists of Long Pond, Clear Pond, High Pond, and Inland sea. It was here that the first fully revolving steam excavator was used in 1911. When this area was mined, the Middle Fork River was relocated to the most extreme west side of the river valley, where it is located today. Between 1919 and 1924, the Number 6 Slope (shaft) Mine and the Number 6 Strip Mine were excavated. Today, this area is called Pond Number 6, which is located at the southwest portion of the park. All stripping in the Missionfield Number 1 Mine ceased in 1925, and the last strip mine operation in the area ceased in 1971.

As a result of the strip mining, the stripping shovel caused an unequal mixing of the strata and left patches of shale, till, clay, and waste coal exposed on the ridges. These ridges are commonly known as spill banks (Croxtton, 1928) or spoils.

No previous botanical studies have been made on the flora of Kickapoo State Park. Although no bryological studies have been done on the park itself, a list of mosses from Vermilion County was made by Grant and Hague (1931). No collection information was given in this report. McCleary and Redfern (1979) mention collections of mosses from Vermilion County, again, locality data was omitted. This study was undertaken to complete a checklist of the bryophytes of the area and to determine succession of bryophytes on spoil banks.

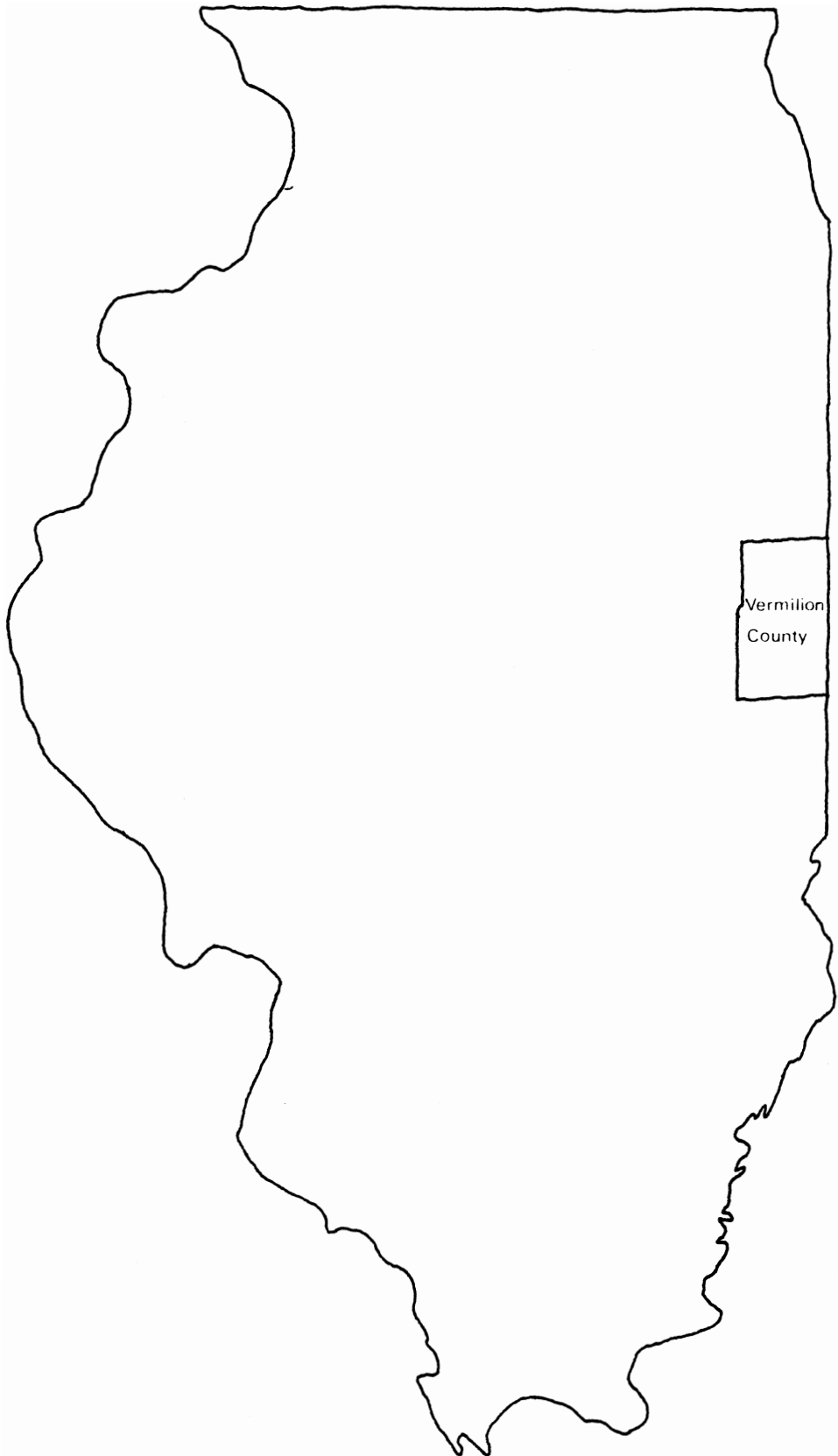


Figure 1. Location of Vermilion County within the state.

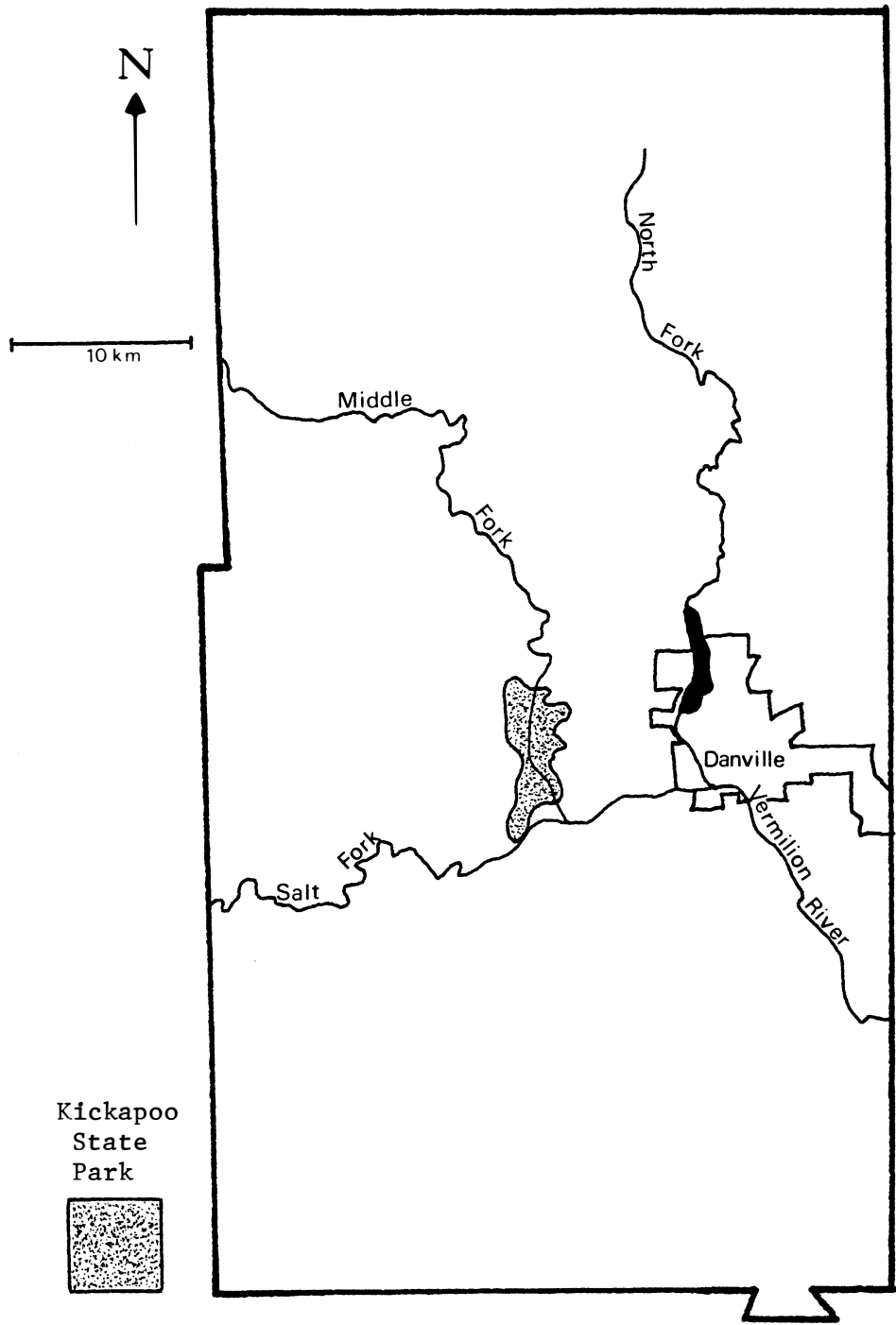


Figure 2. Map of Vermilion County showing Kickapoo State Park.

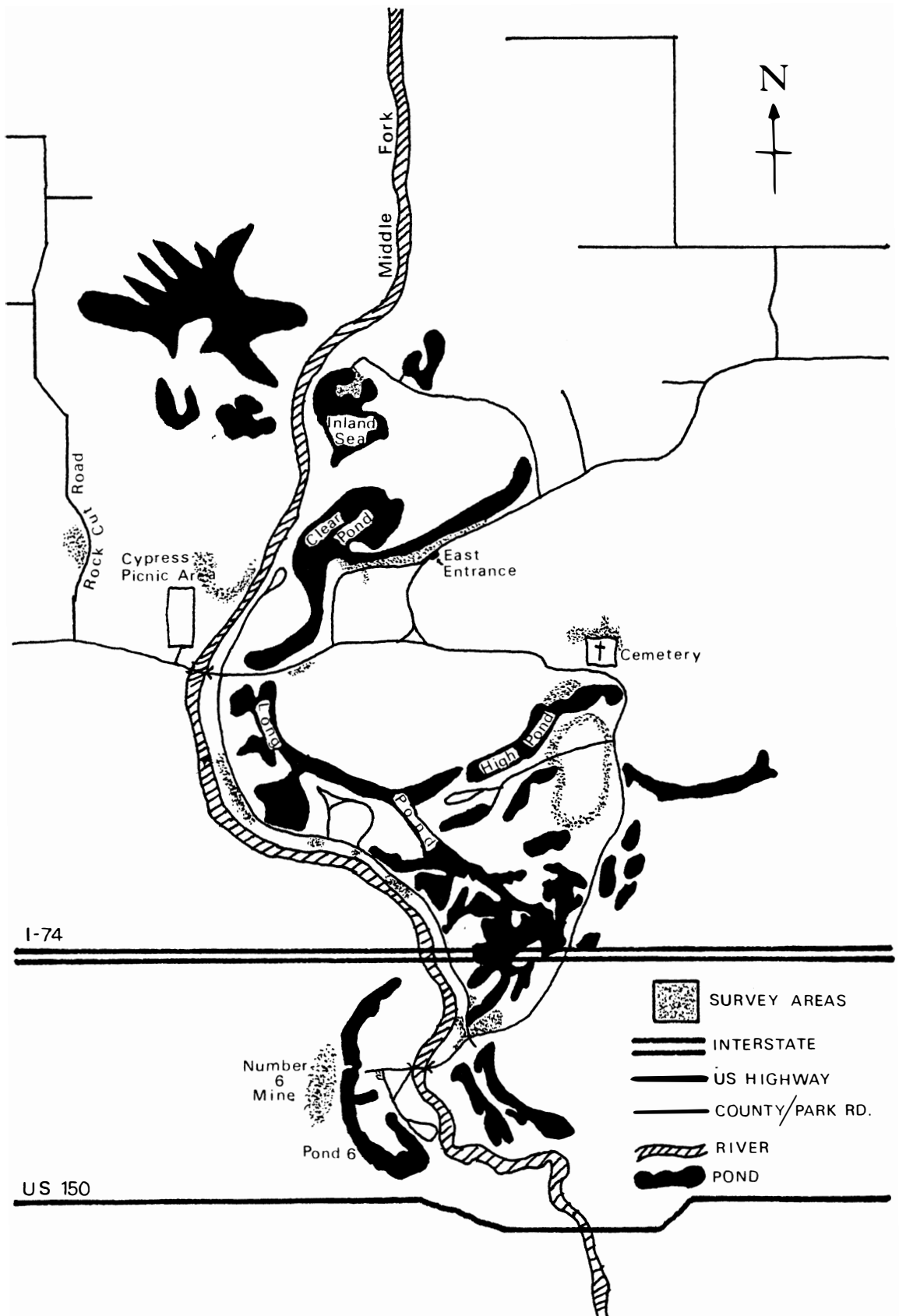


Figure 3. Map of Kickapoo State Park.

LITERATURE REVIEW

A considerable amount of bryological research has been done in Illinois. The earliest reports of such work was done by Brendel (1857-1858). His "Mosses occurring around Peoria" was included as an appendix. In June of 1859, George Vasey presented a paper entitled "Mosses of Illinois" to the State Natural History Society at Bloomington, Illinois. In 1874, Harry Patterson published "Plants in the vicinity of Oquawka, Illinois" which contained a list of 38 moss species. In 1878, Wolf and Hall published a list which contained 145 species of mosses and 45 species of liverworts. After that, very little was done until Hill (1902, 1905, 1907, 1909, 1914, 1916) published a series of papers on Illinois bryophytes. Later Hague (1930), compiled a checklist of Illinois mosses, and Grant and Hague (1931) published a list of mosses from Vermilion County, Illinois, reporting 42 species. Hague and Drexler (1938) reported 29 liverworts and 2 hornworts from 18 counties in Illinois, including Vermilion County, while McCleary and Redfearn (1979) mentioned 35 species of mosses from Vermilion County.

The number of studies of strip-mined areas in Illinois are few, however, Cornwall (1971) did a spoil classification and plant cover study on anthracite mining spoils in Pennsylvania. Cummings, et al, (1966) reported on the properties and plantability of east Kentucky spoil banks. Croxton (1928) reported on some of the revegetation of what is now Kickapoo State Park, while Brewer and Triner (1956) did a study on strip mined lands in Perry County, Illinois.

There have been few studies of strip-mined areas in relation to bryophytes. Schimwell (1973) did research on the ecology of moss dominated vegetation on heavy metal spoil heaps of the Southern Pennines, England. Others have reported bryophytes as uncommon (Brewer and Triner, 1956), and as occurring beneath stands of trees on north facing slopes (Cornwall, 1971). Ceratodon purpureus has been mentioned as occurring on ledges of soil formed behind clumps of vegetation (Brierly, 1956); Polytrichum sp. was reported as occurring in shaded but not sunny areas (Schramm, 1966). Tryon and Markus (1953) included "moss" in an estimate of total ground cover but did not identify the species. In a study of heavy-metal mine spoil heaps, Shimwell (1973) found moss dominated communities rare and mostly restricted to moist habitats. Dicranella varia, Bryum psuedotriquetrum and Philonotis fontana were found in such habitats.

Rastorfer (1981) found 32 moss taxa and 1 liverwort species at a reclaimed surface mine at Goose Lake State Park in Grundy County, Illinois. This study compared the relative abundance of species on constructed mine soils (reclaimed) to those on the abandoned mine spoils. Ceratodon purpureus and Funaria hygrometrica were predominant primary bryophyte invaders on the reclaimed mine soils. Rastorfer also states that mosses occurred in areas affected by the 1975-1978 reclamation effort only after the establishment of vascular plants. Chimney (1984) reported Ricciocarpus natans for the first time in a coal strip mine impoundment (pond). This was located on the Old Peabody Coal Company's Little John Mine Number 5 in Knox County, Illinois.

MATERIALS AND METHODS

A bryophyte search of the varied habitats at Kickapoo State Park was conducted during the summer of 1987 and the spring of 1988. The specimens were collected with a pocket knife and placed in a #1 paper bag. The location and ecology of each specimen was recorded on the paper bag at the time of collection. The specimens were identified using the taxonomic keys of Crum and Anderson (1981), Crum (1986), Conard and Redfearn (1979) and Welch (1957). Nomenclature follows Crum and Anderson for the mosses and Conard and Redfearn for the liverworts. The author's identifications for all specimens were confirmed by Dr. Charles B. Arzeni.

The identified specimens are stored in standard bryological packets labeled with the scientific name and authority, fruiting or sterile condition, locality data, date collected, collection number and habitat. These specimens are deposited in the Ernest L. Stover Herbarium at Eastern Illinois University (EIU).

Frequency of specimens was noted and categorized into common, occasional, infrequent, and rare. Those bryophytes considered frequent or common were found with great regularity; those listed as occasional were found with less frequency; those listed as infrequent were found only sparingly, and rare indicating that specimens were found only once or twice.

A survey of the entire park was not feasible, in consideration of its size (2,843 acres or 1150.6 hectares). The areas surveyed were determined according to accessibility.

THE FOLLOWING REPRESENTS A CHECKLIST OF THE MUSCI AND HEPATICAE
COLLECTED IN VERMILION COUNTY.

(New county records marked with an *)

ALPHABETICAL LIST OF MUSCI

*Amblystegium riparium (Hedw.) BSG Rare; on soil bank next to Long Pond. #3

Amblystegium serpens (Hedw.) BSG Common; especially along the bank of the runoff stream from Long Pond. #31

*Amblystegium serpens (Hedw.) BSG var. juratzkanum (Schimp.) Rau & Herv. Rare; on twigs at ravine bottom north of the cemetery. #87

Amblystegium tenax (Hedw.) BSG Rare; on sandstone rock in stream running into Clear Pond on east side. #48, 49, 50, 51

*Amblystegium trichopodium (Schultz) Hartm. Rare; found in water near concrete bridge west of the east entrance near clear pond. #81

Amblystegium varium (Hedw.) Lind. Common; on soil along wooded trails. #57

*Anomodon attenuatus (Hedw.) Hub. Common; on tree bases and occasionally on soil. #29, 45, 46, 65, 76, 77

Anomodon minor (Hedw.) Furnr. Rare; at the base of a tree on the east bank of the Middle Fork River near the canoe exit point. #24

Anomodon rostratus (Hedw.) Schimp. Occasional; on tree bases near Redear Campsite and on soil on the bank of the Long Pond runoff. #16, 30, 85

Atrichum angustatum (Brid.) BSG Common; on trail edges and ridge bottoms. #26, 36, 59, 61, 72, 84

Aulacomnium heterostichum (Hedw.) BSG Infrequent; on north facing slopes south of Clear Pond and north of the Cemetery. #78, 79, 86

Barbula unguiculata Hedw. Infrequent; found on disturbed areas frequented by fishermen and along trails in open areas. #1, 80

Bartramia pomiformis Hedw. Infrequent; found on steep slope north of the cemetery (a large population). #89

Brachythecium acuminatum (Hedw.) Aust. Occasional; on tree bases and rotten logs. #9, 58

Brachythecium oxycladon (Brid.) Jaeg. & Sauerb. Common; very abundant on exposed soils. #2, 17, 74

*Brachythecium rivulare BSG Rare; found in seep area south of Clear Pond on slope. #75

Brachythecium salebrosum (Web. & Mohr) BSG Common; throughout the park in shaded disturbed areas along trails. #32, 55, 66

Bryhnia graminicolor (Brid.) Grout Infrequent; on steep bank south of Clear Pond along trail. #73

*Bryoandersonia illicebra (Hedw.) Robins. Occasional; Between road and river ridge; each population was relatively large. #10

*Campyllum chrysophyllum (Brid.) J. Lange Occasional; west of Long Pond at the base of trees. #60, 69, 80

*Campyllum hispidulum (Brid.) Mitt. Common; on soil and occasionally at tree bases. #19, 71

Ceratodon purpureus (Hedw.) Brid. Rare; on soil of disturbed areas. #54

*Desmatodon obtusifolius (Schwaegr.) Schimp. Rare; found on top of a concrete bridge wall just west of the east entrance of the park near Clear Pond. #63

- Dicranella heteromalla (Hedw.) Schimp. Common; east of Clear Pond on the soil at the base of trees as well as along wooded trail. #35, 43
- *Encalypta ciliata Hedw. Rare; found in disturbed area along High Pond Trail. #70
- Entodon seductrix (Hedw.) C.M. Common; on dead and living trees and on concrete base near mine shaft no. 6, as well as on soil. #7, 18, 20, 42
- Eurhynchium hians (Hedw.) Sande-Lac. Rare; on soil by stream flowing from large field by visitors station just south of the bridge, and at the south end of Clear Pond at water's edge. #28, 44
- *Fissidens taxifolius Hedw. Common; found in the more heavily wooded areas of the western portion of the park. #8, 33, 34, 62
- Grimmia apocarpa Hedw. Rare; on concrete bases near mine shaft number 6. #92
- Hypnum lindbergii Rare; on soil west of Long Pond road and south of the spillway in a recently cleared area. #79
- Leskea gracilescens Hedw. Common; on hardwood trees. #5, 6, 56, 64
- *Mnium affine Bland. ex. Schwaergr. var. ciliare C.M. Rare; found on top of a steep bank above stream flowing into Clear Pond on the east side. #39
- *Mnium affine Bland. ex Funck var. rugicum (Laur.) BSG Rare; on ravine side between road and Long Pond. #73
- Mnium cuspidatum Hedw. Common; throughout the park in heavily wooded areas on soil and decayed logs. #4, 11, 41, 52, 75
- *Orthotrichum pusillum Mitt. Common; on larger and older trees, especially on Populus deltoides. #12, 21, 25, 37, 78
- *Orthotrichum strangulatum P. -Beauv. Rare; found once on exposed limestone rock north of the Cypress picnic area. #83

Physcomitrium pyriforme (Hedw.) Hampe Common; Abundant along road north of the campground and Long Pond. #82

Platygyrium repens (Brid.) BSG Common; usually on fallen logs and on old trees. #14, 40, 90

*Pohlia wahlenbergii (Web. & Mohr) Andr. Rare; along runoff from Long Pond. #38

Rhynchostegium serrulatum (Hedw.) Jaeg. and Sauerb. Occasional; moist soil in wooded areas and on rotten logs. #22, 47, 53, 76

*Thuidium recognitum (Hedw.) Lindb. Common; found abundantly between the park road and the large ridge east of the river. #15, 67

*Weissia controversa Hedw. Infrequent; on soil pile on High Pond Trail and at ravine bottom north of the cemetery. #68b, 87

ALPHABETICAL LIST OF HEPATICAE

Conocephalum conicum (L.) Lindb. Rare; on sandstone at Rock Cut
Road. #91

*Frullania eboracensis Gottsche. Occasional; on hardwood trees. #13

Lophocolea heterophylla (Schrad.) Dumort. Infrequent; on very rotten
logs in heavily wooded areas. #23, 27, 68a, 74, 77

DISCUSSION

A total of 92 collections were made with 45 species identified. Of these, 42 were mosses and 3 were liverworts. In addition, 19 species are reported as new to the county. These include:

Fissidens taxifolius, Encalypta ciliata, Desmatodon obtusifolius, Weissia controversa, Pohlia wahlenbergii, Mnium affine var. ciliare, Mnium affine var. rugicum, Orthotrichum pusillum, Orthotrichum strangulatum, Anomodon attenuatus, Amblystegium riparium, Amblystegium trichopodium, Amblystegium serpens var. juratzkanum, Thuidium recognitum, Brachythecium rivulare, Bryoandersonia illicebra, Campylium chrysophyllum, Campylium hispidulum, and Frullania eboracensis.

It appears that the amount of time that has elapsed since the area was last mined has given both vascular and non vascular plants time to revegetate the barren spoils. Shortly after mining operations ceased, the height and steep grade of the spoil bank slopes presented a problem for revegetation. Steep, largely barren slopes were subjected to severe erosion which is evident in the northeast section of the park. This makes the establishment of seedlings or sporelings difficult (Carvey et al, 1977). The 60 year old and older spoil banks have had enough time to develop into a stable mesophytic forest. These forested areas eventually developed richer, more productive soils. Bryologically, these areas are represented by a larger percentage of mosses and liverworts than the more open and disturbed areas with less vegetation.

Once vascular plants are established on mine spoils, the risk of erosion is reduced and litter from these plants will produce a more mesic situation which is favorable to bryophytes.

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