THE FLORA OF THE LOVE CREEK NATURE CENTER, BERRIEN COUNTY, MICHIGAN, U.S.A.

by

© MODHAFER A. HAMODIE

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science

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Short Title -

FLORA OF THE LOVE CREEK NATURE CENTER

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ABSTRACT

M.Sc. Modhafer A. Hamodie Plant Science

The Flora of the Love Creek Nature Center,
Berrien County, Michigan, U.S.A.

A floristic survey was made of the Love Creek Nature Center, located in Berrien County, at the extreme southwestern corner of the state of Michigan, U.S.A. The checklist of vascular plants of the Center was based on field collections made at the Center, and on a herbarium search of Andrews University Herbarium. From this study, it was found that the flora of the Love Creek Nature Center was composed of 458 taxa. Descriptions of eight habitats were made: the upland deciduous forest, the mesic deciduous forest, the forest strip along the northern edge of the marsh, the succession forest, the marsh, the stream sides, the dry meadow, and the disturbed areas including the trails. The history and physical description of the area are included also.

RESUME

Maîtrise | Modhafer A. Hamodie | Phytologie

La Flore du Centre de Nature Love Creek,
Comté de Berrien, Michigan, Etats-Unis

Un relevé de la flore du Centre de Nature Love Creek situé dans le comté de Berrien, à la limite sud-ouest extrême de l'état du Michigan (E.U.) a été effectué. La liste annotée des plantes vasculaires du Centre se fonde non seulement sur des collections de plantes faites au Centre, mais aussi sur un examen de l'herbier de l'Université Andrews. La flore du Centre de Nature Love Creek englobe 458 taxa. Une description des huit différents habitats a aussi été élaborée, incluant la forêt de feuillus des plateaux, la forêt de feuillus mésique, la lisière de forêt le long de la limite nord des marais, la forêt de succession, le marais, les bordures des cours d'eau, les prés secs, et les régions perturbées incluant les bordures des sentiers. Une description historique et physique de la région a aussi été incluse.

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INTRODUCTION

Berrien County, in extreme southwestern Michigan, is unique for several reasons. Firstly, the flag of four different nations (France, Spain, England, and United States) flew over this County; secondly, it is situated in the transition zone between the former tall-grass prairie province and the deciduous forest province; and thirdly, within its boundaries, there are three nature centers for public instruction, utilization, and research. One of these centers is the Love Creek Nature Center, located seven km east of Berrien Springs on Huckleberry Road, in T6S, R17W, Sections 16, 17 (Lat. 41° 56'N, Long. 86° 18'W).

The Love Creek Nature Center is situated on property owned by Berrien County since 1839. From this time on, the property has been farmed, logged, and partially disturbed on various occasions. Situated within its boundary are upland and lowland deciduous forests, abandoned corn fields, a marsh, and Love Creek which is one of the few "clean", cold-water trout and salmon spawning streams in southwestern Michigan.

Because of the increase in the awareness of nature which began to develop in the late 1960's and early 1970's, the Berrien County Parks and Recreation Department began to consider using the "Old Love Creek Property" for a nature center. In May of 1976 the Center was dedicated, and it was opened to the public one year later. The Center's objectives are to facilitate the study of nature by the public.

Because of the Center's recent development, very little biological information has been obtained. The purpose of this study was to perform a floristic inventory of the vascular plants of the Love Creek Nature Center, to describe the existing vegetation, and to summarize the existing botanical information on the Love Creek region.

DESCRIPTION OF THE STUDY AREA

Location

The Love Creek Nature Center is located in east-central Berrien County, in the southwestern corner of the state of Michigan, between latitudes 41° 57' and 42° 00'N and longitude 86° 18' and 86° 20'W (Fig. 1). It is situated approximately seven km east of Berrien Springs, and two km south-west of Berrien Center.

The Center is composed of 44.5 hectares (110 acres) of deciduous woods and abandoned fields at various stages of succession, along Love Creek.

The Nature Center is bounded to the east by Huckleberry Road; to the north by Berrien County land and the Berrien General Hospital; to the west by the Berrien-Oronoko Township Landfill Dump; and to the south by private property.

Love Creek flows east to west across the length of the Center, going in and out of the Center in the central portion, and forming its curved western boundary. It eventually empties into the nearby St. Joseph River (Fig. 2).

History

Berrien County, as it is now known, originated in the early part of the nineteenth century. In 1838 the county officials felt the need to purchase a "poor farm" for needy individuals of the region. It was not until 1847 that the Berrien County Board of Commissioners proceeded

Figure 1. Map of the Michigan region showing the location of Berrien County.

FIGURE 1

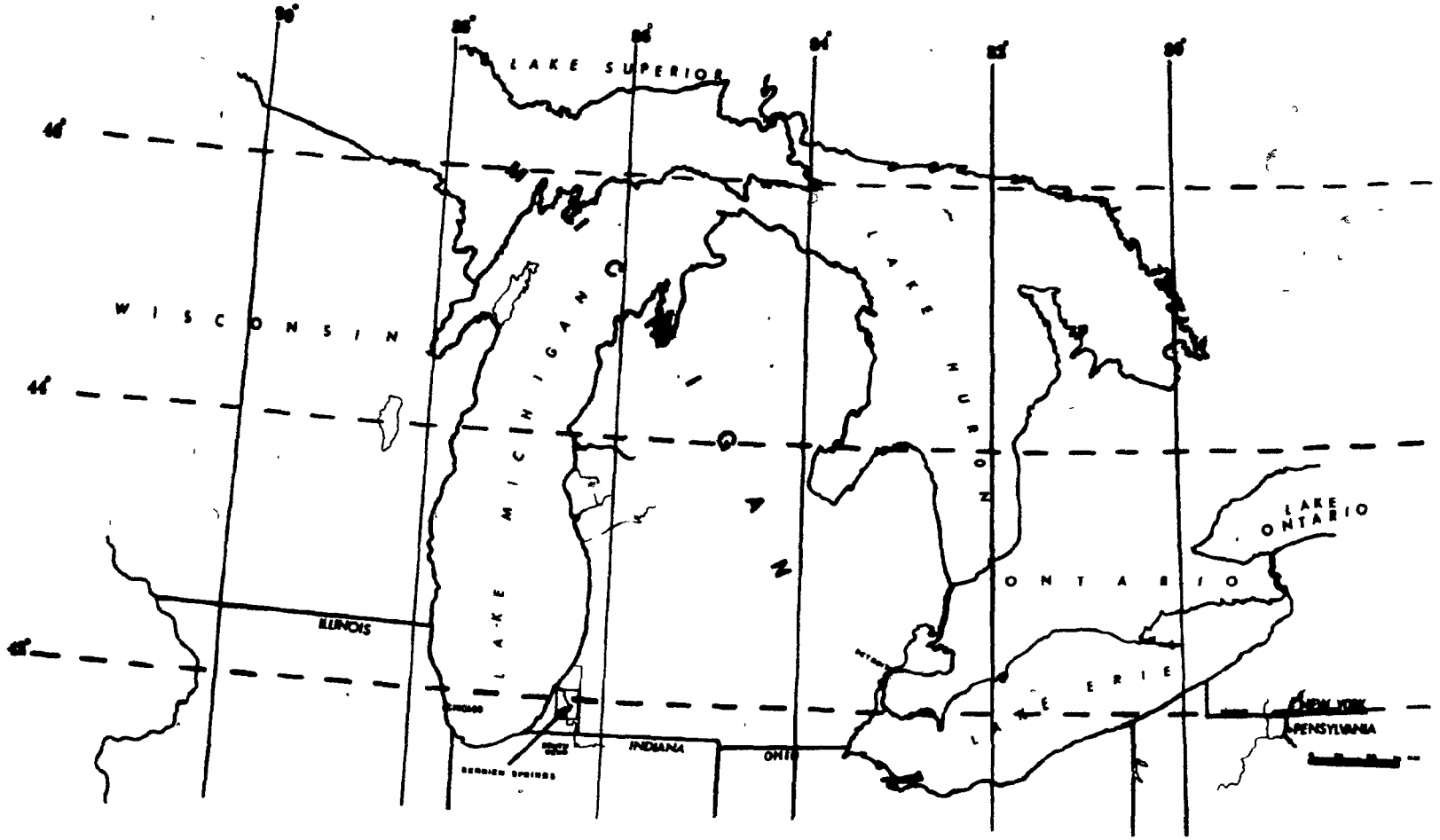
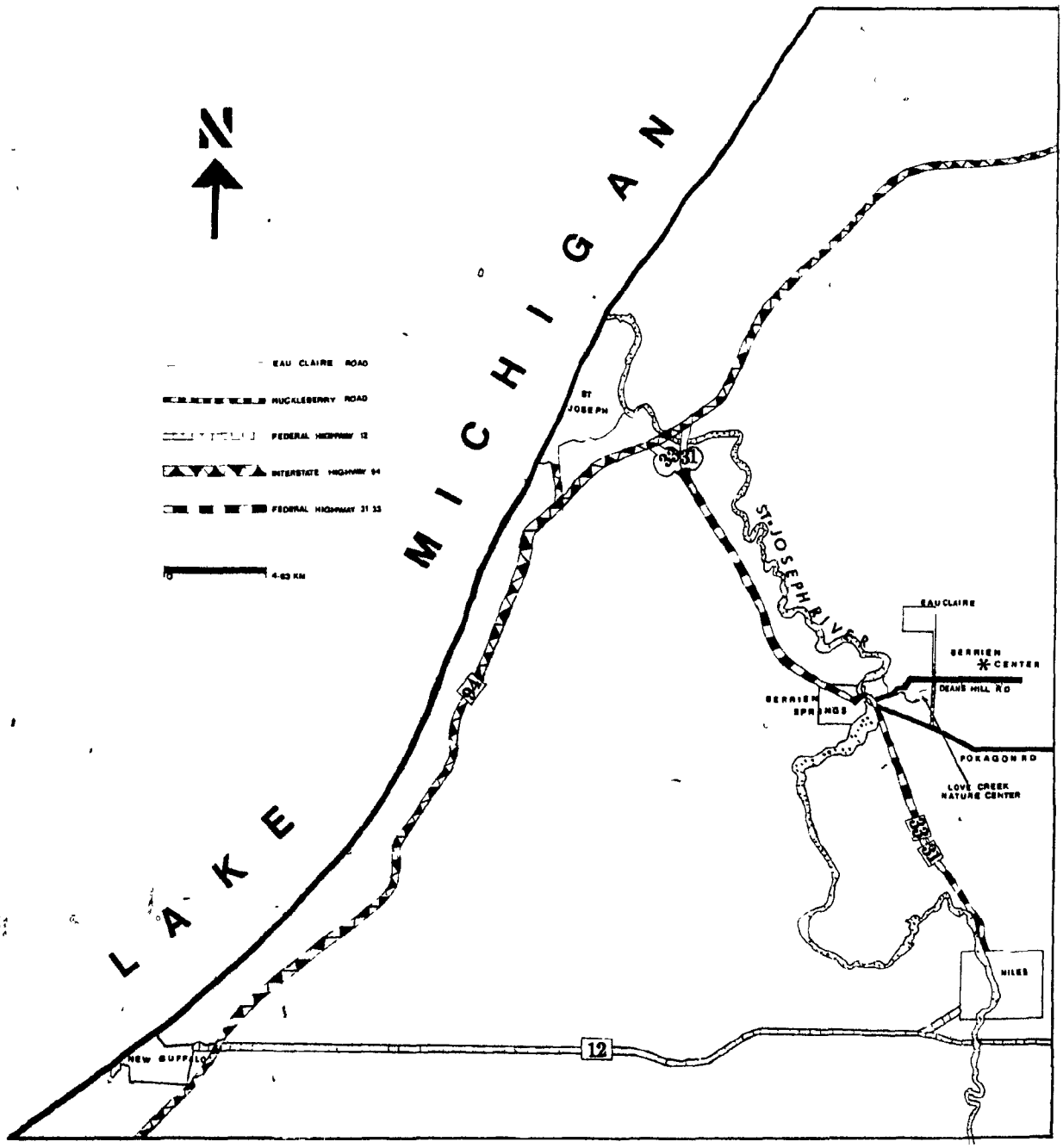

LAKE SUPERIOR
WISCONSIN
LAKE MICHIGAN
ILLINOIS
INDIANA
OHIO
LAKE ONTARIO
ONTARIO
LAKE ERIE
PENNSYLVANIA

Figure 2. Map of Berrien County, Michigan, showing the location of the Love Creek Nature Center.

FIGURE 2


LAKE MICHIGAN
EAU CLAIRE ROAD
HUCKLEBERRY ROAD
FEDERAL HIGHWAY 12
INTERSTATE HIGHWAY 94
FEDERAL HIGHWAY 31 33
0 4 8 12 KM
ST JOSEPH
ST JOSEPH RIVER
EAU CLAIRE
BERRIEN CENTER
DEANS MILL RD
BERRIEN SPRINGS
POKAGON RD
LOVE CREEK NATURE CENTER
NILES
NEW BUFFALO
94
31
12

with the purchase of the property where the Love Creek Nature Center and the Berrien General Hospital are now located. The Commissioners' mandate was that not more than $4.00 per acre was to be spent for "a poor farm" (Ellis and Ensign, 1880).

The frame of the first dwelling to be erected on the "poor farm" was completed in July of 1847. In 1869 the first brick structure was built on that portion of the property where the Berrien General Hospital is located today. To provide water for the "poor farm" complex, two dams were constructed on Love Creek: one small dam on the South Fork just east of the confluence of the northern and southern tributaries of Love Creek, and a large one, a short distance west of where the two streams join. The construction date of the two dams is not known for certain, but the date 1903 was inscribed in the cement of the larger dam. How long the dams were in use is not known (Charles Barnes, personal comm.).

In 1962, a building to house the County Dog Pound was built on Huckleberry Road. It is believed that the surrounding forest was cleared at the time (Charles Barnes, personal comm.) and put into cultivation. This no doubt included annual crops. Apple trees were possibly planted too as old apple trees were found in the area.

The next known alteration of the area took place in April 1970 when black walnut trees (Juglans nigra) were logged from the western portion of the property (Anonymous, 1970). The full extent of the logging is not known.

The Love Creek Nature Center was dedicated and fenced as a park for the public in 1976. It was not, however, until 1977 that the Center, with proper staff, was opened to the public.

Very little scientific information is known from the area. Two previous limnological studies by Jackson and Johnson (1974) and Rule (1976) were concerned with Love Creek itself. These investigations dealt specifically with the micro-flora and fauna of Love Creek on a seasonal basis, and with the various chemical and physical properties of the stream. The present investigation is the first floristic study conducted at the Love Creek Nature Center.

Climate

The climate of Berrien County may be classified as temperate continental, with warm summers, cool winters, and occasional periods of short cold spells and summer heat waves (Harrison, 1979).

Due to the closeness of Lake Michigan, to the west of Berrien County, the climate tends to be milder than would be expected normally at the same latitude. The prevailing westerly winds produce cool spring and summer days, and mild autumn and winter temperatures. Colder temperatures are generally associated with easterly and northerly winds. Weather data from the closest weather recording station are presented in Table 1. The reporting station is located at Eau Claire, approximately seven km north of the Nature Center at 42° 10'N, 86° 25'W.

The average temperature for the warmest month, July, is 22.5°C, while that of the coldest month, January, is -5.8°C. The highest average precipitation occurs in June (9.7 cm), and the lowest in December (1.3 cm).

Table 1. Average Temperature and Precipitation for Eau Claire, Michigan for 1974-1979. Averages are based on Climatological Data Michigan, U.S.A. Dept. of Commerce Vol. 89(1974) - Vol. 95(1980). Nat. Climatic Center, Asheville, N.C.

	Average Temp. °C	1974		1975		1976		1977		1978		1979		Average Precipitation/ Month
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	
J	-5.8	2.1	-5.1	1.1	-7.1	-3.3	-10.1	-6.9	-14.9	-3.8	-11.4	-4.8	-12.0	2.9 cm
F	-4.2	1.4	-6.4	0.9	-7.8	6.4	-3.7	0.2	-8.3	-3.2	-13.2	-4.3	-12.5	4.2
M	4.1	12.1	2.3	8.2	-1.3	11.2	-0.3	10.6	1.4	3,3	-5.4	7.9	-1.4	6.0
A	9.7	14.1	4.5	16.4	4.4	16.9	4.1	18.7	5.9	14.4	2.3	12.3	2.1	9.6
M	14.7	18.2	7.5	18.9	7.7	19.2	7.2	26.4	12.6	20.8	9.5	20.6	7.9	9.2
J	20.0	27.4	15.6	24.8	12,9	26.8	14.8	24.9	12.7	26.2	13.3	26.4	14.1	9.7
J	22.5	28.9	15.9	30.2	16.9	28.5	13.8	30.2	17.7	27.3	15.7	27.4	15.2	8.6
A	21.3	28.3	16.8	28.2	15.2	27.1	14.6	25.7	14.4	27.3	16.4	25.6	15.7	7.2
S	18.4	24.0	13.6	22.2	9.6	23.1	16.2	22.4	12.4	25.8	14.2	24.5	12.3	5.1
O	11.0	19.3	9.6	16.7	5.8	13.6	3.5	15.1	4.8	15.7	6.2	15.3	6.4	2.1
N	4.5	9.7	1.9	8.8	1.3	4.2	-3.4	9.6	1.8	10.1	0.8	8.4	0.3	5.4
D	-2.4	1.2	-5.7	2.1	-3.1	-1.4	-10.1	0.2	-7.3	1.1	-5.9	4.1	-3.7	1.3

Topography

The Love Creek Nature Center is a very irregular piece of land (Fig. 3) and is 1,552 m long. It is divided into three major sections: eastern, middle, and western. The eastern section is the largest and widest. It represents an area of approximately 586 m long and 450 m wide, and a total of approximately 26.37 hectares. The middle region is the narrowest. Its length is 322 m with a width at its eastern extremity of 137 m, whereas the width of the western end is only 80 m. The western section of the study area has a semicircular shape, with the middle portion being widest. This section is 279 m wide and 644 m long.

The topography of the study area consists of rolling hills separated by moist, wooded valleys. Flat ridges, moderately steep slopes, and stream valleys are found throughout the entire length of the stream and its tributaries. A maximum elevation (230 m or 760 ft) is reached at the southeastern corner, whereas the minimum point is located at the extreme western end. Lowlands bordering Love Creek are gently sloping from east to west. The northern part of the eastern section is relatively level, with a southward slope towards the Creek. The southern part of this section is characterized by a lowland marsh bordered on the east by a ridge, which also represents the eastern border of the Center. The middle section is relatively low compared with the eastern and western ones. The western segment includes mostly an elevated area, sloping steeply towards the Creek, which reaches its lowest point in the Center at its exit (196.56 m or 650 ft) (Fig. 4).

Figure 3. Map showing the habitats and physical features of the Love Creek Nature Center.

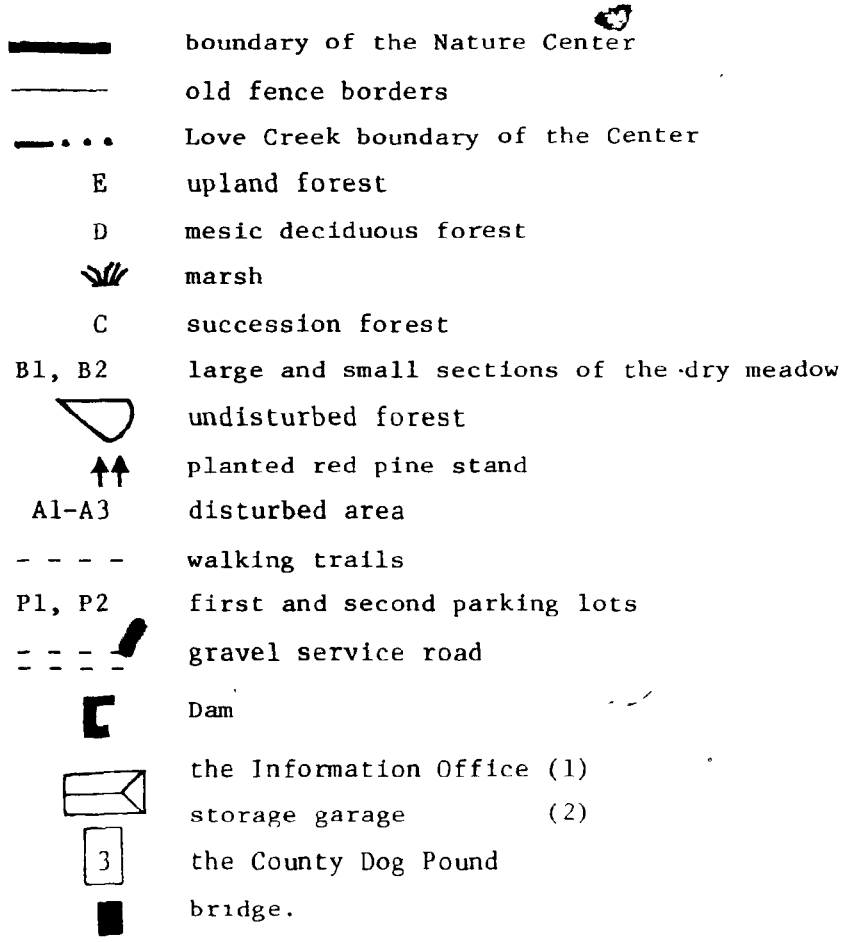
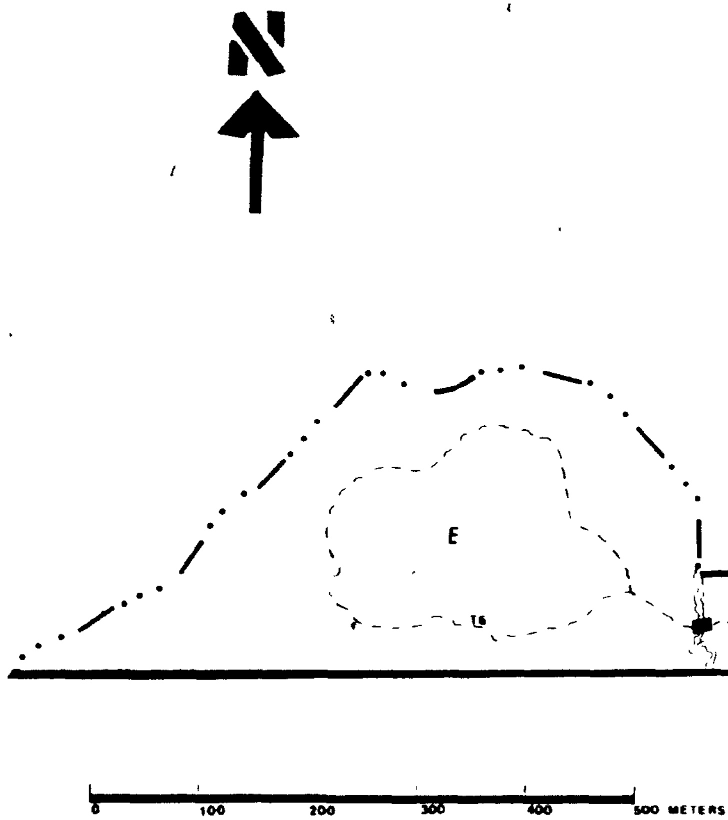


FIGURE 3



N
A1
P1
A1
C
T2
A2
C
A2
P2
B1
A3
T3
B2
E
T6
D
0
100
200
300
400
500 METERS

Figure 4. Topography of the Love Creek Nature Center, Berrien County, Michigan (from a topographic map of Berrien Springs, Dept. Interior Geological Survey, U.S.G.S. and U.S.C. & G.S., U.S.A. 1971).

—••• represents Love Creek forming the Nature Center boundary.

FIGURE 4

0 100 200 300 400 500 METERS

CONTOUR INTERVAL 10 FEET (3 METERS)

DATUM IS MEAN SEA LEVEL

Geomorphology

The physiography of Berrien County is a direct result of the Pleistocene glaciations, which occurred between ca. 1,000,000 years B.P. and 11,000 years B.P. During this epoch, there were four major glacial advances which completely covered the County. These are the Nebraskan, the Kansan, the Illinoian, and the Wisconsin. The Cary substage of the Wisconsin glaciation affected the physiography of this area most profoundly. This substage is characterized by three main ice lobes, the last two successively covering the deposits of the previous ones in this order: Erie, Saginaw, and Lake Michigan lobes (Harrison, 1979).

From this time on (i.e. 14,000 years ago) the Lake Michigan lobe began a northwesterly retreat out of the county (Ogden, 1977). It left behind a glacial landscape of recessional end moraines, ground moraines, outwash plains, glacial drainage ways, and small glacial lakes. The depth of the glacial deposits ranges from 13.9 m to 32.4 m throughout the County.

The topography of Berrien County is a result of these various deposits. The end moraines created ridges, while the ground moraines were responsible for the undulating landscape. Fairly uniform flat areas are found where sandy and gravelly outwash plains existed. Present-day lakes, bogs and marshes are also witnesses of these glacial events (Harrison, 1979). Several of these features are found in the Love Creek region.

Soils

Seven soil types exist within the Love Creek Nature Center, based on the soil conservation service map (Sheet No. 45) of the Soil Survey of Berrien County, Michigan (1980) (Fig. 5). The physical and chemical characters associated with soil types are given in Table 2. These types are Gray Brown Podzolic soils (Braun, 1950).

The Riddles-Oshtemo Soil Complex (1, 3 and 6) and the Oshtemo sandy loam complex (2, 4, 5, and 8) cover the greatest area of the Center.

Riddles-Oshtemo soils are found on the steep sloping, well-drained areas of the upland deciduous forest, on the slopes surrounding the marsh (12-18%), and to a more limited extent, on the somewhat level to gently sloping areas 1 (1-6%) and 6 (12-18%). These soils are also found under the disturbed areas (A_1, 1-6%; A_2, A_3, 6-12%) (Fig. 3).

The Oshtemo sandy loam soil is found in the more mesic regions, along the banks above Love Creek, on well-drained gently sloping (0-12%) to steep sloping 18-35% areas. Level areas and the foot of slopes are somewhat poorly drained. Oshtemo sandy loam soil is also present in the mesic deciduous forest just east of the marsh (0-12%), and in the dry meadow (12-18%).

The steep banks of Love Creek in the western section of the Nature Center are covered by Spinks loamy fine sand (13, 12) on slopes of 0-6% and 6-12%. Spinks loamy fine sand is also present in shallow depressions adjacent to the Creek. Udorthents and Udipsamments 11 (18-90%) were found on moderately steep to very steep, eroded, well-drained banks. Mucky soils are present where there is seepage.

Figure 5. Soils map of the Love Creek Nature Center, Berrien County, Michigan (after soil survey of Berrien Co., MI, 1980).

1, 3, 6	= Riddles-Oshtemo Complex
4, 5, 2, 8	= Oshtemo sandy loam
13, 12	= Spinks loamy sand
11	= Udorthents and Udipsamments
9	= Aquents and Histosols
10	= Monitor loam
7	= Cohoctah-Abscota sandy loam

FIGURE 5


N
12
11
6
3
13
10
4
5
11
7
2
7
4
6
4
2
8
3
5
6
10
9
4
0
100
200
300
400
500 METERS

Table 2. Physical and Chemical Characters of the Love Creek Nature Center Soils (Data based on Soil Survey of Berrien Co., MI, 1980).

Map Symbol Soil Complex Soil Units	Slope % respective to the order of map symbol	Depth (cm)	Parent Material	Texture	Organic Matter %	Soil Reaction (pH)	Moist Bulk Density (g/cm^3)	Available Water Capacity (cm/cm)
1, 3, 6	1-6, 6-12, 12-18							
Riddles-Oshtemo Complex								
Riddles		0 - 17.8	Loam and sand clay	Loam	0.5-2	6.1-7.3	1 30-1.50	0.51-0.61
		17.8-139.7	Loam till	Sandy clay loam, clay loam, loam		5.1-7.3	1.40-1.60	0.41-0.46
Oshtemo		0 - 25.4	Loamy and sandy	Sandy loam	0.5-3	5.1-6.5	1.14-1.60	0.25-0.38
		25.4- 83.8	material	Sandy clay loam		5.1-6.5	1.20-1.59	0.30-0.48
4, 5, 8, 2	0-12, 6-12, 12-18, 18-35							
Oshtemo sandy loam								
Oshtemo		0 - 25.4	Loam and sandy	Sandy loam	0.5-3	5.1-6.5	1.14-1.60	0.25-0.38
		25.4- 83.8	material	Sandy clay loam		5.1-6.5	1.20-1.59	0.30-0.48
13, 12	0-6, 6-12							
Spinks loamy sand								
Spinks		0 - 25.4	Sand material	Loamy fine sand	2 -4	5.1-7.3	1.14-1.60	0.20-0.25
		25.4-152.4		Stratified sand to loamy fine sand		5.6-7.8	1.20-1.47	0.10-0.20

continued ...

Map Symbol Soil Complex Soil Units	Slope % respective to the order of map symbol	Depth (cm)	Parent Material	Texture	Organic Matter %	Soil Reaction (pH)	Moist Bulk Density (g/cm^3)	Available Water Capacity (cm/cm)
11	18-90							
Udorthents and Udipsamments								
Udorthents		No data	No data available	No data	No data	No data	No data	No data
Udipsamments		No data	No data available	No data	No data	No data	No data	No data
9	0							
Aquents and Histosols								
Aquents		No data	Alluvial material	No data	No data	No data	No data	No data
Histosols		No data	Organic material	No data	No data	No data	No data	No data
10	0-3							
Monitor loam								
Monitor		0 -40.6	Loamy outwash	Loamy silt loam	1 -3	5.6-7.3	1.30-1.45	0.51-0.61
		40.6-71.1	Underlain by sand and gravel	Sandy clay loam		4.5-6.5	1.45-1.65	0.41-0.46
7	No data available							
Cohoctah-Abscota sandy loam								
Cohoctah		0 - 38.1	Loamy and sandy	Sandy loam	1 -4	6.1-7.8	1.12-1.59	0.33-0.56
		38.1-106.7	Alluvial deposits	Loam sand, fine sandy loam, silt loam		6.1-8.4	1.48-1.80	0.30-0.51
Abscota		0 - 15.4	Sandy and loamy alluvium	Sandy loam	0.5-3	6.1-6.5	1.14-1.60	0.30-0.38
		15.4- 99.0		Sand		6.1-7.8	1.20-1.59	0.13-0.18

The Aquents and Histosols (9) are confined to the marsh, in the southern part of the eastern section of the Center (Fig. 3). This soil complex consists of level soils having standing water at or water very near the surface throughout the year. It includes Histosols, made of organic or dead vegetation matters, and Aquents, formed by alluvial mineral material (Soil Survey of Berrien Co., MI, 1980). According to the soil survey staff (U.S.D.A., 1975), Histosol is characterized by a very high content of organic matter, while Aquents have sulfidic material within 5 cm of the mineral surface.

A Monitor loam soil (10) is present on 0-3% slopes forming the basin of the South Fork of the Love Creek, and on the westernmost part of the middle section of the Nature Center adjacent to the Creek.

The Cohoctah-Abscota sandy loam soil complex (7) is located east of the old large dam, and extends north along the western border of the eastern section of the property. This unit is composed of Cohoctah soil, on the nearly level, poorly-drained areas, and of Abscota on the moderately well-drained areas. Cohoctah soil is present on the lowest elevation of the Love Creek meanders, and is subject to frequent flooding. Abscota soil is on the higher ridges and terraces adjacent to the stream.

THE VEGETATION OF SOUTHWESTERN MICHIGAN

1) History of the Vegetation

The sequence of the Wisconsin ice retreat and the migrational history of the forest species from the south to the north towards Michigan state is modified from Ogden (1977) and Davis (1976), respectively.

Close to the margin of the late Wisconsin ice which covered northeastern North America were both boreal forest and tundra. Spruce (Picea) grew throughout the midwest and the east, south of the ice sheet at the maximum of the last glaciation, 20,000 years ago (Davis l.c.). Spruce followed the northward retreat of the ice sheet (Wright, 1968). From 18,000-16,000 years B.P. the Great Lakes area was still covered by late Wisconsin ice. By 14,000 years B.P. the ice had retreated from most of southern Michigan, except for a lobe on Lake Michigan. At this time south Michigan was covered by a closed boreal forest of spruce. Twelve thousand years ago the southern part of the Lower Peninsula of Michigan was free of the ice, but a lobe was still present on the north part of the Lower Peninsula (Ogden l.c.). Spruce was declining in the southern peninsula of Michigan at ca. 11,000 years B.P. (Ogden l.c.), and jack and /or red pine had arrived in the central lower Peninsula by this time (Davis l.c.). The ice had retreated entirely from the Great Lake - St. Lawrence Region by 10,000 years B.P. At this time, spruce pollen was replaced by hardwood pollen (principally oak) (Ogden l.c.). White pine (Pinus strobus) migrated northward and westward about 1000 years after the migration of jack pine. White pine arrived in southern Michigan at about 10,700 years ago, and in the upper part of the Lower Peninsula at about 10,000 years ago (Davis l.c.).

Eight thousand years B.P., amelioration of the climate permitted a strong increase in oak pollen, with the more southern deposits in Ohio and Indiana showing also a consistent increase in hickory pollen (Ogden l.c.). Hickory (Carya) arrived in southern Michigan 10,000 years ago. Further east, hemlock was showing a similar increase. It moved west towards Michigan and had reached both the upper and the lower parts of the Lower Peninsula of Michigan by 8,000 years B.P. (Davis l.c.).

Beech moved northward and arrived in southern Michigan 7,000 years ago. It has never been west of its present boundary, but it is apparently moving westward now (Davis l.c.).

By 6,000 years B.P. hemlock was replaced by hickory in eastern Ohio and by beech in western Ohio, Indiana and the adjacent area of southern Michigan. The period from 6,000 years B.P. to 4,000 years B.P. is recognized as the Xerothermic Interval in Ohio, and it is characterized by a minimum in beech pollen in the western part of the state. In eastern Ohio, the event is recognized as a maximum in beech pollen chiefly at the expense of hickory. At this time the major prairie element extended into Ohio and probably into southern Michigan (Ogden l.c.).

Three theories had been proposed for the occurrence of the prairie: (1) Because of the dry warm climate the prairie had expanded northward and occupied previously burned-over forest land. Curtis (1959: 295-305) indicated that besides the above mentioned theory, other hypotheses could account for the origin of true prairie in the prairie-forest border region. (2) It could be assumed that the area had never been occupied by trees and that the land had remained that way ever since. (3) Robinson (1969) reported that the probable source of the prairie flora

in Michigan was from the tall-grass "Prairie Peninsula" immediately south and west of the state.

Michigan wet prairies arose by the desiccation of marshes occupying shallow post-glacial lakes. This possibility can be traced back to the ideas on the origin of the prairies expressed by several authors (Lesquereux, 1865; Sampson, 1921; Sears, 1926). For example, Bonser (1903) described marsh areas of Typha, Scirpus, etc.... in northern Ohio which, following drainage, developed into "natural meadows". A substantial percentage of wet prairie plants are present in other states: Michigan, Illinois, and Wisconsin (Brewer, 1965). Kenoyer (1929) reported that Michigan prairies "are all on glacial outwash, level in contour, and on soil of high organic matter. It is believed that they began as marshes. Even now around the borders of lakes are wet meadows that show the transition from marsh to prairie". Brewer (l.c) concluded that the possibility that most Michigan prairie developed from marshes is worth consideration.

2) Description of Vegetation

The following description of the forest vegetation of Michigan is taken from Braun (1950), Kapp (1978), Nichols (1935) and Voss (1972). The various units of vegetation are described from the north to the south of the Lower Peninsula of Michigan.

The northern part of the Lower Peninsula is occupied by the Great Lakes white pine-hemlock-mixed hardwood forests (Kapp, 1978). This forest type is transitional between the northern coniferous forest to the north, and the beech-maple forest to the south (Nichols, 1935).

In the climatic climax of this region are found white pine (Pinus strobus), hemlock (Tsuga canadensis), yellow birch (Betula alleghaniensis), sugar maple (Acer saccharum), basswood (Tilia americana), American elm (Ulmus americana), white ash (Fraxinus americana), red oak (Quercus borealis), black cherry (Prunus serotina) and red maple (Acer rubrum).

Kapp (1978) reported that in the central Lower Peninsula (between 43° 20⁻ and 43° 40⁻ N. latitude) south of the above mentioned area, a transition zone exists, that is characterized by the southern limit of the range of several Great Lakes pine-hemlock-mixed hardwood forests species, and the northern range limit of certain species of the Eastern Deciduous hardwoods, dominated by oak-hickory and beech-sugar maple forests. This is the area of contact between the Eastern Deciduous forest region (oak-hickory and beech-sugar maple associations) and the Great Lakes pine-hemlock-mixed hardwood forests (Braun, 1950; Kapp, 1978; Nichols, 1935). Species which have their southern limit in this region may extend farther to the south, especially along the east shore of Lake Michigan: white pine (Pinus strobus), black spruce (Picea mariana), balsam fir (Abies balsamea) and hemlock (Tsuga canadensis). Pinus strobus extends to the south on the eastern and western counties of Michigan (Voss, 1972). The southern limit of jack pine is in the central Lower Peninsula (Davis, 1976). Voss indicates that this species is dominant here. Certain species of the deciduous forest, as the swamp, bur, black, and chinkapin oaks (Quercus bicolor, Q. macrocarpa, Q. velutina, and Q. muehlenbergii), the shagbark and pignut hickories (Carya ovata and C. glabra), the hackberry (Celtis occidentalis), the eastern cottonwood (Populus deltoides), the sycamore (Platanus occidentalis), and the flowering dogwood (Cornus florida) reach their northern limit in this zone.

The forest vegetation of southern and southwestern Michigan includes: (1) the beech-sugar maple type, with a more diverse set of hardwood species than in the northern part of the Lower Peninsula; (2) the oak-hickory forest type, intermixed with prairie patches, that penetrates into the beech-sugar maple region in southern Michigan.

Representative beech-sugar maple forest types in southern and southwestern Michigan are found at places like Sandhill Woodlot in Ingham Co. (Frye, 1976a), Baker Woodlot in East Lansing (Beach and Stevens, 1980), Toumey Forest (Schneider, 1966), Sandford Natural Area (Beaman, 1970), Cooper's Glen Woodlot in Kalamazoo Co. (Zager and Pippen, 1977), and Waren Woods in Berrien Co. (Billington, 1924; Braun, 1950). Sugar maple (Acer saccharum), beech (Fagus grandifolia), ashes (Fraxinus spp.), elms (Ulmus spp.), tulip trees (Liriodendron tulipifera), black cherry (Prunus serotina), hickories (Carya spp.), oaks (Quercus spp.), basswood (Tilia americana), red maple (Acer rubrum), hackberry (Celtis occidentalis), black locust (Robinia pseudo-acacia), and others are representative of the diverse hardwoods encountered in the abovementioned woodlots.

In southwestern Michigan (including Berrien Co.) the beech-sugar maple forest extends south in a narrow band along Lake Michigan, to northwestern Indiana. A mixture of northern and southern elements of Michigan forests have been found in Berrien Co. sand dunes along the shore of Lake Michigan (Wells and Thompson, 1982). The mixture includes trees like hemlock (Tsuga canadensis), white pine (Pinus strobus), yellow birch (Betula alleghaniensis), basswood (Tilia americana), Tulip tree (Liriodendron tulipifera), oaks (Quercus spp.), sassafras (Sassafras albidum), and others which like acidic, well-drained soils.

At other localities in southwestern Michigan, there is a patchwork of beech-maple and oak-hickory formations. Such an area was described by Barnes and Kohring (1978) at Indian Bowl, northwest of the Love Creek Nature Center.

The herbaceous vegetation in woodlot areas of south and southwestern Michigan are like those found in Sandhill Woodlot (Frye, 1976b), Baker Woodlot (Stevens and Beach, 1980), and Warren Woods (l.c.).

The vegetation of dry meadows and thickets in southwestern Michigan can be represented by a tract studied by Brewer et al. (1969) in Kalamazoo Co. The area included a hay field dominated by brome grass and alfalfa as well as a heterogenous mixture of woody vegetation of the thicket.

Wetland areas, in southwestern Michigan, are like the Hampton Creek wetland in Kalamazoo Co. which has been recently studied by Sytsma and Pippen (1981). This study has revealed that the peatland and the lowland areas adjacent to Hampton Lake are dominated by red maple (Acer rubrum), speckled alder (Alnus rugosa), black ash (Fraxinus nigra), black cherry (Prunus serotina) and slippery elm (Ulmus rubra). Another example is a lowland wet area at Indian Bowl (Barnes and Kohring, l.c.), which is a fen dominated by tamarack (Larix laricina).

Wet prairies are rare in southwestern Michigan, compared to dry prairies (Brewer, 1965). A conclusion can be reached from the studies carried out by Gleason (1917) in Washtenaw Co., Hayes (1964) in St. Clair Co., Brewer (1965) in Kalamazoo Co., and Barnes and Kohring (1978) in Berrien Co. as to the species which are of high presence on the wetter areas in southern and southwestern Michigan. The conclusion is that such

species as Aster novae-angliae, Gentiana andrewsii, Pycnanthemum virginianum, Solidago ohioensis, S. riddellii, Spartina pectinata, and Vernonia fasciculata seem to be typical of wet prairies, in the sense that they are more likely to be found in this community than in any other, at least in southern Michigan.

Most of the dry prairies in southwestern Michigan are included in the counties Berrien, Branchy, Calhous, Cass, Kalamazoo, St. Joseph and Van Buren (Robinson, 1969). Robinson indicated that there are five genera indicative of prairie communities in southwestern Michigan: Andropogon, Bouteloua, Koeleria, Panicum and Sorghastrum. Scharrer (1971) added that Ruellia is limited to the prairie in Michigan, and therefore is one of the best indicators of such remnants. He recorded 68 prairie species in southwestern Michigan. Scharrer (l. c.) mentioned that three large prairie relic sites exist in Berrien Co.: portage prairie near Niles, Terre Coup prairie near Galien, and Wolf's prairie near Berrien Springs. He listed the prairie species of these sites. Andropogon, a grass highly tolerant to a wide range of environmental conditions and a major indicator of prairie communities, is the prevalent genus in the area.

MATERIALS AND METHODS

The diversity of vegetation within the Love Creek Nature Center hindered a detailed, intensive quantitative study of all communities in the one summer that was available for this study. The overall objective was therefore to describe and compare the various habitats. The forest communities were chosen for a more detailed investigation because they could be sampled in a relative short period of time. Eight habitats were chosen because their vegetation was relatively distinct; these were: (1) The Upland Deciduous Forest, (2) The Mesic Deciduous Forest, (3) A Forest strip along the northern edge of the Marsh, (4) The Succession Forest, (5) The Marsh, (6) The Stream sides, (7) The Dry Meadow, and (8) The Disturbed Areas, including the nature trails.

The arborescent habitats were analyzed by the Point Centered Quarter Method of Cottam and Curtis (1956). This method was chosen because differences between vegetation units could be described accurately and rapidly within the time allotted for the study. Also, this procedure presented advantages over other plotless methods such as, the closest individual method, the nearest neighbor method, and the random pairs method. The Point Centered Quarter Method provides more data on tree species composition per sampling point and gives the most reliable results for distance determinations, even when only a limited number of points are used. In addition, this method is the least susceptible to subjective bias and requires no correction factor in computing mean distances. With respect to the standard plot techniques, the Point Centered Quarter Method does not need to be adjusted to the sample size for the particular

density of the vegetation under investigation and it requires less labour and less equipment.

Because of the short distance between the trees in the woods, parallel compass lines with sampling points, every 10 m appeared adequate for sampling. All transects were initiated 10 m from the edge of each stand except in the forest strip along the northern edge of the marsh. An east-west transect through the middle part of this formation was carried out.

The number of sampling points in each forest community was proportional to the area. In the four forest formations, the number of points sample were: upland deciduous forest - 73; mesic deciduous forest - 63; strip wood at the northern edge of marsh - 19; and succession forest - 169.

Within each of the four quarters of a single sampling point, the one tree nearest to the point was identified and measured. Only the individuals with a stem diameter at breast height (DBH) of at least 5 cm and taller than 3 m were considered as trees. The DBH measurements were used to avoid problems associated with the presence of saplings of many species in the study areas. The number of species, the DBH measurements and the distance between the tree and the point were used to calculate the relative density, the relative frequency, and the relative dominance of each species. Importance values were calculated by summing up relative density, relative frequency, and relative dominance.

The shrub and herbaceous layers were not studied quantitatively for lack of time; the relative vegetational abundance was recorded using visual estimations according to the following scale:

D = Dominant (i.e. gregarious so as to occupy and control any layer of the vegetation)

C = Common (never or rarely out of sight)

F = Frequent (frequently observed)

O = Occasional (occasionally observed)

R = Rare (solitary, found only after thorough exploration)

This scale is slightly modified from that used by Tansley and Adamson (1913).

The Checklist

A checklist of vascular plants for the flora of the Love Creek Nature Center was prepared and is presented in Appendix I. The list denotes location of voucher specimens, habitat, abundance and status whether or not the plant is listed on the Threatened and Endangered species list of Michigan (Wagner et al., 1977).

The plant collecting techniques used in the field were described by Savile (1962). Whenever possible the plants were collected in triplicate.

The plants were identified only to the species level, except when stated otherwise, or when specialists verified the material. The nomenclature of the native taxa follows that of Gleason and Cronquist (1963). Plant names deviating from Gleason and Cronquist are based on Voss (1972) and the opinion of specialists actively working on the following taxa: Toxicodendron, Gillis (1971); Crataegus, Phipps and Muniyamma (1979); and Urtica, Woodland (1974). For cultivated plants, the names given in Bailey (1977) were followed.

The taxonomists to whom specimens were sent for verification were: G. Argus - Salicaceae; H.E. Ballard - Viola; L. Brouillet - Aster and Solidago; C.A. Keller - Brassicaceae; J. McNeill - Caryophyllaceae; J.B. Phipps - Crataegus; R. Pohl - Poaceae; A.A. Reznicek - Cyperaceae; D.E. Swales - Fraxinus and Lonicera; W.H. Wagner, Jr. - Pteridophytes; M.J. Waterway - Galium and Agrimonia; and D.W. Woodland - Urticaceae. D.W. Woodland confirmed all other identifications.

Voucher specimens are deposited at the Andrews University Herbarium (AUB) and at the McGill University Herbarium (MTMG) with the third set being retained by the author. Abbreviations for herbaria follow Holmgren et al. (1981).

DESCRIPTION OF THE VEGETATION OF LOVE CREEK NATURE CENTER

1) The Upland Deciduous Forest

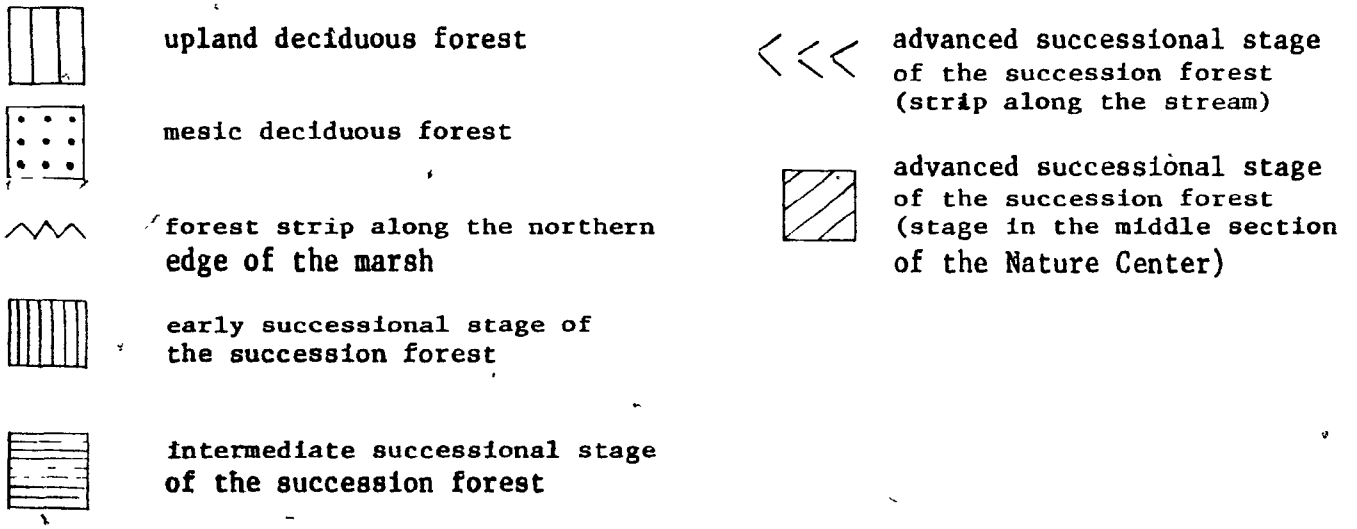
The upland deciduous forest is located at the extreme west end of the Nature Center (Fig. 6, 7). The area is generally flat to slightly rolling, with steep slopes along the banks of Love Creek. Low-lying areas are also found along the Creek and they are subjected to frequent flooding in the spring and summer. The largest portion of this forest is the upland area. It is covered by a Riddles-Oshtemo Soil Complex. The steep slopes and the banks of the Creek are situated on Udorthents and Udipsamment Soils, and Spinks Loamy sand soil (Fig. 5).

The forest was dominated by Acer saccharum (I.V.72.89). Ulmus rubra (37.74), Prunus serotina (36.86), Robinia pseudoacacia (35.47), Liriodendron tulipifera (26.06), Fagus grandifolia (22.44), Quercus borealis (15.12), and Fraxinus americana (14.28) were significant elements. Less common tree species are also listed in Tables 3 and 4. The mean distance between trees in this forest was 3.84 m.

Robinia pseudoacacia was unique to this formation at the Love Creek Nature Center. It was most abundant from the middle part of the western section northward to the stream. It was very common around the Berrien-Oronoko Township Dump, just across the Creek. Fagus grandifolia was prominent above the steep slopes along the stream, probably because of the good drainage. Ulmus rubra, Ostrya virginiana, and Carpinus caroliniana were most common on the low-lying ground along Love Creek.

Juglans nigra (2.11), Fagus grandifolia, and Ulmus americana (1.78) were not abundant in this forest. This was no doubt due to the

Figure 6. Map showing the location and limits of the forest habitats of Love Creek Nature Center.



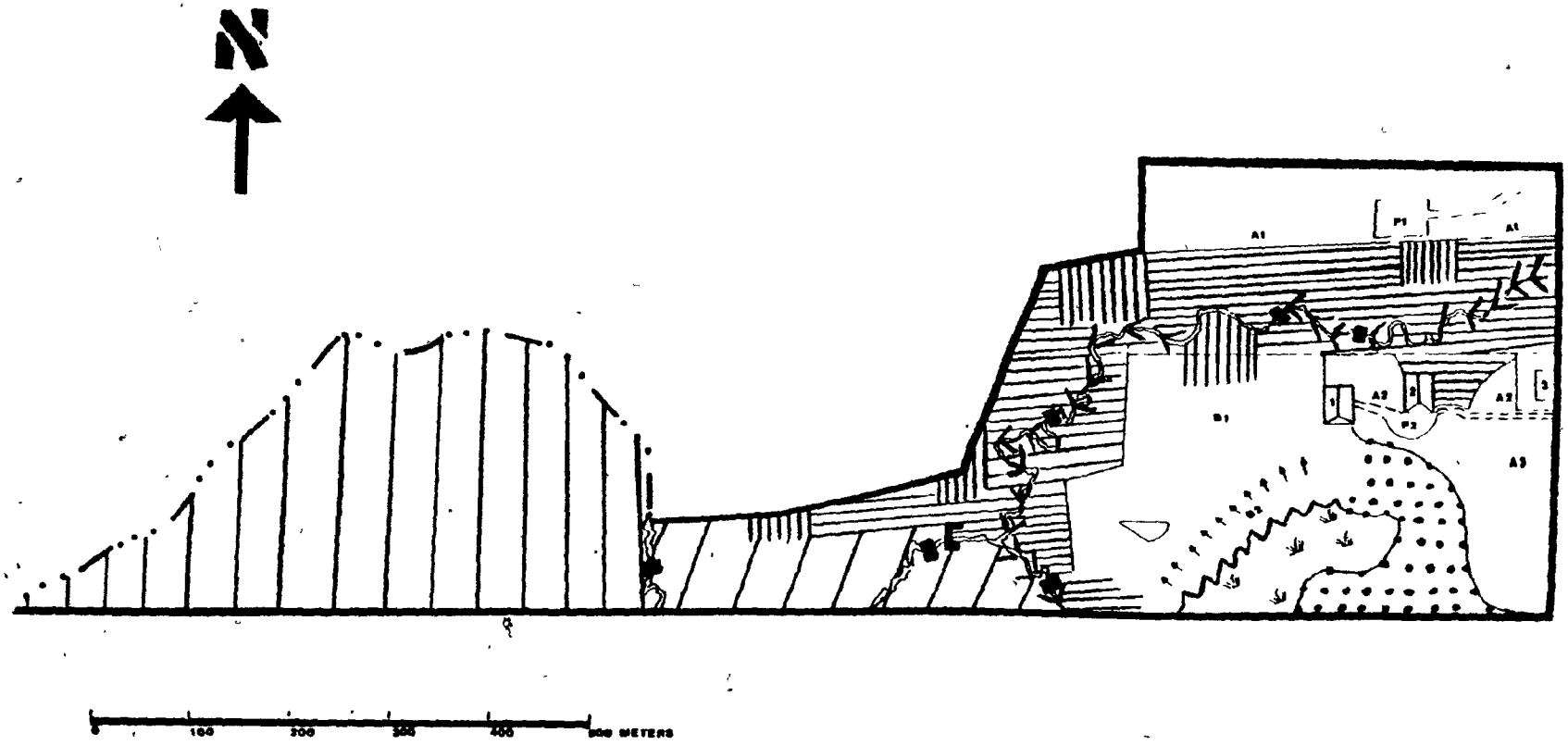

N
A1
A2
A3
0
100
200
300
400
500 METERS

Figure 7. The upland deciduous forest, as found at the west end of the Love Creek Nature Center, showing the dominant tree Acer saccharum.

Figure 8. The windfall area on the northwest side of the upland deciduous forest of the Love Creek Nature Center.

Damage was caused by a tornado in July 1980.

FIGURES 7 AND 8

COLOURED PICTURES

Table 3. Upland Deciduous Forest Composition in the Love Creek Nature Center determined by Point Centered Quarter Method. Data are based on 73 sample points.

Species	Relative Density	Relative Frequency	Relative Dominance	Importance Value (I.V)
Acer saccharum	26.03	23.15	23.71	72.89
Ulmus rubra	13.01	14.29	10.44	37.74
Prunus serotina	11.30	12.81	12.75	36.86
Robinia pseudoacacia	10.27	9.85	15.35	35.47
Liriodendron tulipifera	6.85	7.88	11.33	26.06
Fagus grandifolia	7.88	6.90	7.66	22.44
Quercus borealis	4.79	4.43	5.90	15.12
Fraxinus americana	5.14	5.91	3.23	14.28
Sassafras albidum	2.40	2.96	2.98	8.34
Carpinus caroliniana	2.74	3.94	0.94	7.62
Ostrya virginiana	2.40	2.46	1.12	5.98
Celtis occidentalis	1.71	1.48	1.18	4.37
Asimina triloba	1.37	1.48	0.42	3.27
Carya cordiformis	0.68	0.99	0.82	2.49
Juglans nigra	0.68	0.49	0.94	2.11
Ulmus americana	0.34	0.49	0.95	1.78
Crataegus holmesiana	0.68	0.49	0.27	1.44

Note: The mean distance between trees was 3.84 m.

Table 4. Alphabetical List of Taxa found in the Upland Deciduous Forest in the Love Creek Nature Center.

Tree Layer

Acer rubrum
Acer saccharum
Aesculus glabra
Asimina triloba
Carpinus caroliniana
Carya cordiformis
Celtis occidentalis
Fagus grandifolia
Fraxinus americana var. *americana*
Fraxinus pennsylvanica var. *pennsylvanica*
Juglans nigra
Liriodendron tulipifera
Ostrya virginiana
Prunus serotina
Prunus virginiana
Quercus alba
Quercus borealis
Robinia pseudoacacia
Sassafras albidum
Tilia americana
Ulmus americana
Ulmus rubra

Shrubs and Trees Seedlings Layer

Asimina triloba
Berberis thunbergii
Celastrus scandens
Cornus florida
Cornus racemosa
Crataegus holmesiana
Crataegus pedicellata
Crataegus cf. *pringlei*
Crataegus punctata
Euonymus americanus
Hamamelis virginiana
Lindera benzoin
Lonicera canadensis
Lonicera tatarica
Parthenocissus quinquefolia
Ribes cynosbati

Table 4 continued.

Shrubs and Trees Seedlings Layer (cont'd)

Rubus cf. *flagellaris*

Viburnum acerifolium

Vitis aestivalis var. *argentifolia*

Zanthoxylum americanum

Herbaceous Layer

Actaea alba

Adiantum pedatum

Agrimonia pubescens

Agrostis gigantea

Allium tricoccum

Allium vineale

Anagallis arvensis

Anemone virginiana

Anemonella thalictroides

Aralia racemosa

Arisaema triphyllum

Asarum canadense

Asplenium platyneuron

Athyrium asplenioides

Athyrium pycnocarpon

Athyrium thelypteroides

Boehmeria cylindrica

Botrychium dissectum var. *dissectum*

Botrychium virginianum

Brachyelytrum erectum

Bromus inermis

Carex albursina

Carex arctata

Carex convoluta

Carex leptonervia

Carex rosea

Caulophyllum thalictroides

Chelidonium majus

Circaea canadensis

Cryptotaenia canadensis

Dentaria laciniata

Dryopteris intermedia

Dryopteris marginalis

Table 4 continued.

Herbaceous Layer (cont'd)

Epipactis helleborine
Festuca obtusa
Floerkea proserpinacoides
Galium aparine
Geranium maculatum
Goodyera pubescens
Hepatica acutiloba
Hydrophyllum appendiculatum
Hydrophyllum canadense
Hystrix patula
Juncus effusus var. *solutus*
Juncus tenuis
Laportea canadensis
Leersia oryzoides
Lycopodium complanatum var. *flabelliforme*
Mitella diphylla
Monotropa uniflora
Osmorhiza claytonii
Osmorhiza longistylis
Panax quinquefolium
Panax trifolium
Panicum implicatum
Phlox divaricata
Pilea pumila
Plantago major
Poa languida
Poa sylvestris
Poa trivialis
Podophyllum peltatum
Polygonum virginianum
Polystichum acrostichoides
Prenanthes altissima
Sanguinaria canadensis
Sanicula canadensis
Sanicula gregaria
Smilacina racemosa
Smilacina stellata
Smilax hispida
Solanum nigrum
Stylophorum diphyllum
Thalictrum dioicum
Thelypteris noveboracensis
Trillium grandiflorum
Veronica officinalis
Verbena scabra

Table 4 continued.

Herbaceous Layer (cont'd)	
Viola canadensis	*Viola striata*
Viola pubescens var. *eriocarpa*	*Viola striata* X *rostrata*
Viola rostrata	

heavy logging in the past and to Dutch Elm Disease (Charles Barnes, personal comm.).

Other disturbances were the result of the July 5, 1980 tornado, which caused great damage to the northwest side of the forest (Fig. 8). This resulted in a large area being exposed to the direct influence of sunlight.

Cornus florida and Asimina triloba were two prominent members of the shrub layer. Other shrubs and vines are listed in Table 4.

After the spectacular display of prevernal flora, the understory becomes cool and shaded. These conditions are ideal for herbaceous species tolerant of low light intensity with Hydrophyllum canadense, H. appendiculatum, Viola canadensis being the dominant species and the flowering Chelidonium majus, Stylophorum diphyllum, Podophyllum peltatum, Sanguinaria canadensis, Veronica officinalis and Osmorhiza claytonii being relatively common. Fern and other flowering plants were present throughout the community. They are listed in Table 4. The species Athyrium pycnocarpon, Lycopodium complanatum var. flabelliforme and Panax quinquefolium were found only in this community at the Center.

2) The Mesic Deciduous Forest

The mesic deciduous forest is located east of the marsh, along the southern border of the eastern section of the Center, bordered to the north and east by disturbed areas (Fig. 3, 6). It is found on the slope of the U-shaped basin surrounding the marsh. There is a moisture gradient from the bottom of the slope, near the marsh, to the top of the ridge bordering the disturbed area. The lowest part is flooded during the spring

and summer. The soil types on which this forest is found are the Riddles-Oshtemo Soil Complex, adjacent to the marsh, and the Oshtemo sandy loam, which covers the remaining area (Fig. 5).

This forest was composed mostly of a large number of small trees and saplings. The more mature, taller trees occurred toward the southernmost portion of the ridge. The dominant trees were Ulmus rubra (I.V.87.33), and Prunus serotina (69.88). Liriodendron tulipifera (31.61) was common. Other frequent species were Carya cordiformis (19.43), Acer saccharum (17.71), Fraxinus americana (14.94), Quercus borealis (14.87) and Fagus grandifolia (11.63). Other species are listed in Tables 5 and 6. The mean distance between trees in this forest was 3.20 m.

Ulmus rubra was most abundant at the east end of the marsh where the soil was continuously water-saturated (Fig. 9). A few medium-sized Juglans nigra (5.73) were also present. They survived the earlier logging operations (mentioned previously). Liriodendron tended to occur with higher frequency in an area which was situated between the waterlogged zone near the marsh and the base of the slope where the water table appeared to be close to the surface. This is the habitat in which this species is usually observed in Michigan (Thompson, 1981). Fagus was prominent on the moist well-drained slopes. Populus deltoides and Platanus occidentalis were also present in this formation as a few large scattered trees, or as very young saplings. For these reasons, they were not sampled by the Point Centered Quarter Method.

Many of the trees in the ecotone between the mesic deciduous community and the disturbed area were broken, dead or showed extensive

Figure 9. The southwestern corner of the mesic deciduous forest of the Love Creek Nature Center adjacent to the marsh showing the boardwalk, the observation tower and the dominant tree Ulmus rubra.

Figure 10. An early successional stage of the succession forest forming a continuum with the dry meadow dominated by Rhus typhina. The dominant grass in this area is Andropogon virginicus.

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Images en couleur

physical damage. This was probably due to the past logging disturbances and/or by wind.

The shrub layer contained a large number of saplings and tree seedlings. In the lowest area adjacent to the marsh, Ribes cynosbati, Rosa palustris, R. virginiana, Asimina triloba, Sambucus canadensis and Toxicodendron radicans ssp. negundo were present. Salix discolor had invaded the extreme western part of this forest. The drier ecotone between the mesic forest and the disturbed area to the east was occupied by Rhus typhina, Vitis riparia, Cornus stolonifera, and Rubus occidentalis.

Close to the marsh, various grasses and forbs, such as Agrostis tenuis, Glyceria melicaria, Leersia virginica, Campanula americana, Dioscorea villosa, and the hybrid violet Viola affinis x V. sororia, were present. This wet habitat was also ideal for a number of other herbaceous species which also occurred elsewhere in the Center: Arisaema triphyllum, Cryptotaenia canadensis, Floerkea proserpinacoides, Osmorhiza claytonii, Panax trifolium, Podophyllum peltatum, Smilacina racemosa, Trillium grandiflorum, Viola canadensis, V. pubescens var. eriocarpa, V. sororia and others (see Table 6). Habenaria sp. was found in a very wet forest soil, at the limit between the mesic forest and the strip of forest bordering the northern edge of the marsh.

3) The Forest Strip along the Northern Edge of the Marsh

There is a forest strip bordering the northern edge of the marsh, which isolates the marsh from the dry meadow to the north. The forest strip forms a band less than 10 m wide. The area is gently sloping (12-18%) towards the marsh, and is covered by the Riddles-Oshtemo Soil Complex.

Table 5. Mesic Deciduous Forest Composition in Love Creek Nature Center determined by Point Centered Quarter Method. Data are based on 63 sample points.

Species	Relative Density	Relative Frequency	Relative Dominance	Importance Value (I.V.)
Ulmus rubra	32.15	27.88	27.30	87.33
Prunus serotina	20.24	21.82	27.82	69.88
Liriodendron tulipifera	11.11	12.12	8.38	31.61
Carya cordiformis	7.54	6.67	5.22	19.43
Acer saccharum	5.56	7.88	4.27	17.71
Fraxinus americana	5.16	6.06	3.72	14.94
Quercus borealis	5.16	4.85	4.86	14.87
Fagus grandifolia	3.17	3.64	4.82	11.63
Juglans nigra	1.59	0.61	3.53	5.73
Tilia americana	1.59	2.42	1.21	5.22
Asimina triloba	1.98	1.21	1.02	4.21
Populus tremuloides	1.19	1.21	0.77	3.17
Celtis occidentalis	0.79	1.21	0.61	2.61
Ostrya virginiana	0.40	0.61	0.26	1.27
Carpinus caroliniana	0.40	0.61	0.23	1.24

Note: The mean distance between trees was 3.20 m.

Table 6. Alphabetical List of Taxa found in the Mesic Deciduous Forest in the Love Creek Nature Center

Tree Layer

Acer rubrum
Acer saccharinum
Acer saccharum
Asimina triloba
Aesculus glabra
Carpinus caroliniana
Carya cordiformis
Celtis occidentalis
Fagus grandifolia
Fraxinus americana var. americana
Juglans nigra
Liriodendron tulipifera
Ostrya virginiana
Platanus occidentalis
Populus deltoides
Populus tremuloides
Prunus serotina
Prunus virginiana
Quercus borealis
Salix discolor
Tilia americana
Ulmus rubra

Shrubs and Trees Seedlings Layer

Asimina triloba
Cornus florida
Cornus racemosa
Cornus stolonifera
Lindera benzoin
Rhus typhina
Ribes cynosbati
Rosa palustris
Rosa virginiana
Rubus occidentalis
Sambucus canadensis
Toxicodendron radicans ssp. negundo
Viburnum cassinoides
Vitis riparia

Table 6 continued.

Herbaceous Layer

Actaea alba

Agrimonia gryposepala

Agrimonia parviflora

Agrimonia striata

Agrostis tenuis

Allium tricoccum

Allium vineale

Amphicarpa bracteata var. bracteata

Arisaema triphyllum

Asarum canadense

Aster cordifolius

Aster pilosus

Aster puniceus

Aster simplex

Campanula americana

Caulophyllum thalictroides

Chelidonium majus

Cicuta maculata

Cinna arundinacea

Circaea canadensis

Cryptotaenia canadensis

Dactylis glomerata

Desmodium canescens

Dioscorea villosa

Echinochloa muricata

Eupatorium rugosum

Festuca obtusa

Floerkea proserpinacoides

Galium triflorum

Geum canadense

Glyceria melicaria

Glyceria striata

Habenaria sp.

Impatiens pallida

Isopyrum biternatum

Laportea canadensis

Leersia virginica

Mitella diphylla

Osmorhiza claytonii

Osmorphiza longistylis

Panax trifolium

Phlox divaricata

Phryma leptostachya

Podophyllum peltatum

Polygonum virginianum

Table 6 continued.

Herbaceous Layer (cont'd)	
Ranunculus abortivus	Stylophorum diphyllum
Ranunculus fascicularis	Trillium grandiflorum
Ranunculus septentrionalis	Veronica missurica
Sanicula gregaria	Viola affinis X sororia
Smilacina racemosa	Viola canadensis
Smilacina stellata	Viola pubescens var. eriocarpa
Smilax hispida	Viola sororia

Prunus serotina (I.V.77.90) was the dominant tree. Acer saccharum (61.13), Ulmus rubra (55.52), Fraxinus americana (25.50) and Acer rubrum (15.66) were less abundant (Table 7). Eight other species with low importance values were observed. Two of these, Populus tremuloides and Salix amygdaloides, were clumped in isolated stands on the north side of the marsh. The mean distance between the trees in this strip was 3.14 m.

The shrub layer included a rich mixture of diverse shrubs: Cornus stolonifera was dominant and Sambucus canadensis was frequent. Salix discolor, Viburnum acerifolium, V. cassinoides, V. opulus var. americanum, and Cornus racemosa were occasional. Cephalanthus occidentalis, Ribes americanum and R. cynosbati were rare. The former of the latter three species and V. opulus var. americanum were only found at this particular location in the entire study site.

The herbaceous layer was comprised of Symplocarpus foetidus, Urtica dioica ssp. gracilis, and Stachys hispida. Onoclea sensibilis was occasional. Lilium michiganense grew at the western end of the formation and sedges (Carex spp.) were abundant in this area (Table 8). This habitat also harbored species from the adjacent dry meadow and marsh communities.

4) The Succession Forest

The succession forest occupies the northern portion of the eastern section of the Center and extends into the middle section (Fig. 3). It covers approximately one-third of the property. To the north, east, and south, it is bordered by open, disturbed or cultivated areas and to the west, by the upland deciduous forest.

Table 7. The Forest Strip along the Northern Edge of Marsh Composition in the Love Creek Nature Center determined by the Point Centered Quarter Method. Data are based on 19 sample points.

Species	Relative Density	Relative Frequency	Relative Dominance	Importance Value (I.V.)
Prunus serotina	27.63	25.00	25.27	77.90
Acer saccharum	18.42	15.39	27.32	61.13
Ulmus rubra	21.05	17.31	17.16	55.52
Fraxinus americana	6.58	9.62	9.00	25.20
Acer rubrum	5.26	7.69	2.71	15.66
Populus tremuloides	5.26	5.77	2.54	13.57
Carpinus caroliniana	3.95	5.77	2.47	12.19
Salix amygdaloides	2.63	3.85	5.60	12.08
Liriodendron tulipifera	1.32	1.92	2.67	5.91
Quercus borealis	1.32	1.92	1.74	4.98
Carya cordiformis	1.32	1.92	1.59	4.83
Fagus grandifolia	1.32	1.92	1.10	4.34
Morus rubra	1.32	1.92	0.84	4.08

Note: The mean distance between trees was 3.14 m.

Table 8. Alphabetical List of Taxa found in the Forest along the Northern Edge of the Marsh in the Love Creek Nature Center.

Tree Layer

Acer negundo

Acer rubrum

Acer saccharum

Aesculus glabra

Carpinus caroliniana

Fraxinus americana var. *americana*

Fraxinus nigra

Liriodendron tulipifera

Populus tremuloides

Prunus serotina

Quercus borealis

Salix amygdaloides

Ulmus rubra

Shrubs and Trees Seedlings Layer

Cephalanthus occidentalis

Cornus racemosa

Cornus stolonifera

Morus rubra

Parthenocissus inserta

Parthenocissus quinquefolia

Ribes americanum

Ribes cynosbati

Rubus occidentalis

Salix bebbiana

Salix discolor

Sambucus canadensis

Toxicodendron radicans ssp. *negundo*

Viburnum acerifolium

Viburnum cassinoides

Viburnum opulus var. *americanum*

Table 8 continued.

Herbaceous Layer

Agrimonia gryposepala
Agrimonia parviflora
Agrimonia striata
Allium tricoccum
Allium vineale
Anagallis arvensis
Aster puniceus
Aster simplex
Boehmeria cylindrica
Caltha palustris
Campanula americana
Carex amphibola var. turgida
Carex bebbii
Carex blanda
Carex cristatella
Carex granularis
Carex lurida
Carex sparganioides
Carex stipata
Cicuta maculata
Cinna arundinacea
Cirsium muticum
Cyperus strigosus
Dactylis glomerata
Dryopteris intermedia
Dryopteris spinulosa
Echinochloa muricata
Eleocharis erythropoda
Eupatorium maculatum
Eupatorium rugosum
Festuca obtusa
Floerkea proserpinacoides
Galium triflorum
Glyceria melicaria
Glyceria striata
Impatiens pallida
Isopyrum biternatum
Juncus effusus var. solutus
Laportea canadensis
Leersia virginica
Lilium michiganense
Lysimachia nummularia
Mentha arvensis
Onoclea sensibilis
Penthorum sedoides
Phryma leptostachya

Table 8 continued.

Herbaceous Layer (cont'd)

Polygonum arifolium	Scirpus expansus
Polygonum sagittatum	Scutellaria lateriflora
Polystichum acrostichoides	Senecio aureus
Ranunculus abortivus	Solanum dulcamara
Ranunculus fascicularis	Solidago patula
Ranunculus sceleratus	Stachys hispida
Ranunculus septentrionalis	Steironema ciliatum
Rumex obtusifolius	Symplocarpus foetidus
Rumex occidentalis	Thelypteris palustris
Saururus cernuus	Urtica dioica ssp. gracilis
Saxifraga pensylvanica	

Topographically, the land is moderately level. This forest is lower than the dry meadow area located on its southern and eastern boundaries. The plants of this forest formation are growing on five soil types: Riddles-Oshtemo Soil Complex, Oshtemo sandy loam, Cohoctah-Abscota Soil Complex, Monitor loam, and Udorthents and Udipsamments soils.

Early, intermediate, and advanced successional stages existed within this formation (Fig. 6). These will be described in turn.

In the northern part of the forest, a previously cleared area has been left undisturbed for some time. This now constitutes an early succession stage of the forest. This area was relatively open, dominated by shrubs such as Rhus typhina, Crataegus cf. aboriginum, C. holmesiana, Cornus stolonifera, Rubus alleghenıensis, R. occidentalis, Sassafras albidum and Toxicodendron radicans ssp. negundo. Saplings of Quercus borealis, Prunus serotina and Ulmus rubra were also present. In the open areas among the shrubs, grasses, primarily Andropogon virginicus (an indicator of poor soils, Pohl, 1978), were dominant. They were accompanied by various annual, biennial, and perennial plants such as Ambrosia artemisiifolia, A. trifida, Asclepias syriaca, Daucus carota, Erigeron annuus and Lactuca canadensis var. canadensis. Among the less common forbs growing in this open area, the following species were noted: Aster cordifolius, Anemone cylindrica, Asparagus officinalis and Solidago nemoralis. Two species listed among the rare species of Michigan (Wagner et al., 1977) were found in this habitat: Eragrostis pilosa, occasional in the whole area; and Asclepias amplexicaulis, of which a single plant was seen northeast of the old large dam (Fig. 14). Other species are listed in Table 10.

Data for tree cover of both the intermediate and advance succession stage are presented in Table 9. Fraxinus americana (I.V. 71.81), Prunus serotina (68.36) and Ulmus rubra (65.40) were co-dominants. Also common were Quercus borealis (23.78), Acer saccharum (14.57), and Liriodendron tulipifera (10.12). Other tree species are given in Table 9: all of these species were more abundant in the succession forest than anywhere else in the Center. The mean distance of 2.86 m between the trees in the succession forest clearly showed that trees were closer together in this forest. The small size and the closeness of the trees reflected the successional nature of this formation. The intermediate successional stage occurred on both sides of the valley of the North Fork of Love Creek. It was a mixture of small trees. Most of the data apply to this stage (See Table 9). The shrubs Rhus typhina and Morus rubra often were of a sufficient size to be sampled on occasion with other forest trees. Their presence reinforced the evidence that this forest was of a successional nature. Both species were also present as small shrubs along the margin of the forest, adjacent to the early succession forest. Rhus typhina was more prominent in this area (Fig. 10).

The shrub layer in this stage of the succession forest included Rhus typhina, Crataegus holmesiana, and Rubus occidentalis as the most common species. Juniperus communis occurred occasionally throughout this formation. It was present around the older section of the Berrien General Hospital, which may have been the source of propagules for the individuals found in the Center. This upright form of the species is much more common north of Berrien County (Voss, 1972).

The vines, Parthenocissus inserta, P. quinquefolia and Vitis riparia, were common climbers in this forest, especially along the margins.

Table 9. Succession Forest Composition in the Love Creek Nature Center determined by the Point Centered Quarter Method. Data are based on 169 sample points.

Species	Relative Density	Relative Frequency	Relative Dominance	Importance Value (I.V.)
Fraxinus americana	22.85	25.45	23.51	71.81
Prunus serotina	23.29	23.94	21.13	68.36
Ulmus rubra	26.11	14.85	24.44	65.40
Quercus borealis	7.57	9.09	7.12	23.78
Acer saccharum	3.56	5.45	5.56	14.57
Liriodendron tulipifera	2.52	3.93	3.67	10.12
Tilia americana	2.08	3.94	1.74	7.76
Juglans nigra	0.89	1.52	4.35	6.76
Salix exigua	1.04	1.82	1.41	4.27
Carya cordiformis	1.19	1.82	1.21	4.22
Asimina triloba	1.19	1.49	0.75	3.43
Sassafras albidum	0.74	1.52	0.52	2.78
Fagus grandifolia	0.59	0.91	1.19	2.69
Rhus typhina	1.04	0.91	0.54	2.49
Ostrya virginiana	0.59	0.91	0.89	2.39
Carpinus caroliniana	0.74	0.91	0.62	2.27
Salix rigida	0.59	0.30	0.61	1.50
Celtis occidentalis	0.30	0.60	0.26	1.16
Pyrus malus	0.15	0.30	0.35	0.80
Morus rubra	0.15	0.30	0.14	0.59

Note: The mean distance between trees was 2.86 m

Table 10. Alphabetical List of Taxa found in the Succession Forest in the Love Creek Nature Center.

Tree Layer

Acer rubrum

Acer saccharum

Aesculus glabra

Carpinus caroliniana

Carya cordiformis

Celtis occidentalis

Fagus grandifolia

Fraxinus americana var. *americana*

Fraxinus pennsylvanica var. *pennsylvanica*

Juglans cinerea

Juglans nigra

Liriodendron tulipifera

Ostrya virginiana

Platanus occidentalis

Populus tremuloides

Prunus serotina

Prunus virginiana

Pyrus malus

Quercus alba

Quercus borealis

Salix eriocephala

Salix exigua

Ulmus americana

Ulmus rubra

Sassafras albidum

Tilia americana

Shrubs and Trees Seedlings Layer

Acer negundo

Ailanthus altissima

Asimina triloba

Cornus florida

Cornus racemosa

Cornus stolonifera

Crataegus cf. *aboriginum*

Crataegus holmesiana

Crataegus pedicellata

Dirca palustris

Hamamelis virginiana

Juniperus communis var. *communis*

Table 10 continued.

Shrubs and Trees Seedlings Layer (cont'd)

Juniperus virginiana
Lindera benzoin
Lonicera canadensis
Lonicera involucrata
Morus rubra
Parthenocissus inserta
Parthenocissus quinquefolia
Rhus typhina
Ribes cynosbati
Rosa multiflora
Rubus allegheniensis
Rubus cf. *flagellaris*
Rubus occidentalis
Salix discolor
Salix eriocephala (*S. rigida*)
Sambucus canadensis
Sambucus pubens
Sassafras albidum
Toxicodendron radicans ssp. *negundo*
Viburnum acerifolium
Vitis riparia
Zanthoxylum americanum

Herbaceous Layer

Achillea millefolium
Adiantum pedatum
Agrimonia pubescens
Agrostis tenuis
Alliaria officinalis
Allium vineale
Ambrosia artemisiifolia
Ambrosia trifida
Amphicarpa bracteata var. *bracteata*
Andropogon virginicus
Anemone cylindrica
Anemone virginiana
Anemonella thalictroides
Antennaria plantaginifolia
Apios americana
Arabis laevigata
Arenaria serpyllifolia var. *serpyllifolia*

Table 10 continued.

Herbaceous Layer (cont'd)

Arisaema triphyllum
Asclepias amplexicaulis
Asclepias syriaca
Asclepias tuberosa
Asparagus officinalis
Asplenium platyneuron
Aster cordifolius
Aster pilosus
Barbarea vulgaris
Boehmeria cylindrica
Botrychium dissectum var. dissectum
Botrychium matricariaefolium
Botrychium virginianum
Bromus inermis
Bromus secalinus
Campanula americana
Cardamine bulbosa
Cardamine hirsuta
Carex cephalophora
Carex gracillima
Carex hystericina
Carex rosea
Cerastium fontanum ssp. trivale
Chelidonium majus
Chrysanthemum leucanthemum
Cichorium intybus
Circaea canadensis
Claytonia virginica
Convolvulus sepium
Cryptotaenia canadensis
Cystopteris fragilis
Dactylis glomerata
Daucus carota
Dentaria diphylla
Desmodium viridiflorum
Dicentra canadensis
Dicentra cucullaria
Digitaria sanguinalis
Dryopteris intermedia
Dryopteris marginalis
Dryopteris spinulosa
Echinochloa muricata
Eleocharis erythropoda

Table 10 continued.

Herbaceous Layer (cont'd)

Epifagus virginiana

Equisetum arvense

Eragrostis pilosa

Eragrostis poaeoides

Erigeron annuus

Erigeron philadelphicus

Erythronium americanum

Eupatorium rugosum

Festuca arundinacea

Festuca obtusa

Fragaria virginiana

Galium aparine

Galium circaezans

Galium kamtschaticum

Galium trifidum

Galium triflorum

Geum canadense

Glecoma hederacea

Goodyera pubescens

Hackelia virginiana

Helianthus decapetalus

Hepatica acutiloba

Hesperis matronalis

Hypericum perforatum

Hystrix patula

Impatiens pallida

Juncus tenuis

Lactuca canadensis var. *canadensis*

Lamium purpureum

Laportea canadensis

Lathyrus latifolius

Leonurus cardiaca

Lepidium campestre

Lepidium virginicum

Leptoloma cognatum

Lilium michiganens

Lobelia inflata

Luzula acuminata var. *acuminata*

Lysimachia nummularia

Maianthemum canadense var. *canadense*

Matricaria matricarioides

Matteuccia struthiopteris

Table 10 continued.

Herbaceous Layer (cont'd)

Medicago lupulina
Medicago sativa
Mitchella repens
Mitella diphylla
Monotropa uniflora
Oenothera biennis
Osmorhiza claytonii
Osmorhiza longistylis
Oxalis stricta
Panax trifolium
Panicum clandestinum
Panicum implicatum
Pedicularis canadensis
Phleum pratense
Phlox divaricata
Phryma leptostachya
Phytolacca americana
Picris hieracioides
Plantago lanceolata
Plantago major
Poa alsodes
Poa compressa
Poa trivialis
Podophyllum peltatum
Polygonatum pubescens
Polygonum virginianum
Polystichum acrostichoides
Potentilla norvegica
Prenanthes altissima
Prunella vulgaris
Pteridium aquilinum
Ranunculus abortivus
Ranunculus recurvatus
Rudbeckia hirta
Rumex acetosella
Rumex crispus
Sanguinaria canadensis
Sanicula gregaria
Satureja vulgaris
Silene pratensis
Smilacina racemosa
Smilacina stellata
Solidago caesia
Solidago canadensis
Solidago flexicaulis

Table 10 continued.

Herbaceous Layer (cont'd)

Solidago nemoralis	*Urtica dioica* ssp. *gracilis*
Sonchus asper	*Verbena scabra*
Spiranthes cernua	*Vernonia missurica*
Taraxacum officinale	*Veronica officinalis*
Thelypteris noveboracensis	*Vicia cracca*
Tragopogon dubius	*Viola canadensis*
Tragopogon pratensis	*Viola conspersa*
Tridens flavus	*Viola pubescens* var. *eriocarpa*
Trifolium pratense	*Viola striata*
Trillium grandiflorum	

Other species, which occurred in various degrees of abundance, made up the ground cover: Arisaema triphyllum, Panax trifolium, Hackelia virginiana, Aster cordifolius, A. pilosus, Dentaria diphylla, Phlox divaricata, Spiranthes cernua, Phryma leptostachya, Trillium grandiflorum, Arabis laevigata, Alliaria officinalis, Botrychium matricariaefolium, B. virginianum and Epifagus virginiana.

The advanced successional stage occurred as a narrow band of large mature trees in the valley of the North Fork of Love Creek. Fraxinus americana, Prunus serotina, Ulmus rubra, Acer saccharum, Carya cordiformis, Tilia americana and Juglans nigra grew in the valley. Although its importance value was higher than in other forests, J. nigra (6.76) (Tables 3, 5, 9) was still rare in this forest, again due to past logging. This species prefers wet soils (Wells and Thompson, 1982). Salix exigua (4.50) and S. rigida (1.50) were found only along the stream. On the undulating grounds of the southwestern part of the succession forest, in the middle section of the Center, Fagus grandifolia was more frequently encountered.

The eastern part of the valley of the succession forest along the North Fork of Love Creek was favorable for spring flowers such as Arisaema triphyllum, Podophyllum peltatum, Trillium grandiflorum and Viola canadensis; and for ferns such as Asplenium platyneuron and Dryopteris intermedia. Associated with the beech, at the western end of the advanced succession forest, were Epifagus virginiana, Botrychium virginianum, Dicentra canadensis, D. cucullaria, Hystrix patula, Monotropa uniflora, and Goodyera pubescens. The latter species formed a large colony which colonized a shaded cool, Cohoctah-Abscota Soil Complex,

near the junction of the branches of Love Creek (Fig. 5). The ferns Adiantum pedatum, Dryopteris marginalis, Matteuccia struthiopteris and Thelypteris noveboracensis also occurred in this part of the forest The understory vegetation which occurred along the stream will be described later (stream side).

The number of species in the succession forest was relatively higher compared with the number of species in the other forests in the Love Creek Nature Center. However, the high number of species in the succession forest may be attributed to several important factors (among others). Such factors are light intensity, shade, and soil moisture content for the different soils which seemed to vary from one location to another in this unstable community.

5) The Marsh

The marsh is located in a U-shaped basin in the southeast part of the Love Creek Nature Center. It is bordered on the north by a strip of mesic forest, on the east and west by a mesic deciduous forest and on the south by a neighboring farm. The South Fork of Love Creek emerges from the west end of the marsh. The marsh is shallow with its depth ranging from 15 to 30 cm. A small open area of water existed in the east-north-east part of the marsh, bordering the mesic deciduous forest. An open area of water is produced annually when the stream floods in the spring and early summer. The South Fork of Love Creek enters the marsh and the Nature Center on the southeast corner (Fig. 11). On entering the marsh, the stream widens and decreases in velocity, depositing debris and silt. In this way, the water leaving the marsh is cleaner than when it enters. The marsh acts as a natural filter for the Creek, and helps to keep the Creek water clean the year round. The Love Creek marsh is one of the most productive and dynamic communities, for it offers food, water, and shelter to various kinds of small animals. Such animals are Green Frog, Spring Peeper, Chorus Frog, Red-Backed Salamander-

Figure 11. The South Fork of Love Creek entering the marsh of the Love Creek Nature Center.

The shrub Lindera benzoin can be seen in the foreground.

Figure 12. The Love Creek marsh showing the dominance of Typha latifolia (in background) and Leersia oryzoides (in foreground). The shrub Salix discolor can be seen in the foreground.

COLOURED PICTURES
Images en couleur

American Toad (Amphibians); Blue Racer, Gardner Snake, Box Turtle (Reptiles); Yellow-Warbler, Yellow Throat, Red-Winged Blackbird, Marsh Wren, Green Heron and the Great Horned Owl who hunts in this habitat (Birds); Cottontail Rabbit, Raccoon, Meadow Vole "mouse", Long-Tail Weasels, Muskrat, Short-Tailed Shrew and the Gray Fox (Mammals), who have been seen in the marsh, does not live there (Dave Groat, Chief Naturalist in Love Creek Nature Center, personal comm.).

The plant community of this habitat is growing in very moist soils of the "Aquents" and Histosols" types.

The vegetation of the marsh appeared to be determined by the depth of the water. In muddy, shallow canals, such species as Sagittaria latifolia, Mimulus ringens, Verbena hastata, Caltha palustris, Sparganium americanum were found in abundance in isolated stands. The largest area of the marsh was composed of a raised, decaying organic mat which included cattail (Typha latifolia) and cut grass (Leersia oryzoides). Typha latifolia was more common than Leersia oryzoides in the western half of the marsh, while in the eastern half the reverse was true (Fig. 12). The next most common herbaceous species in the marsh were Aster puniceus, Eupatorium perfoliatum, E. maculatum, Asclepias incarnata, and Epilobium palustre. The floating Lemna minor was occasionally found here in the exposed shallow canals in the southeastern part of the marsh. Other species are listed in Table II.

6) The Stream Sides

Love Creek flows through various portions of Berrien Township. It originates from a swampy area near the village of Berrien Center (Section 9). The greater portion of the Creek lies within Section 17. From its origin to its entrance into the St. Joseph River, it drops 39.6 m over a distance of approximately 4.8 km (Rule, 1976).

Table 11. Alphabetical List of Taxa found in the Marsh Habitat in the Love Creek Nature Center.

Tree Layer

Populus tremuloides

Ulmus rubra

Shrub Layer

Cornus stolonifera

Salix amygdaloides

Salix discolor

Herbaceous Layer

Alisma plantago-aquatica

Allium canadense

Asclepias incarnata

Aster patens var. *patens*

Aster puniceus

Bidens cernua

Caltha palustris

Carex cristatella

Carex lacustris

Carex lurida

Cuscuta umbrosa

Cyperus strigosus

Epilobium palustre

Eleocharis erythropoda

Eupatorium maculatum

Eupatorium perfoliatum

Eupatorium rugosum

Galium aparine

Galium tinctorium

Galium trifidum

Iris versicolor

Laportea canadensis

Leersia oryzoides

Lemna minor

Lobelia siphilitica

Mimulus ringens

Nasturtium officinale

Polygonum coccineum

Polygonum hydropiperoides

Sagittaria latifolia

Scirpus expansus

Solidago patula

Sparganium americanum

Symplocarpus foetidus

Typha angustifolia

Typha latifolia

Urtica dioica ssp. *gracilis*

Verbena hastata

Verbena scabra

The North Fork of Love Creek, in the Nature Center, winds its way through the northern region of the property, within the succession forest. At the eastern limit of the middle section, it turns south to join the South Fork (in Section 17) flowing from the marsh (Fig. 3). Emerging on the west end of the marsh, the South Fork passes out of the southern boundary and later reenters as a clear flowing trout and salmon spawning stream (Fig. 13).

From the point where the two Forks join each other, the flow of the Creek increases, primarily due to surface runoff as it makes its way through the moraines to the St. Joseph River. Springs and seepage areas are numerous along the stream. A mixed deciduous maple-beech forest flanks the stream in the upland areas.

Upon leaving the Center property, the stream flows through a flood plain area known as the "Indian Bowl" (a wet prairie site), before entering the St. Joseph River a short distance downriver from Berrien Springs.

The average width of the stream is approximately 50 cm and the depth varies from 15 to 40 cm. The water is cool and flows fast in a narrow and shallow channel. No submerged or floating plants were found (Fig. 13). Small, open, shallow areas occur along the side of North Fork. It was here that Equisetum hyemale was dominant. Various Carex and grasses were found in more open areas. The grasses included Agrostis gigantea, Glyceria melicaria and Poa trivialis. Other species are listed in Table 12.

Juncus tenuis and J. effusus were occasionally distributed on both sides of the stream. They were found most abundantly in the lowland floodplain eastward of the old large Dam (Fig. 14). Other plants found

FIGURES 13 AND 14

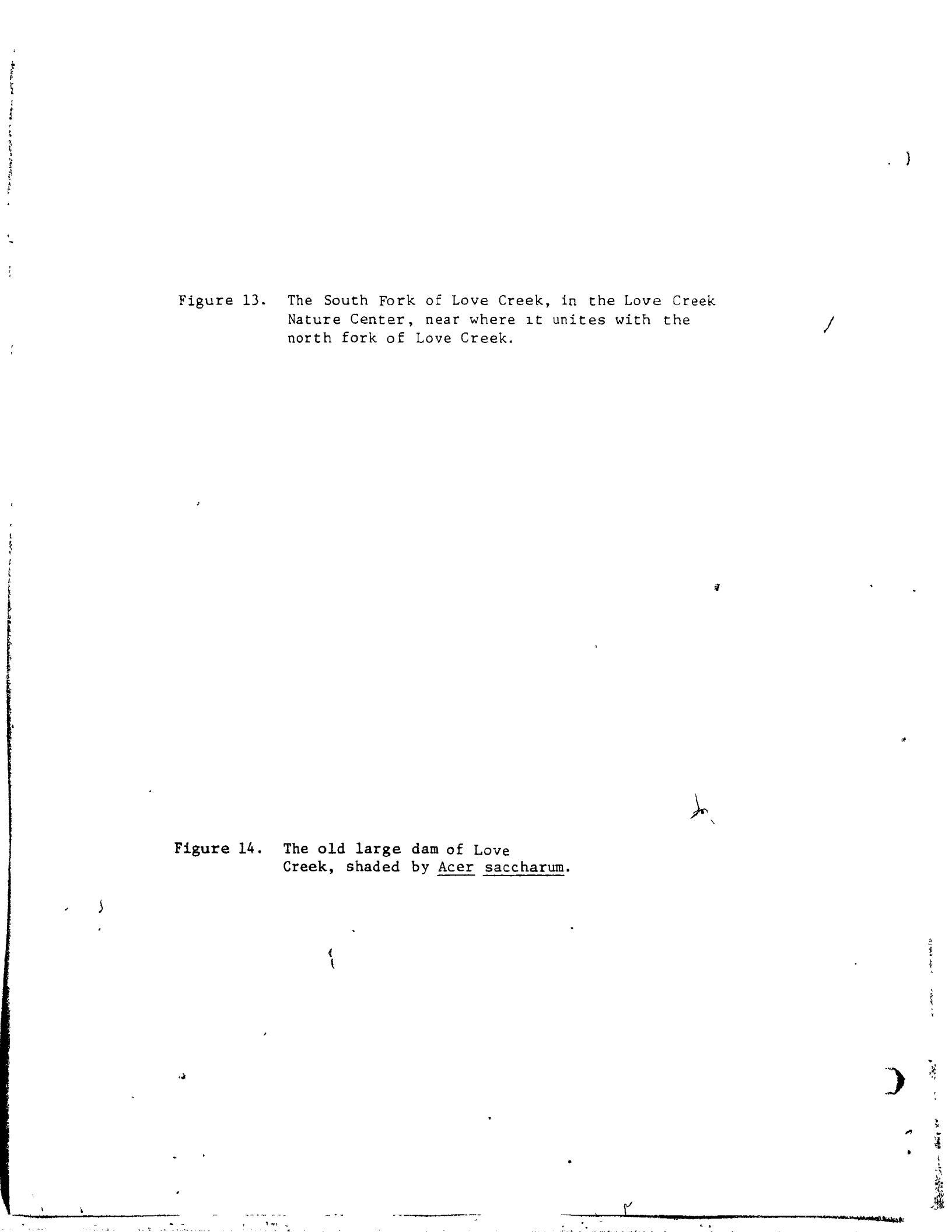


Figure 13. The South Fork of Love Creek, in the Love Creek Nature Center, near where it unites with the north fork of Love Creek.

Figure 14. The old large dam of Love Creek, shaded by *Acer saccharum*.

Table 12. Alphabetical List of Taxa found in the Stream Sides Habitat in the Love Creek Nature Center.

Tree Layer

Morus rubra

Populus deltoides

Populus tremuloides

Prunus serotina

Salix amygdaloides

Salix discolor

Salix eriocephala (*S. rigida*)

Salix exigua

Shrub Layer

Cornus racemosa

Cornus stolonifera

Ribes americanum

Sambucus pubens

Toxicodendron radicans ssp. *negundo*

Viburnum lentago

Herbaceous Layer

Agrimonia striata

Agrostis gigantea

Amphicarpa bracteata var. *bracteata*

Apios americana

Aralia racemosa

Asarum canadense

Aster cordifolius

Athyrium thelypteroides

Bidens cernua

Bidens vulgata

Boehmeria cylindrica

Bromus secalinus

Caltha palustris

Campanula americana

Carex albursina

Carex amphibola var. *turgida*

Carex arctata

Carex blanda

Carex convoluta

Carex crinita

Carex cristatella

Carex lacustris

Carex laxiculmis

Table 12 continued:

Herbaceous Layer (cont'd)

Carex laxiflora
Carex lupulina
Carex prasina
Carex sparganioides
Carex stipata
Carex swanii
Circaea canadensis
Claytonia virginica
Cryptotaenia canadensis
Cuscuta umbrosa
Cystopteris fragilis
Dactylis glomerata
Desmodium canescens
Dryopteris intermedia
Dryopteris marginalis
Dryopteris spinulosa
Echinocystis lobata
Equisetum arvense
Equisetum hyemale
Erigeron philadelphicus
Eupatorium perfoliatum
Eupatorium purpureum
Eupatorium rugosum
Festuca obtusa
Floerkea proserpinacoides
Galium circaezans
Galium trifidum
Geum canadense
Glecoma hederacea
Glyceria melicaria
Hackelia virginiana
Hemerocallis fulva
Hepatica acutiloba
Hydrophyllum canadense
Hystrix patula
Impatiens pallida
Iris versicolor
Juncus effusus var. solutus
Juncus tenuis
Laportea canadensis
Lilium michiganense
Lobelia siphilitica
Luzula acuminata var. acuminata
Mentha arvensis
Myosotis scorpioides

Table 12 continued.

Herbaceous Layer (cont'd)

Nasturtium officinale	Saururus cernuus
Osmorhiza claytonii	Scirpus atrovirens
Panicum clandestinum	Scirpus expansus
Panicum implicatum	Scutellaria lateriflora
Pedicularis canadensis	Sium suave
Pilea pumila	Smilacina stellata
Poa trivialis	Solanum dulçamara
Polygonum arifolium	Solidago flexicaulis
Polygonum sagittatum	Steironema ciliatum
Polygonum virginianum	Thelypteris noveboracensis
Polystichum acrostichoides	Thelypteris palustris
Prenanthes altissima	Trillium grandiflorum
Sagittaria latifolia	Urtica dioica ssp. gracilis
Sanicula gregaria	Veronica officinalis
	Vinca minor

occasionally in the latter habitat were Campanula americana, Impatiens pallida, Pilea pumila, Urtica dioica, Sagittaria latifolia, and Luzula acuminata. Lobelia siphilitica was rare. All these plants inhabited other localities along the Creek, except for the latter three species. These were found only in the floodplain mentioned above. Iris versicolor was more frequent along the stream to the east of the first bridge of the Creek trail (T_2, Fig. 3). Myosotis scorpioides, Floerkea proserpinacoides, Claytonia virginica, Mentha arvensis, Scutellaria lateriflora and Saururus cernuus were adapted to the floodplain habitat along the depression of the shady shore of the stream, eastward from the Nature Center trail (T_1, Fig. 3). The first three species formed an associaton. Along the stream, other species such as Galium trifidum, Cryptotaenia canadensis, Aster cordifolius, and Smilacina stellata were frequent. Other species like Hepatica acutiloba, Asarum canadense, and Laportea canadensis were present in isolated patches. The latter species occurred in other locations in an occasional manner near the second bridge of the Beech Wood Trail (T_5, Fig. 3).

7) The Dry Meadow

The dry meadow is located in the east central portion of the Nature Center. It is bounded on the south by the forest strip along the marsh, on the west and north by the succession forest, on the east by an open disturbed area, and on the southeast by the mesic deciduous forest.

A ridge planted with a narrow row of Pinus resinosa divides the meadow into two unequal, north and south divisions (Fig. 15). The southern, smaller division is located at the northwest side of the marsh (Fig. 16) and is separated from the marsh by a strip of trees. The larger portion is to the north of the pine ridge (Fig. 17).

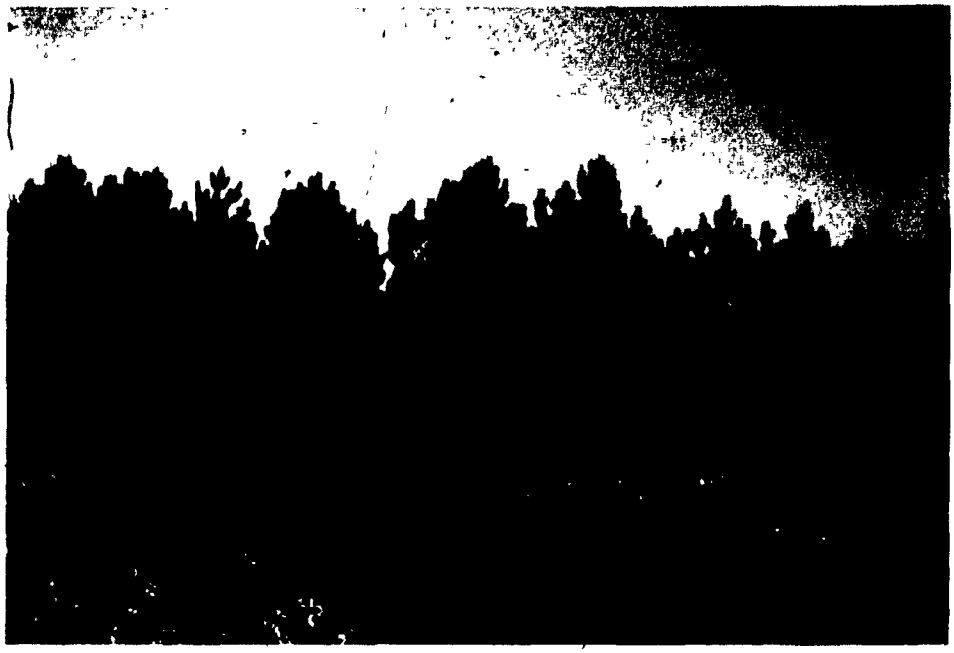
Figure 15. Planted red pine row (Pinus resinosa) separating the dry meadow into two sections.

Andropogon virginicus (red), Silene pratensis (white) and Solidago canadensis (yellow) are in the foreground.

This picture shows the southern part of the large section of the dry meadow.

Figure 16. The smaller southern section of the dry meadow of Love Creek Nature Center dominated by Bromus inermis and B. secalinus.

FIGURES 15 AND 16



COLOURED PICTURES
Images en couleur

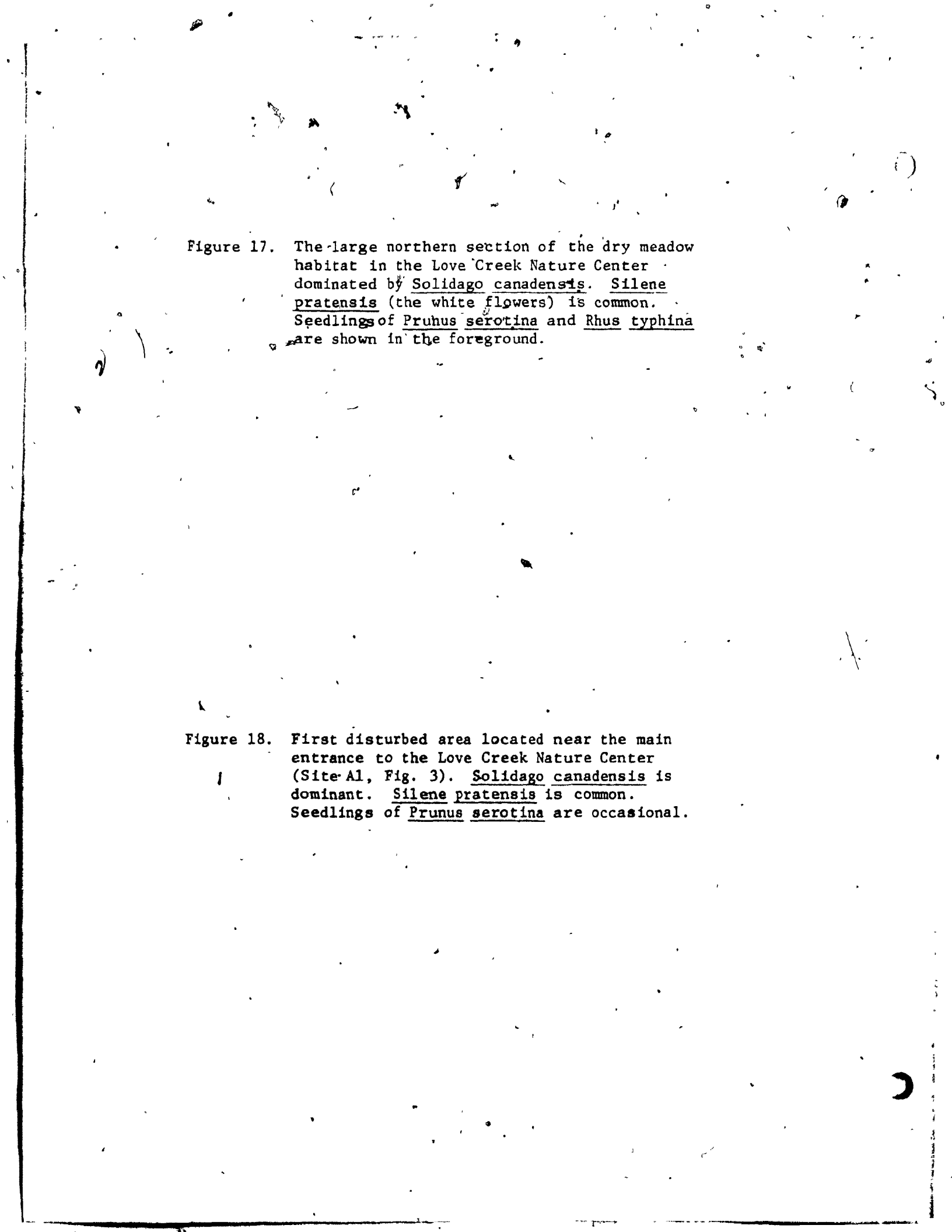


Figure 17. The large northern section of the dry meadow habitat in the Love Creek Nature Center dominated by Solidago canadensis. Silene pratensis (the white flowers) is common. Seedlings of Pruhus serotina and Rhus typhina are shown in the foreground.

Figure 18. First disturbed area located near the main entrance to the Love Creek Nature Center (Site A1, Fig. 3). Solidago canadensis is dominant. Silene pratensis is common. Seedlings of Prunus serotina are occasional.

FIGURES 17 AND 18

COLOURED PICTURES
Images en couleur.

The north division occupies a central large hill which slopes gently throughout the remaining area. The south division is located on a relatively steep slope which extends from a planted red pine ridge southward to the marsh (Fig. 3, 4). The plant community of the north and the south divisions of the meadow are growing on Oshtemo sandy loam soil and Riddles-Oshtemo Soil Complex, respectively (Fig. 3, 5).

Seedlings of various deciduous trees were present in the understory of the Pinus resinosa (e.g. Acer negundo, A. rubrum, A. saccharum, Quercus borealis, Fagus grandifolia, Fraxinus americana, Ulmus americana, U. rubra, Carpinus caroliniana, and Toxicodendron radicans). At the extreme eastern end of the pine ridge, shrubs of Rhus typhina were present.

The dry meadow has been greatly disturbed by man. As recently as ten years ago, the area was planted for agricultural crops (Charles Barnes, personal comm.). In the southwest part, there was a relatively undisturbed grove (Fig. 3). It included Prunus serotina, Fraxinus americana, Ulmus americana, Acer rubrum, A. saccharum, Morus alba, Liriodendron tulipifera, Tilia americana, Crataegus cf. aboriginum, and Vitis riparia.

The meadow formed a continuum with the succession forest to the northwest. Forest invasion into the meadow occurred in this open area, with Prunus serotina, Rhus typhina, and Cornus stolonifera as the dominant invading species.

In the eastern section of the larger division of the dry meadow, seedlings of Prunus serotina and Rhus typhina, as well as shrubs of Rosa multiflora, Rubus cf. flagellaris, R. occidentalis, Crataegus cf. aboriginum, and Vitis riparia were found. Also, a hedgerow at the extreme

eastern border of the area, just beside the Information Office (Fig. 3), included Sassafras albidum, Prunus serotina, Fraxinus americana, Tilia americana, Ulmus rubra and Vitis riparia.

The larger division of the dry meadow was dominated by Aster pilosus, Daucus carota, and Solidago canadensis. Other common herbs were Asclepias syriaca, Bromus secalinus, Dactylis glomerata, Fragaria virginiana, Medicago sativa, Melilotus alba, M. officinalis, Oenothera biennis, Silene pratensis, Trifolium repens, and T. pratense. Other plants are listed in Table 13.

The smaller division of the dry meadow was a grassy area dominated by Bromus inermis, B. secalinus and species such as Asclepias syriaca, Barbarea vulgaris, Campanula americana, Daucus carota, Desmodium viridiflorum, Medicago lupulina, M. sativa, Melilotus officinalis, Oenothera biennis, and Trifolium pratense were present as well. Most of these species were introduced. The introduced "weeds" in this area were numerous, and are indicative of fairly recent disturbance. The extreme southern portion of this area is adjacent to the strip of wood along the marsh. Species such as Stachys hispida, Eupatorium rugosum, and Scutellaria lateriflora were found here. They were absent from other areas of both the small and the large divisions of the dry meadow. In the center of this area a stump with sucker shoots of Ailanthus altissima was present. In the eastern portion of this site, there were shrubs and trees with: Rhus typhina, Quercus borealis, Ulmus americana, Acer saccharum, Tilia americana and Prunus serotina predominate.

Table 13. Alphabetical List of Taxa found in the Dry Meadow Habitat in the Love Creek Nature Center.

Tree Layer

Ailanthus altissima

Carpinus caroliniana

Pinus resinosa

Prunus serotina

Ulmus americana

Ulmus rubra

Shrubs and Trees Seedlings Layer

Acer negundo

Acer rubrum

Acer saccharum

Ailanthus altissima

Carpinus caroliniana

Cornus stolonifera

Crataegus cf. *aboriginum*

Elaeagnus angustifolia

Elaeagnus commutata

Fagus grandifolia

Fraxinus americana var. *americana*

Liriodendron tulipifera

Lonicera canadensis

Lonicera tatarica

Morus alba

Populus tremuloides

Prunus serotina

Quercus borealis

Rhus typhina

Rosa multiflora

Rubus enslenii

Rubus cf. *flagellaris*

Rubus occidentalis

Salix discolor

Sambucus canadensis

Sassafras albidum

Tilia americana

Toxicodendron radicans ssp. *negundo*

Ulmus americana

Ulmus rubra

Vitis riparia

Table 13 continued.

Herbaceous Layer

Achillea millefolium
Agropyron repens
Agrostis gigantea
Ambrosia artemisiifolia
Ambrosia trifida
Andropogon virginicus
Anthemis arvensis
Apocynum cannabinum
Arabis laevigata
Arabis lyrata
Arenaria serpyllifolia var. serpyllifolia
Asclepias syriaca
Asclepias tuberosa
Asparagus officinalis
Asplenium platyneuron
Aster cordifolius
Aster patens var. patens
Aster pilosus
Barbarea vulgaris
Bromus inermis
Bromus secalinus
Campanula americana
Carex sparganioides
Carex vulpinoidea
Centaurea maculosa
Cerastium fontanum ssp. trivale
Cirsium arvense
Dactylis glomerata
Daucus carota
Desmodium nudiflorum
Desmodium viridiflorum
Digitaria sanguinalis
Equisetum arvense
Erigeron annuus
Erigeron philadelphicus
Erigeron strigosus
Eupatorium rugosum
Festuca arundinacea
Festuca obtusa
Fragaria virginiana
Geum canadense
Hieracium pratense
Hypericum perforatum
Juncus tenuis
Lactuca canadensis var. canadensis
Lactuca canadensis var. longifolia
Lactuca serriola
Lepidium campestre

Table 13 continued.

Herbaceous Layer (cont'd)

Medicago lupulina
Medicago sativa
Melilotus alba
Melilotus officinalis
Oenothera biennis
Oxalis stricta
Panicum miliaceum
Paspalum ciliatifolium
Phleum pratense
Picris hieracioides
Poa compressa
Poa nemoralis
Poa pratensis
Potentilla norvegica
Potentilla recta
Prunella vulgaris
Rumex acetosella
Rumex crispus
Scutellaria lateriflora
Setaria glauca
Silene pratensis
Solidago canadensis
Solidago graminifolia var. *nuttallii*
Solidago juncea
Stachys hispida
Taraxacum officinale
Tragopogon dubius
Tridens flavus
Trifolium pratense
Trifolium repens
Verbascum thapsus
Verbena hastata
Vernonia missurica
Veronica officinalis
Vicia cracca
Viola striata

8) The Disturbed Area and Trail Sides

Disturbed areas occupy two parts of the Love Creek Nature Center The first site (A_1 in Fig. 3) occupies the area north of the eastern part of the succession forest. A corn field borders the site on the north and west, and Huckleberry Road on the east. The eastern part is occupied by the northern entrance and parking lot of the Center, on a gently east-west sloping ground Westward, it covers a prominent hill (Fig 3, 4, 18) This area is situated on the Riddles-Oshtemo Soil Complex

Cultivated shrubs and seedlings were planted near the entrance and near the parking lot (P_1, Fig. 3) and included Cercis canadensis, Euonymus alata, Taxus cuspidata, Thuja occidentalis, Picea pungens, Cornus stolonifera, and Acer saccharum. The hill is gently sloping westward and northward. In this area, seedlings of Quercus alba, Prunus serotina, P virginiana, Acer negundo and small bushes of Sambucus canadensis and Rhus typhina were growing. The extreme western end of this area had been invaded by seedlings of Ulmus rubra and Vitis riparia. The whole area had been subjected to disturbance, and hence various annual, biennial, and perennial weeds existed such as Ambrosia artemisiifolia, Oenothera biennis, Daucus carota, Solidago canadensis, Fragaria virginiana, Aster pilosus, and Dactylis glomerata. Other common herbs were Veronica arvensis, Cirsium vulgare, Barbarea vulgaris, Rumex crispus and R. acetosella.

The second disturbed area (A_2, A_3, Fig. 3) is located at the eastern end of the Center. It is bordered by Huckleberry Road and the County Dog Pound on the east and by a dry meadow, the Information Office and the mesic deciduous forest to the west. A gravel service road separates segment A_2 from a larger southern one (A_3, Fig. 19). It is a gently rolling

Figure 19. The second disturbed area (A2, A3, Fig 3), located along the service road to Information Office of the Love Creek Nature Center. Silene pratensis and Solidago canadensis were present. The visible grasses are Bromus spp., Poa spp., Abies balsamea, Prunus serotina and Rhus typhina (in the foreground) were planted.

Figure 20. A frequently disturbed area adjacent to the County Dog Pound, in the Love Creek Nature Center. Rhus typhina and Prunus serotina are in the background. Bromus sp., Digitaria sanguinalis, Silene pratensis and seedlings of Solanum carolinense are present in the foreground.

FIGURES 19 AND 20

area, sloping from Huckleberry Road on the east to the dry meadow on the west. This site is located on the Riddles-Oshtemo Soil Complex and on Oshtemo sandy loam soil.

The northern segment contained a few small shrubs of Rhus typhina and Prunus serotina, and weeds such as Cichorium intybus, Silene pratensis, Potentilla recta, Cirsium vulgare, Agropyron repens, and species of Bromus. A small frequently disturbed area behind the County Dog Pound (Fig. 20) was unique in that it includes common annual weeds: Conyza canadensis, Chenopodium album, Polygonium persicaria and Datura stramonium. Biennial and perennial weeds such as Physalis heterophylla, Solanum carolinense, and Phytolacca americana, grew in less disturbed ground. In this area a few shrubs of Crataegus pedicellata, Populus deltoides, and Prunus serotina persisted. The latter had seedlings scattered throughout the area. Pteridium aquilinum was found at the ecotone between the disturbed area and the succession forest. A lawn of Bromus inermis, B. japonicus, B. secalinus, Dactylis glomerata, Panicum spp., Poa spp. occupied the area between the Information Office and the storage garage (Fig. 3, 19, 21).

A number of planted species were also found here: Acer saccharum, Ligustrum vulgare, Taxus cuspidata, Pinus resinosa, Abies balsamea, Cornus stolonifera, and Populus alba. Portulaca oleracea and Mollugo verticillata were found in the zone between the grassy area and the bare disturbed ground.

At the eastern limit of southern segment A3, a hedgerow borders a ditch along Huckleberry Road; included here were Prunus serotina, Cornus stolonifera, C. florida, Acer saccharum, Ulmus americana, U. rubra, Fraxinus americana, Populus tremuloides, Fagus grandifolia, Liriodendron tulipifera, Vitis riparia, Toxicodendron radicans, and Rhus typhina. Herbs such as

Figure 21. The Information Office of the Love Creek Nature Center. Bromus secalinus, Cirsium sp., Conyza canadensis, Daucus carota, Festuca arundinacea, Silene pratensis, Solidago canadensis are shown in the foreground.

FIGURE 21

Eupatorium coelestinum and Lathyrus latifolius also were found here. Four parallel north-south rows of recently planted Pinus strobus occur just west of this arborescent line. A strip of mixed trees and shrubs are present along the southern boundary of this site. Species included Carpinus caroliniana, Ulmus americana, Prunus serotina, Acer saccharum, and Asimina triloba, and the vine Vitis riparia. Major herbs in this area were: Bromus secalinus, Erigeron annuus, Ambrosia artemisiifolia, Oenothera biennis, Aster pilosus, Solidago canadensis and Daucus carota. Occasional species were Agrostemma githago, Saponaria officinalis, Asclepias tuberosa, and Monarda fistulosa. Verbena cf. calcicola was growing at the ecotone between the disturbed habitat and the mesic deciduous forest. Patches of Epilobium palustre, a rare plant in Michigan (Wagner et al., 1977), were found in moist, marginal locations in the first (A_1) and third (A_3) disturbed habitats.

A few plants of the disturbed areas had been introduced along some trails of the Center. These plants were Hesperis matronalis (T_2), Leonurus cardiaca (T_5), Plantago major and Taraxacum officinale (T_2, T_4) (Fig. 3). Convolvulus sepium (T_2) and Solanum nigrum (T_5) might be introduced from either neighboring properties, or from other habitats of the Love Creek Nature Center. The first species grew in the eastern part of the succession forest adjacent to Huckleberry Road, and the second was found in the upland deciduous forest.

Plant Communities and Soils

The majority of the forest communities in Love Creek Nature Center are located on two major drained soil types. These soils consist

Table 14. Alphabetical List of Taxa found in the Disturbed Habitat and trail sides of the Love Creek Nature Center.

Tree Layer

Acer saccharum	- A3	Prunus serotina	- A3
Carpinus caroliniana	- A3	Ulmus americana	- A3
Populus tremuloides	- A3	Ulmus rubra	- A3

Shrubs and Trees Seedlings Layer

Abies balsamea	- A2	Picea pungens	- A1
Acer negundo	- A1		
Acer saccharinum	- A2	Pinus resinosa	- A2
Acer saccharum	- A1, A2, A3	Pinus strobus	- A3
Asimina triloba	- A3	Populus alba	- A2
Cercis canadensis	- A1	Populus deltoides	- A2, A3
Cornus alternifolia	- A3	Prunus serotina	- A1, A2, A3
Cornus florida	- A3		
Cornus stolonifera	- A1, A2, A3	Prunus virginiana	- A1, A2
Crataegus cf. dodgei	- A1	Pyrus malus	- A2
Crataegus pedicellata	- A2	Quercus alba	- A1
Elaeagnus angustifolia	- A1	Rhus typhina	- A1, A2, A3
Elaeagnus commutata	- A3	Rosa fendleri	- A2
Euonymus alata	- A1	Rosa multiflora	- A1
Fagus grandifolia	- A3	Rubus occidentalis	- A1, A3
Fraxinus americana var. americana	- A2, A3	Salix discolor	- A3
Ligustrum vulgare	- A2	Sambucus canadensis	- A1, A2, A3
Liriodendron tulipifera	- A3		

Table 14 continued.

Shrubs and Trees Seedlings Layer (cont'd)			
Taxus cuspidata	- A1, A2	Ulmus americana	- A1
Thuja occidentalis	- A1	Ulmus rubra	- A1, A3
Toxicodendron radicans ssp. negundo	- A3	Vaccinium corymbosum	- A3
		Vitis riparia	- A1, A3

Herbaceous Layer			
Achillea millefolium	- A1, A2, A3	Asclepias tuberosa	- A3
Agropyron repens	- A1, A2, A3	Aster pilosus	- A1, A2, A3
Agrostemma githago	- A3	Barbarea vulgaris	- A1, A2, A3
Agrostis gigantea	- A2	Bromus inermis	- A1, A2, A3
Alliaria officinalis	- A1	Bromus japonicus	- A1, A2, A3
Allium vineale	- A3	Bromus secalinus	- A1, A2, A3
Ambrosia artemisiifolia	- A1, A2, A3	Capsella bursa-pastoris	- A1, A2, A3
Ambrosia trifida	- A1, A2, A3	Carex vulpinoidea	- A1
Anaphalis margaritacea	- A3	Centaurea maculosa	- A1, A3
Andropogon virginicus	- A1, A2, A3	Cerastium fontanum ssp. trivale	- A1, A2, A3
Antennaria neglecta	- A1, A2, A3		
Anthemis arvensis	- A1, A2, A3		
Apocynum cannabinum	- A1, A3		
Arabidopsis thaliana	- A1, A2, A3		
Arenaria serpyllifolia var. serpyllifolia	- A1, A2, A3		
Asclepias syriaca	- A1, A2, A3	Chenopodium album	- A2

Table 14 continued.

Herbaceous Layer (cont'd)

Cichorium intybus	- A2, A3
Cirsium arvense	- A2, A3
Cirsium vulgare	- A1, A2, A3
Conyza canadensis	- A2
Convolvulus sepium	- T2
Cyperus strigosus	- A1
Dactylis glomerata	- A1, A2, A3
Datura stramonium	- A2
Daucus carota	- A1, A2, A3
Desmodium viridiflorum	- A1
Digitaria sanguinalis	- A1, A2
Epilobium palustre	- A1, A3
Eragrostis pilosa	- A1
Eragrostis spectabilis	- A1, A2, A3
Erigeron annuus	- A1, A2, A3
Erigeron philadelphicus	- A1, A2, A3
Eupatorium coelestinum	- A3
Festuca rubra	- A2
Fragaria virginiana	- A1, A3
Hesperis matronalis	- A1, T2
Hieracium pratense	- A3
Hypericum perforatum	- A1, A3
Hypochaeris radicata	- A2
Juncus tenuis	- A1, A2
Lactuca serriola	- A1, A3
Lamium purpureum	- A1, A2, A3
Lathyrus latifolius	- A3
Leontodon autumnalis	- A3
Lepidium campestre	- A1, A2, A3
Lepidium virginicum	- A1, A2, A3
Leonurus cardiaca	- A3, T5
Leptoloma cognatum	- A2
Lobelia inflata	- A3
Matricaria matricarioides	- A1, A2, A3
Medicago lupulina	- A1, A2, A3
Medicago sativa	- A1, A2, A3
Melilotus alba	- A1, A2, A3
Melilotus officinalis	- A1, A2, A3
Mollugo verticillata	- A2
Monarda fistulosa	- A3
Oenothera biennis	- A1, A2, A3
Oxalis stricta	- A1, A2, A3

Table 14 continued.

Herbaceous Layer (cont'd)

Panicum capillare	- A2
Panicum clandestinum	- A2
Panicum dichotomiflorum	- A2
Panicum implicatum	- A2
Phleum pratense	- A1, A2, A3
Physalis heterophylla	- A2
Phytolacca americana	- A2
Plantago lanceolata	- A1, A2, A3
Plantago major	- A1, A2, A3, T2, T4
Poa pratensis	- A1, A2, A3
Poa trivialis	- A1, A2, A3
Polygonum convolvulus	- A1
Polygonum pensylvanicum var. laevigatum	- A2
Polygonum persicaria	- A1, A2
Portulaca oleracea	- A2
Potentilla argentea	- A2, A3
Potentilla canadensis	- A2, A3
Potentilla norvegica	- A1, A3
Potentilla recta	- A1, A2, A3
Prunella vulgaris	- A1, A2, A3
Pteridium aquilinum	- A2
Ranunculus recurvatus	- A2, A3
Rumex acetosella	- A1, A2, A3
Rumex crispus	- A1, A2, A3
Rumex obtusifolius	- A1
Saponaria officinalis	- A3
Satureja vulgaris	- A2, A3
Secale cereale	- A1, A2, A3
Senecio aureus	- A3
Silene antirrhina	- A2
Silene pratensis	- A1, A2, A3
Solanum carolinense	- A2
Solanum dulcamara	- A3
Solanum nigrum	- T5
Solidago canadensis	- A1, A2, A3
Solidago graminifolia var. nuttallii	- A2, A3
Sonchus asper	- A1, A2, A3
Taraxacum officinale	- A1, A2, A3, T2, T4
Tragopogon dubius	- A1, A3

Table 14 continued.

Herbaceous Layer (cont'd)			
Tragopogon pratensis	- A1	Verbena scabra	- A1
Triodanis perfoliata	- A1, A2, A3	Veronica agrestis	- A1, A2, A3
Trifolium pratense	- A1, A2, A3	Veronica arvensis	- A1, A3
Trifolium repens	- A1, A2, A3		
Verbascum blattaria	- A1	Vicia cracca	- A1, A2, A3
Verbascum thapsus	- A1, A2, A3	Viola arvensis	- A3
Verbena cf. calcicola	- A3	Viola striata	- A3
Verbena hastata	- A1		

Abbreviations: Disturbed areas and trail sides as in Figure 3.

either of a Riddles-Oshtemo Soil Complex and/or a Oshtemo sandy loam. The imperfectly drained Monitor loam, Abscota, and the poorly-drained Cohoctah soils are minor units of the succession forest soil. The marsh-pond community is growing on the Aquents and Histosols soils whereas the stream community runs through a mixture of various soil types: Oshtemo sandy loam, Monitor loam, Cohoctah, Spinks loam, and Udorthents and Udipsamments soils. The communities of the exposed habitats, the north division of the dry meadow and the disturbed areas, are growing on Oshtemo sandy loam and Riddles-Oshtemo Soil Complex respectively. The former soil type is located in a limited area of the disturbed area (A_3), which appears as a continuous extent of the mesic deciduous forest soil, while the latter soil type is in the south division of the dry meadow. Table 15 shows the distribution of the dominant species of the Nature Center communities in relation to soil types.

Table 15. Distribution of Dominant Species in Relation to Soil Types at the Love Creek Nature Center.

Plant Communities	Soil Type	Slope	Dominant Trees	Dominant Shrubs	Dominant Herbaceous Plants
Upland deciduous forest	Riddles-Oshtemo Complex	12-18	Acer saccharum	-	Hydrophyllum appendiculatum
					H. canadense
					Viola canadensis
Mesic deciduous forest	Oshtemo sandy loam	0-12	Ulmus rubra	-	Trillium grandiflorum
			Prunus serotina		
The forest along the north edge of the marsh	Riddles-Oshtemo Complex	12-18	Prunus serotina	Cornus stolonifera	-
			Acer saccharum		
			Ulmus rubra		

continued ...

Plant Communities	Soil Type	Slope %	Dominant Trees	Dominant Shrubs	Dominant Herbaceous Plants
The succession forest	(1) Riddles-Oshtemo Complex	(a) 1- 6 12-18	Fraxinus americana*	-	Andropogon virginicus (1(a))
		(b) 0-12	Prunus serotina*		
		(c) 1- 6 6-12	Ulmus rubra*		Podophyllum peltatum (1(c), 2(d))
	(2) Oshtemo - sandy loam	(d) 18-35			Viola canadensis (1(c), 2(d))
	(3) Cohoctah-Abscota Soil Complex	No data			
	(4) Monitor loam	0 - 3			
The marsh	Aquents and Histosols	0	-	-	Leersia oryzoides Typha angustifolia Typha latifolia

continued

Plant Communities	Soil Type	Slope %	Dominant Trees	Dominant Shrubs	Dominant Herbaceous Plants
Stream sides	Oshtemo sandy loam	0-12	-	-	Equisetum hyemale
Dry meadow	Riddles-Oshtemo Soil Complex	12-18	-	-	Bromus inermis Bromus secalinus
	Oshtemo sandy loam	0-12 6-12 12-18	-	-	Aster pilosus Daucus carota Solidago canadensis
Disturbed areas	Riddles-Oshtemo Soil Complex	1- 6 6-12	-	-	Ambrosia artemisiifolia Aster pilosus Dactylis glomerata Daucus carota Erigeron annuus Fragaria virginiana Oenothera biennis Solidago canadensis

* These dominant trees are on all the slopes of all the soil types of the succession forest.

Endangered and Threatened Species

In recent years, public concern has developed in North America, and within individual states and provinces, about the disappearance and exploitation of our native flora. Because many people in southwestern Michigan are concerned, a discussion of this subject in relation to the flora of the Love Creek Nature Center will follow.

Various terms have been used to describe the status of a species. These include: endangered, threatened, rare and extinct. The Michigan Endangered Species Act of 1974 (Act No. 203) (Wagner et al., 1977) defines an endangered species as "a species of fish or wildlife, or plant life which is in danger of extinction throughout all or a significant part of its range ...", while threatened species are "species which are likely to become endangered species within the foreseeable future throughout all or a significant portion of its range ...". The Technical Advisory Committee [the committee especially concerned with taxa "endangered and threatened" within all the U.S.A. (Wagner et al., 1977)] has listed the following taxa, present in Michigan, as "endangered and threatened": Lycopodium sitchense, Lycopodium sp. nov. J.G. Bruce., Phyllitis scolopendrium var. americana, Woodsia abbeae, Scirpus hallii, Polygonatum biflorum var. melleum, Isotria medeoloides, Arnica cordifolia, Opuntia fragilis, Baptisia leucophaea, Petalostemum purpureum, Castanea dentata, Gentiana saponaria, Nelumbo pentapetala, Chamaerhodos nuttallii, and Chelone obliqua. None of these species were found in the Love Creek Nature Center.

A third term "rare" has also been used. It too has been defined, in the Act of 1974, as "a species or lower taxon that while not "endangered" or "threatened" is extremely uncommon in Michigan and deserves further study and monitoring". A much larger number of species were listed as rare or threatened in Michigan (Wagner et al., l.c.). Some of these were found in the Love Creek Nature Center: Aesculus glabra, Lonicera involucrata, Panax quinquefolium - "threatened"; Asclepias amplexicaulis, Epilobium palustre, Eragrostis pilosa, and Morus rubra - "rare".

Comments by the Michigan Department of Natural Resources (DNR) investigators presently updating and revising the list of Wagner et al. (1977) have indicated that Aesculus glabra and Morus rubra appear to be much more common in Michigan and Berrien County than first thought, and probably will be removed from future, revised lists. However, both species were not common in the Nature Center. Only one plant of Panax quinquefolium was found within the Center and therefore, this species appears very rare. This may be due to intensive public collecting in southwestern Michigan for medical purposes. With the exception of Epilobium palustre, found in the marsh, the remaining species (listed earlier) were found occasionally in habitats undergoing rapid successional change. Only one plant of Asclepias amplexicaulis was found along the margin of the successional forest. As these habitats are changing, the presence of these species within the Center may be put in jeopardy.

THE FLORA

Numerical Summary and Hybrids

The flora of the Love Creek Nature Center includes all vascular plants found in the summer of 1980. The total number of taxa after eliminating the doubtful ones consisted of 91 families, 261 genera, 434 species, 3 subspecies and 19 varieties. These have been broken down into their major taxonomic categories and are presented in Table 16.

The number of introduced species (106) comprised 101 species of the Angiosperm flora of the Love Creek Nature Center, whereas the remaining 5 species are Gymnospermae. Furthermore among the Angiospermae are 23 Monocotyledoneae and 78 Dicotyledoneae. The family representing the largest number of taxa was the Compositae with 58 taxa (12.6% of the total flora). This was followed by Gramineae with 41 taxa (8.9%), Cyperaceae with 29 (6.3%) and the Rosaceae with 22 (4.8%).

Two hybrids were also found in the Center: *Viola affinis* X *sororia* and *Viola striata* X *rostrata*.

Table 16. Synopsis of the Taxonomic Groupings comprising the Flora of the Love Creek Nature Center.

	Families	Genera	Species	Subspecies	Varieties	Total Taxa
Pteridophyta	4	13	21	-	2	23
Spermatophyta						
Gymnospermae	3	6	8	-	1	9
Angiospermae						
Monocotyledoneae	12	51	98	-	4	102
Dicotyledoneae	72	191	307	3	12	322
TOTAL	91	261	434	3	19	456*

* The total taxa of the Flora of Love Creek Nature Center after adding two Viola hybrids (see page 107) is 458.

SUMMARY AND CONCLUSIONS

The study area, Love Creek Nature Center, is located in Berrien County, Michigan. This area of Michigan is located in the broad transition zone between the previously more extensive prairie peninsula to the south and west and the deciduous forests (beech-maple) in the north and east.

Topographic diversity in the Love Creek Nature Center as well as differences in soil moisture and drainage, are responsible for local variation of the vegetation. The history of the site and the seed source are other factors which contribute to this variation. Eight habitats were described: the upland deciduous forest, the mesic deciduous forest, the strip of forest along the northern edge of the marsh, the succession forest, the marsh, the stream sides, the dry meadow, and the disturbed areas and trails.

The forested areas of the Nature Center were rich with a mixture of deciduous, beech-maple forest elements which characterize southwestern Michigan woods. All the forested areas were dominated by Prunus serotina and Ulmus rubra, except the upland deciduous forest which was dominated by Acer saccharum. Fraxinus americana var. americana was one of the dominant trees in the succession forest, and it was also common in the forest strip along the northern edge of the marsh. Such shrubs as Cornus florida, C. racemosa, Crataegus holmesiana, Lindera benzoin, Rhus typhina and Toxicodendron radicans ssp. negundo, and herbs such as Trillium grandiflorum, Podophyllum peltatum, Viola canadensis, Hydrophyllum spp. and Dicentra spp. were found.

The disturbed area and the dry meadow of the Center had a composition similar to other dry meadows of southwestern Michigan. Woody plants like Cornus spp., Prunus serotina, Rhus typhina, and Vitis riparia were invading these open areas. The dominant herbs were Aster pilosus, Bromus spp., Daucus carota, and Solidago canadensis. These two areas did not represent typical southwestern Michigan prairies, although a few elements (e.g. Asclepias tuberosa and Solidago graminifolia) may be present. This was attributed to the lack in the Center, of suitable habitats, such as broad, level outwash plains.

The marsh hydrophytic community was dominated by Leersia oryzoides, Typha latifolia, T. angustifolia, and Carex spp. Epilobium palustre, a rare species in Michigan (Wagner et al., 1977) was common in the marsh. The shrubs Salix amygdaloides and S. discolor were frequent. Streamside depressions were dominated by Equisetum hyemale. These two habitats were conspicuously devoid of submerged and floating aquatic plants, except for Lemna minor which was occasionally present in the marsh.

Because the Center staff have constructed many hiking trails, several weeds were introduced into the forest formations.

The study area was characterized by a rich flora of 434 species, 3 subspecies, 19 varieties, 261 genera, and 91 families. Of the 106 taxa that were introduced within the Center, 101 were Angiospermae and the remaining five were Gymnospermae. Seven species found in Michigan's - "Endangered, Threatened and Rare Species List" (Wagner et al., 1977) were recorded. Two species, Asclepias amplexicaulis and Panax quinquefolium, were restricted to a single plant. These two species are in danger of extinction within the Center and deserve immediate protection.

This thesis has provided information on the previously unknown flora of Love Creek Nature Center. Tree cover was quantitatively studied, but not the shrubs and herbaceous layers. Their abundance was roughly estimated visually. Cover estimation for these would probably have been better done following techniques such as those of Braun-Blanquet (1932). The goal of this thesis was not to describe plant associations, but rather describe the flora of the Center. For this reason, the habitats described do not represent true associations, but rather, broad communities in particular areas of the Center. These often represent heterogenous units. Thus further quantitative studies of ecological associations within the Love Creek Nature Center are still warranted, in relation to topography and soils. It would be particularly interesting to follow the development of the succession of dry meadow, the disturbed areas, and the marsh.

The Center is worth preserving since it is rich in typical floristic elements of various habitats in southwestern Michigan, including a few rare elements. It is hoped that the present goals of the Love Creek Nature Center staff to maintain the Center grounds for educational and investigative studies will be continued. As pressure increases from the public to open up the Center for additional, intensive uses (additional trails, trapping, snowmobiling, picnic areas, etc.), greater constraints will be put on the flora and fauna, and changes will inevitably result. If this thesis helps the Center staff in deciding on future land use policies, then the writer's objectives will have been achieved.

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APPENDIX I

List of Vascular Plants found at the Love Creek Nature Center.

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Aceraceae		
Acer negundo L.	746, 874 (AUB, MTMG)	3(O), 4(R), 7(R), 8(R)
Acer rubrum L.	898 (AUB, MTMG)	1(O), 2(O), 3(C), 4(O), 7(R)
Acer saccharinum L.	921 (AUB, MTMG)	2(R), 8(R)
Acer saccharum Marsh.	685 (AUB, MTMG)	1(D), 2(F), 3(D), 4(C), 7(O), 8(O)
Aizoaceae		
Mollugo verticillata L.	589, 828 (AUB, MTMG)	8(O)
Alismataceae		
Alisma plantago-aquatica L.	393 (AUB)	5(O)
Sagittaria latifolia Willd.	376, 502, 791, 821 (AUB), 502, 821 (MTMG)	5(O), 6(O)

continued

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Anacardiaceae		
Rhus typhina L.	207, 611 (AUB, MTMG)	2(O), 4(F), 7(O), 8(R)
Toxicodendron radicans ssp. *negundo* (Greene) Gillis	111, 155, 374, 801 (AUB, MTMG)	2(R), 3(R), 4(O), 6(R), 7(O), 8(O)
Annonaceae		
Asimina triloba (L.) Dunal	681, 726, 944, 976 (AUB, MTMG)	1(O), 2(O), 4(O), 8(O)
Apocynaceae		
Apocynum cannabinum L.	478, 546 (AUB), 546 (MTMG)	7(R), 8(R)
**Vinca minor* L.	916 (AUB, MTMG)	6(O)
Araceae		
Arisaema triphyllum (L.) Schott	23, 221, 271 (AUB, MTMG)	1(F), 2(F), 4(C)
Symplocarpus foetidus (L.) Nutt.	505, 2591[a] (AUB, MTMG)	3(F), 5(F)
Araliaceae		
Aralia racemosa L.	629, 841 (AUB, MTMG)	1(R), 6(R)
#Panax quinquefolium L.	626 (AUB)	1(R)
Panax trifolium L.	34 (AUB, MTMG)	1(F), 2(F), 4(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Aristolochiaceae		
Asarum canadense L.	30, 290, 2529[a] (AUB), 290, 2529[a] (MTMG)	1(F), 2(F), 6(O)
Asclepiadaceae		
+*Asclepias amplexicaulis* Sm.	555 (AUB)	4(R)
Asclepias incarnata L.	702 (AUB, MTMG)	5(C)
Asclepias syriaca L.	436 (AUB, MTMG)	4(O), 7(C), 8(C)
Asclepias tuberosa L.	479, 481 (AUB), 481 (MTMG)	4(R), 7(O), 8(O)
Balsaminaceae		
Impatiens pallida Nutt.	462, 552 (AUB)	2(O), 3(O), 4(O), 6(F)
Berberidaceae		
**Berberis thunbergii* DC.	675 (AUB, MTMG)	1(R)
Caulophyllum thalictroides (L.) Michx.	75, 86, 165, 309, 2589[a] (AUB, MTMG)	1(O), 2(O)
Podophyllum peltatum L.	51, 77, 165, 198, 270 (AUB), 51, 77, 198, 270 (MTMG)	1(F), 2(F), 4(D)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Betulaceae		
Carpinus caroliniana Walt.	873 (AUB)	1(O), 2(O), 3(O), 4(O), 7(R), 8(R)
Ostrya virginiana (Mill.) K. Koch	797 (AUB), 692, 725 (MTMG)	1(O), 2(O), 4(O)
Boraginaceae		
Hackelia virginiana (L.) Johnst.	797 (AUB, MTMG)	4(O), 6(O)
*Myosotis scorpioides L.	255, 371, 560 (AUB)	6(O)
Campanulaceae		
Campanula americana L.	535, 551, 572 (AUB), 572 (MTMG)	2(O), 3(O), 4(O), 6(O), 7(O)
Triodanis perfoliata (L.) Nieuwl.	97 (AUB, MTMG)	8(O)
Caesalpiniaceae		
Cercis canadensis L.	748 (AUB, MTMG)	8(R)
Caprifoliaceae		
Lonicera canadensis Marsh.	623, 648, 699 (AUB) det. Swa.	1(O), 4(R), 7(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
#Lonicera involucrata (Richards.) Banks	948 (AUB, MTMG) det. Swa.	4(O)
*Lonicera tatarica L.	960 (AUB), 699, 960 (MTMG) det. Swa.	1(O), 7(R)
Sambucus canadensis L.	397, 441, 477 (AUB, MTMG)	2(O), 3(O), 4(O), 7(R), 8(R)
Sambucus pubens Michx.	653 (AUB)	4(O), 6(O)
Viburnum acerifolium L.	68, 87, 469 (AUB), 68, 87 (MTMG)	1(R), 3(O), 4(O)
Viburnum cassinoides L.	708, 938 (AUB, MTMG)	2(O), 3(O)
Viburnum lentago L.	741 (AUB, MTMG)	6(R)
Viburnum opulus L. var. americanum Ait.	330, 933 (AUB), 933 (MTMG)	3(R)
Caryophyllaceae		
*Agrostemma githago L.	161, 242 (AUB, MTMG)	8(O)
*Arenaria serpyllifolia L. var. serpyllifolia	40, 101, 135, 974 (AUB), 135, 974 (MTMG) det. McN.	4(O), 7(C), 8(C)
*Cerastium fontanum Baumg. ssp. triviale (Link) Jalas (= C. vulgatum L.)	9, 96, 134, 186, 262, 418 (AUB), 96, 186, 418 (MTMG) det. McN.	4(O), 7(C), 8(C)
*Saponaria officinalis L.	757 (AUB, MTMG)	8(O)
Silene antirrhina L.	449 (MTMG) det. McN.	8(O)
*Silene pratensis (Rafn) Godron & Gren. (Lychnis alba Miller)	110, 114, 181 (AUB), 110, 181 (MTMG) det. McN.	4(F), 7(C), 8(C)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Celastraceae		
Celastrus scandens L.	837 (AUB)	1(R)
**Euonymus alata* (Thunb.) Sieb.	749 (AUB, MTMG)	8(R)
Euonymus americanus L.	682 (AUB, MTMG)	1(R)
Chenopodiaceae		
Chenopodium album L.	545 (AUB, MTMG)	8(O)
Compositae (Asteraceae)		
Achillea millefolium L.	343, 403 (AUB, MTMG)	4(O), 7(O), 8(O)
Ambrosia artemisiifolia L.	772, 860 (AUB, MTMG)	4(F), 7(C), 8(D)
Ambrosia trifida L.	771 (AUB, MTMG)	4(F), 7(C), 8(C)
Anaphalis margaritacea (L.) Benth. & Hook.	925 (AUB, MTMG)	8(F)
Antennaria neglecta Greene	250 (AUB, MTMG)	8(O)
Antennaria plantaginifolia (L.) Richards.	15, 538 (AUB, MTMG)	4(O)
**Anthemis arvensis* L.	176 (AUB, MTMG)	7(O), 8(O)
Aster cordifolius L.	880, 888 (AUB, MTMG) det. Brouill.	2(O), 4(O), 6(F), 7(O)
Aster patens Ait. var. *patens*	884 (AUB) det. Brouill.	5(C), 7(O)
Aster pilosus L.	883 (AUB), 859, 883 (MTMG) det. Brouill.	2(O), 4(O), 7(D), 8(D)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Aster puniceus L.	804, 902, 906 (AUB), 804, 902, 905, 906 (MTMG) det. Brouill.	2(R), 3(R), 5(C)
Aster simplex Willd.	904 (AUB, MTMG) det. Brouill.	3(O)
Bidens cernua L.	899 (AUB, MTMG)	5(O), 6(O)
Bidens vulgata Greene	915 (AUB, MTMG)	6(O)
*Centaurea maculosa Lam.	759 (AUB, MTMG)	7(O), 8(O)
*Chrysanthemum leucanthemum L.	472 (AUB, MTMG)	4(O)
*Cichorium intybus L.	454 (AUB, MTMG)	4(O), 8(O)
*Cirsium arvense (L.) Scop.	402 (AUB, MTMG)	7(O), 8(O)
Cirsium muticum Michx.	813 (AUB)	3(R)
*Cirsium vulgare (Savi) Tenore	542, 909 (AUB), 573 (MTMG)	8(C)
Conyza canadensis (L.) Cronq.	758 (AUB, MTMG)	8(O)
Erigeron annuus (L.) Pers.	112, 148, 180, 239, 248 554, 838, 913 (MTMG)	4(O), 7(C), 8(D)
Erigeron philadelphicus L.	295 (AUB), 295, 353 (MTMG)	4(O), 6(O), 7(O), 8(O)
Erigeron strigosus Muhl.	142 (AUB), 142, 488 (MTMG)	7(O)
Eupatorium coelestinum L.	878 (AUB, MTMG)	8(O)
Eupatorium maculatum L.	815 (AUB), 783, 815 (MTMG)	5(C)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Eupatorium perfoliatum L.	794 (AUB)	5(F), 6(O)
Eupatorium purpureum L.	790 (AUB)	6(O)
Eupatorium rugosum Houtt.	602, 779, 788, 789, 814, 882 (AUB), 779, 788, 882 (MTMG)	2(O), 3(O), 4(O), 5(O), 6(O), 7(O)
Helianthus decapetalus L.	668 (AUB, MTMG)	4(O)
*Hieracium pratense Tausch	130, 401 (AUB), 130 (MTMG)	7(O), 8(O)
*Hypochaeris radicata L.	250, 473 (AUB), 473 (MTMG)	8(O)
Lactuca canadensis L. var. canadensis	531 (MTMG)	4(O), 7(O)
Lactuca canadensis L. var. longifolia (Michx.) Farw.	833, 834 (AUB), 833 (MTMG)	7(O)
*Lactuca serriola L.	591, 861 (AUB, MTMG)	7(O), 8(O)
*Leontodon autumnalis L.	543 (AUB)	8(O)
*Matricaria matricarioides (Less.) Porter	211 (AUB, MTMG)	4(O), 8(O)
*Picris hieracioides L.	832, 848 (AUB), 832 (MTMG)	4(O), 7(O)
Prenanthes altissima L.	299, 425, 881 (AUB), 881 (MTMG)	1(O), 4(O), 6(O)
Rudbeckia hirta L.	521 (AUB, MTMG)	4(R)
Senecio aureus L.	116, 939 (AUB, MTMG)	3(O), 8(O)
Solidago caesia L.	871, 885 (AUB, MTMG) det. Brouill.	4(F)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Solidago canadensis L.	583, 893 (AUB), 795, 893 (MTMG) det. Brouill.	4(O), 7(D), 8(D)
Solidago flexicaulis L.	887 (AUB), 840, 887 (MTMG) det. Brouill.	4(O), 6(O)
Solidago graminifolia (L.) Salisb. var. nuttallii (Greene) Fern.	822, 886 (AUB), 767, 822, 886 (MTMG) det. Brouill.	7(F), 8(F)
Solidago juncea Ait.	616 (AUB, MTMG) det. Brouill.	7(O)
Solidago nemoralis Ait.	919 (AUB, MTMG) det. Brouill.	4(O)
Solidago patula Muhl.	864, 865, 901 (AUB, MTMG) det. Brouill.	3(O), 5(O)
*Sonchus asper (L.) Hill.	475, 914 (AUB), 475 (MTMG)	4(O), 8(R)
*Taraxacum officinale Weber	2584[a] (AUB)	4(O), 7(O), 8(O), 9(O)
*Tragopogon dubius Scop.	206 (AUB)	4(O), 7(O), 8(O)
*Tragopogon pratensis L.	553 (AUB)	4(O), 8(O)
Vernonia missurica Raf.	830, 855 (AUB), 855 (MTMG)	2(R), 4(R), 7(R)
Convolvulaceae		
*Convolvulus sepium L.	196, 362 (AUB), 362 (MTMG)	4(R), 9(R)
Cuscuta umbrosa Hook.	781, 903 (AUB), 781 (MTMG)	5(O), 6(O)
Cornaceae		
Cornus alternifolia L.f.	910 (AUB)	8(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Cornus florida L.	121, 877 (AUB, MTMG)	1(O), 2(R), 4(O), 8(R)
Cornus racemosa Lam.	737, 740, 742 (AUB, MTMG)	1(R), 2(R), 3(O), 4(O), 6(O)
Cornus stolonifera Michx.	109, 360, 382, 396, 443 695, 715 (AUB, MTMG)	2(R), 3(D), 4(O), 5(R) 6(O), 7(R), 8(R)
Crassulaceae		
Penthorum sedoides L.	808 (AUB, MTMG)	3(O)
Cruciferae (Brassicaceae)		
*Alliaria officinalis Andrz.	59, 587, 787 (AUB), 59, 587 (MTMG) det. Kel.	4(R), 8(R)
*Arabidopsis thaliana (L.) Heyn.	32, 105 (AUB), 32 (MTMG) det. Kel.	8(O)
Arabis laevigata (Muhl.) Poir.	536, 633 (AUB, MTMG)	4(R), 7(R)
Arabis lyrata L.	2602[a] (AUB) det. Kel.	7(O)
*Barbarea vulgaris R.Br.	2, 129, 139, 149, 185, 192, 246 (AUB, MTMG) det. Kel.	4(O), 7(F), 8(F)
*Capsella bursa-pastoris (L.) Medic.	24, 103 (AUB), 24 (MTMG) det. Kel.	8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Cardamine bulbosa (Schreb.) BSP.	946 (AUB, MTMG) det. Kel.	4(O)
*Cardamine hirsuta L.	39 (AUB, MTMG) det. Kel.	4(O)
Dentaria diphylla Michx.	47, 296 (AUB), 296 (MTMG) det. Kel.	4(O)
Dentaria laciniata Muhl.	79 (AUB) det. Kel.	1(O)
*Hesperis matronalis L.	968 (AUB, MTMG) det. Kel.	4(O), 9(R)
*Lepidium campestre (L.) R.Br.	52, 137, 204, 245, 261 (AUB), 52, 204, 245 (MTMG) det. Kel.	4(O), 7(F), 8(F)
Lepidium virginicum L.	450, 457 (AUB), 457 (MTMG) det. Kel.	4(O), 8(O)
*Nasturtium officinale R.Br.	386 (AUB) det. Kel.	5(O), 6(O)
Cucurbitaceae		
Echinocystis lobata (Michx.) T. & G.	796 (AUB, MTMG)	6(R)
Cupressaceae		
*Juniperus communis L. var. communis	429, 528, 565 (AUB), 429 (MTMG)	4(O)
Juniperus virginiana L.	975 (AUB, MTMG)	4(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Thuja occidentalis L.	576 (AUB, MTMG)	8(R)
Cyperaceae		
Carex albursina Sheldon	276 (AUB, MTMG) det. Reznk.	1(O), 6(F)
Carex amphibola Steudel var. turgida Fern.	285, 287 (AUB), 287 (MTMG) det. Reznk.	3(O), 6(F)
Carex arctata Boott	26 (AUB, MTMG) det. Reznk	1(O), 6(F)
Carex bebbii (Bailey) Fern.	378 det. and kept. Reznk	3(O)
Carex blanda Dewey	603, 954 (AUB, MTMG) det. Reznk.	3(F), 6(F)
Carex cephalophora Willd.	580 det. and kept. Reznk.	4(O)
Carex convoluta Mack.	273, 304 (AUB), 304 (MTMG) det. Reznk.	1(O), 6(O)
Carex crinita Lam.	368, 655 (AUB), 655 (MTMG) det. Reznk.	6(O)
Carex cristatella Britton	394, 609, 722 (AUB, MTMG) det. Reznk.	3(O), 5(C), 6(O)
Carex gracillima Schw.	671 det. and kept. Reznk.	4(O)
Carex granularis Willd.	391 (AUB) det. Reznk.	3(O)
Carex hystericina Willd.	285 det. and kept. Reznk.	4(O)
Carex lacustris Willd.	231 (AUB, MTMG) det. Reznk.	5(F), 6(F)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Carex laxiculmis Schw.	293 det. and kept. Reznk.	6(F)
Carex laxiflora Lam.	277 det. and kept. Reznk.	6(F)
Carex leptonervia (Fern.) Fern.	95 det. and kept. Reznk.	1(O)
Carex lupulina Willd.	370 (AUB) det. Reznk.	6(O)
Carex lurida Wahl.	355, 390 (AUB, MTMG) det. ReZnk.	3(O), 5(F)
Carex prasina Wahl.	659 det. and kept. Reznk.	6(F)
Carex rosea Willd.	91, 327 (AUB), 426 (MTMG) det. Reznk.	1(O), 4(O)
Carex sparganioides Willd.	381 (AUB, MTMG) det. Reznk.	3(O), 6(F), 7(O)
Carex stipata Willd.	358, 369, 384, 955, 956 (AUB, MTMG) det. Reznk.	3(O), 6(F)
Carex swanii (Fern.) Mack.	754 det. and kept. Reznk.	6(O)
Carex vulpinoidea Michaux	480, 597 (AUB, MTMG) det. Reznk.	7(O), 8(O)
Cyperus strigosus L.	598, 773, 820 (AUB, MTMG)	3(O), 5(F), 8(O)
Eleocharis erythropoda Steudel	372, 711 (AUB, MTMG) det. Reznk.	3(F), 4(C)
Scirpus atrovirens Willd.	356, 792 (AUB, MTMG) det. Reznk.	6(O)
Scirpus expansus Fern.	389 (AUB, MTMG) det. Reznk.	3(O), 5(F), 6(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Dioscoreaceae		
Dioscorea villosa L.	500 (AUB, MTMG)	2(R)
Elaeagnaceae		
**Elaeagnus angustifolia* L.	961 (AUB, MTMG)	7(R), 8(R)
Elaeagnus commutata Bernh.	923 (AUB, MTMG)	7(R), 8(R)
Equisetaceae		
Equisetum arvense L.	28, 143, 208, 219 (AUB), 219 (MTMG)	4(O), 6(O), 7(R)
Equisetum hyemale L.	29, 289 (AUB)	6(D)
Ericaceae		
Monotropa uniflora L.	578 (AUB)	1(O), 4(O)
Vaccinium corymbosum L.	967 (AUB, MTMG)	8(O)
Fagaceae		
Fagus grandifolia Ehrh.	57, 694 (AUB), 57 (MTMG)	1(F), 2(F), 4(F), 7(R), 8(R)
Quercus alba L.	642, 927 (AUB, MTMG)	1(O), 4(O), 8(R)
Quercus borealis Michx.	319, 640 (AUB), 640 (MTMG)	1(F), 2(F), 3(R), 4(C)
Fumariaceae		
Dicentra canadensis (Goldie) Walp.	2600[a] (AUB, MTMG)	4(F)
Dicentra cucullaria (L.) Bernh.	2599[a] (AUB)	4(F)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Geraniaceae		
Geranium maculatum L.	48, 323 (AUB, MTMG)	1(O)
Gramineae (Poaceae)		
*Agropyron repens (L.) Beauv.	412, 593 (AUB), 175, 412 (MTMG) det. Pohl.	7(C), 8(C)
*Agrostis gigantea Roth	444, 584 (AUB), 444 (MTMG) det. Pohl.	1(O), 6(O), 7(O), 8(F)
*Agrostis tenuis Sibth.	620 (MTMG) det. Pohl.	2(O), 4(O)
Andropogon virginicus L.	895 (AUB, MTMG)	4(D), 7(O), 8(C)
Brachyelytrum erectum (Schreb.) Beauv.	490, 634 (AUB), 490 (MTMG)	1(O)
Bromus inermis Leyss.	127, 140, 213 (AUB, MTMG) det. Pohl.	1(O), 4(F), 7(D), 8(C)
*Bromus japonicus Thunb.	445 (AUB, MTMG) det. Pohl.	8(C)
*Bromus secalinus L.	195, 348, 416, 599 (AUB), 416 (MTMG) det. Pohl.	4(F), 6(O), 7(D), 8(C)
Cinna arundinacea L.	608, 710, 819 (AUB, MTMG) det. Pohl.	2(O), 3(O)
*Dactylis glomerata L.	126, 178, 205, 228, 238, 347, 399 (AUB), 178, 205 (MTMG)	2(O), 3(O), 4(F), 6(O), 7(C), 8(D)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
*Digitaria sanguinalis (L.) Scop.	544 (AUB, MTMG)	4(O), 7(O), 8(O)
Echinochloa muricata (Beauv.) Fern.	785 (AUB, MTMG)	3(O), 4(O)
*&+Eragrostis pilosa (L.) Beauv.	776 (MTMG)	4(O)
*Eragrostis poaeoides Beauv.	775 (AUB, MTMG) det. Pohl.	4(F)
Eragrostis spectabilis (Pursh) Steud.	839 (MTMG) det. Pohl.	8(F)
Festuca arundinacea Schreb.	615, 618 (AUB), 618 (MTMG) det. Pohl.	4(O), 7(O)
Festuca obtusa Biehler	340, 605, 621 (AUB), 340, 605 (MTMG) det. Pohl.	1(O), 2(O), 3(F), 4(F), 6(F), 7(F)
*Festuca rubra L.	594 (AUB, MTMG) det. Pohl.	8(C)
Glyceria melicaria (Michx.) F.T. Hubb.	346, 657 (AUB), 346 (MTMG)	2(O), 3(O), 6(O)
Glyceria striata (Lam.) Hitchc.	607 (AUB, MTMG)	2(O), 3(O)
Hystrix patula Moench	274, 431 (AUB), 274 (MTMG)	1(O), 4(O), 6(F)
Leersia oryzoides (L.) Sw.	807 (MTMG)	1(R), 5(D)
Leersia virginica Willd.	606, 784 (AUB), 606 (MTMG)	2(O), 3(F)
Leptoloma cognatum (Schult.) Chase	897 (MTMG) det. Pohl.	4(O), 8(F)
Panicum capillare L.	761 (AUB, MTMG)	8(O)
Panicum clandestinum L.	540, 654 (AUB), 654 (MTMG) det. Pohl.	4(O), 6(O), 8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Panicum dichotomiflorum Michx.	755 (AUB, MTMG) det. Pohl.	8(O)
Panicum implicatum Scribn.	526, 592 (AUB, MTMG)	1(O), 4(O), 6(O), 8(O)
*Panicum miliaceum L.	614 (MTMG) det. Pohl.	7(R)
Paspalum ciliatifolium Michx.	467 (MTMG) det. Pohl.	7(R)
*Phleum pratense L.	154, 200, 233, 359 (AUB), 200, 359 (MTMG)	4(O), 7(O), 8(O)
Poa alsodes A. Gray	324 (MTMG) det. Pohl.	4(F)
*Poa compressa L.	417, 660 (AUB), 660 (MTMG) det. Pohl.	4(O), 7(C)
Poa languida Hitchc.	430 (MTMG) det. Pohl.	1(O)
*Poa nemoralis L.	610 (AUB, MTMG) det. Pohl.	7(O)
*Poa pratensis L.	98, 128 (AUB), 128, 144 (MTMG) det. Pohl.	7(C), 8(C)
Poa sylvestris A. Gray	74, 422 (AUB), 74 (MTMG) det. Pohl.	1(O)
*Poa trivialis L.	220, 251, 349 (AUB), 220, 235 (MTMG) det. Pohl.	1(O), 4(O), 6(O), 8(C)
*Secale cereale L.	446 (AUB, MTMG) det. Pohl	8(R)
*Setaria glauca (L.) Beauv.	613 (MTMG)	7(O)
Tridens flavus (L.) Hitchc.	831, 896 (AUB), 896 (MTMG) det. Pohl.	4(C), 7(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Hamamelidaceae		
Hamamelis virginiana L.	88, 677 (AUB, MTMG)	1(O), 4(O)
Hippocastanaceae		
#*Aesculus glabra* Willd.	54, 164, 503 (AUB, MTMG)	1(R), 2(R), 3(R), 4(R)
Hydrophyllaceae		
Hydrophyllum appendiculatum Michx.	76, 466, 952 (AUB), 76, 952 (MTMG)	1(D)
Hydrophyllum canadense L.	279, 419, 890 (AUB, MTMG)	1(D), 6(O)
Hypericaceae		
Hypericum perforatum L.	400 (AUB, MTMG)	4(O), 7(O), 8(O)
Iridaceae		
Iris versicolor L.	260, 717 (AUB), 717 (MTMG)	5(O), 6(O)
Juglandaceae		
Carya cordiformis (Wang.) K.Koch	643, 680, 687, 697, 733 (AUB, MTMG)	1(R), 2(F), 4(F)
Juglans cinerea L.	932 (AUB, MTMG)	4(R)
Juglans nigra L.	738, 743 (AUB, MTMG)	1(R), 2(R), 4(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Juncaceae		
Juncus effusus L. var. solutus Fern. & Wieg.	160, 264, 352, 415, 512, 604 (AUB), 379, 604 (MTMG)	1(O), 3(O), 6(O)
*Juncus tenuis Willd.	152, 455, 474, 482, 527, 595, 617 (AUB, MTMG)	1(R), 4(R), 6(F), 7(O), 8(O)
Luzula acuminata Raf. var. acuminata	37, 331 (AUB, MTMG)	4(O), 6(O)
Labiatae (Lamiaceae)		
*Glecoma hederacea L.	957 (AUB)	4(O), 6(O)
*Lamium purpureum L.	46, 184 (AUB), 184 (MTMG)	4(O), 8(O)
*Leonurus cardiaca L.	461, 622 (AUB, MTMG)	4(R), 9(R)
Mentha arvensis L.	559, 806 (AUB, MTMG)	3(O), 6(O)
Monarda fistulosa L.	716 (AUB, MTMG)	8(O)
*Prunella vulgaris L.	476, 525, 534 (AUB), 476, 534 (MTMG)	4(O), 7(F), 8(F)
*Satureja vulgaris (L.) Fritsch	448, 487 (AUB), 448 (MTMG)	4(O), 8(O)
Scutellaria lateriflora L.	556, 704 (AUB, MTMG)	3(O), 6(O), 7(O)
Stachys hispida Pursh	492, 496 (AUB, MTMG)	3(O), 7(O)
Lauraceae		
Lindera benzoin (L.) Blume	62, 89, 641, 690, 691 (AUB, MTMG)	1(O), 2(O), 4(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Sassafras albidum (Nutt.) Nees	731, 747 (AUB , MTMG)	1(O), 4(O), 7(O)
Leguminosae (Fabaceae)		
Amphicarpa bracteata (L.) Fern. var. bracteata	787 (AUB, MTMG)	2(O), 4(F), 6(O)
Apios americana Medic.	811 (AUB, MTMG)	4(O), 6(O)
Desmodium canescens (L.) DC.	548, 624 (AUB), 624 (MTMG)	2(R), 6(O)
Desmodium nudiflorum (L.) DC.	732 (AUB, MTMG)	7(O)
Desmodium viridiflorum (L.) DC.	762 (AUB, MTMG)	4(O), 7(O), 8(O)
*Lathyrus latifolius L.	210, 518 (AUB), 518 (MTMG)	8(O)
*Medicago lupudina L.	102, 124, 153, 170, 199, 247 (AUB), 153, 170, 199 (MTMG)	4(F), 7(C), 8(C)
*Medicago sativa L.	407 (AUB)	4(O), 7(C), 8(O)
*Melilotus alba Desr.	406 (AUB, MTMG)	7(C), 8(C)
*Melilotus officinalis (L.) Desr.	404, 442 (AUB)	7(C), 8(C)
Robinia pseudoacacia L.	159, 646 (AUB, MTMG)	1(C)
*Trifolium pratense L.	113, 212, 236 (AUB), 212, 236 (MTMG)	4(O), 7(C), 8(C)
*Trifolium repens L.	119, 151, 405 (AUB), 119, 405 (MTMG)	7(C), 8(C)
*Vicia cracca L.	210 (AUB, MTMG)	4(O), 7(C), 8(C)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Lemnaceae		
Lemna minor L.	972 (AUB, MTMG)	5(O)
Liliaceae		
Allium canadense L.	377 (AUB, MTMG)	5(O)
Allium tricoccum Ait.	483, 511, 2581[a] (AUB), 483, 511 (MTMG)	1(O), 2(O), 3(O)
**Allium vineale* L.	108, 520 (AUB, MTMG)	1(O), 3(O), 4(O), 8(O)
**Asparagus officinalis* L.	150, 214 (AUB, MTMG)	4(O)
Erythronium americanum Ker.	2593[a] (AUB)	4(O)
Hemerocallis fulva L.	456 (AUB, MTMG)	6(R)
Lilium michiganense Farw.	499 (AUB, MTMG)	3(R), 6(R)
Maianthemum canadense Desf. var. *canadense*	476 (AUB)	4(O)
Polygonatum pubescens (Willd.) Pursh	10 (AUB, MTMG)	4(O)
Smilacina racemosa (L.) Desf.	64, 197, 317 (AUB, MTMG)	1(O), 2(O), 4(O)
Smilacina stellata (L.) Desf.	1 (AUB, MTMG)	1(O), 2(O), 4(O), 6(F)
Smilax hispida Muhl.	862 (AUB)	1(R), 2(R)
Trillium grandiflorum (Michx.) Salisb.	63, 302, 314 (AUB), 63, 314 (MTMG)	1(F), 2(D), 4(O), 6(F)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Limnanthaceae		
Floerkea proserpinacoides Willd.	35, 2582[a] (AUB, MTMG)	1(F), 2(C), 3(C), 6(F)
Lobeliaceae		
Lobelia siphilitica L.	786, 810 (AUB), 786 (MTMG)	5(O), 6(R)
Lobelia inflata L.	764 (AUB, MTMG)	4(O), 8(O)
Lycopodiaceae		
Lycopodium complanatum L. var. *flabelliforme* Fern.	523 (AUB, MTMG)	1(O)
Magnoliaceae		
Liriodendron tulipifera L.	60, 678 (AUB), 678 (MTMG)	1(C), 2(C), 3(R), 4(C), 7(R), 8(O)
Moraceae		
Morus alba L.	163 (AUB, MTMG)	7(R)
†*Morus rubra* L.	874 (AUB)	3(R), 4(R), 6(R)
Oleaceae		
Fraxinus americana L. var. *americana*	638, 724, 793 (AUB, MTMG) det. Swa.	1(F), 2(F), 3(C), 4(D), 7(R), 8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Fraxinus nigra Marsh.	709 (AUB, MTMG) det. Swa.	3(O)
Fraxinum pennsylvanica Marsh. var. *pennsylvanica*	684, 739 (AUB, MTMG) det. Swa.	1(O), 4(O)
**Ligustrum vulgare* L.	924 (AUB, MTMG)	8(O)
Onagraceae		
Circaea canadensis Hill	460 (AUB, MTMG)	1(F), 2(F), 4(O), 6(O)
+Epilobium palustre L.	765 (AUB, MTMG)	5(C), 8(O)
Oenothera biennis L.	574 (AUB, MTMG)	4(O), 7(C), 8(D)
Ophioglossaceae		
Botrychium dissectum Spreng. var. *dissectum*	825 (AUB, MTMG)	1(O), 4(O)
Botrychium matricariaefolium A.Br.	582 (AUB, MTMG)	4(O)
Botrychium virginianum (L.) Sw.	22, 283, 350, 366 (AUB) 283, 366 (MTMG)	1(O), 4(O)
Orobanchaceae		
Epifagus virginiana (L.) Bart.	869 (AUB, MTMG)	4(F)
Orchidaceae		
**Epipactis helleborine* (L.) Crantz	625 (AUB)	1(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Goodyera pubescens (Willd.) R.Br.	107, 735 (AUB), 107 (MTMG)	1(O), 4(O)
Habenaria sp.	782 (AUB)	2(R)
Spiranthes cernua (L.) Rich.	826 (AUB)	4(R)
Oxalidaceae		
Oxalis stricta L.	104, 857 (AUB), 857 (MTMG)	4(O), 7(O), 8(O)
Papaveraceae		
*Chelidonium majus L.	42, 471 (AUB, MTMG)	1(C), 2(F), 4(O)
Sanguinaria canadensis L.	316 (AUB), 281 (MTMG)	1(C), 4(O)
Stylophorum diphyllum (Michx.) Nutt.	4, 420 (AUB), 420 (MTMG)	1(C), 2(F)
Phrymaceae		
Phryma leptostachya L.	459, 510 (AUB), 510 (MTMG)	2(O), 3(O), 4(O)
Phytolaccaceae		
Phytolacca americana L.	453 (AUB, MTMG)	4(R), 8(R)
Pinaceae		
Abies balsamea (L.) Mill.	911 (AUB)	8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
*Picea pungens Engelm.	537 (AUB, MTMG)	8(O)
*Pinus resinosa Ait.	49 (AUB, MTMG)	7(F), 8(O)
*Pinus strobus L.	912 (AUB)	8(R)
Plantaginaceae		
*Plantago lanceolata L.	171, 187, 202, 237 (AUB), 117 (MTMG)	4(O), 8(O)
*Plantago major L.	440, 577, 637 (AUB), 440, 577 (MTMG)	1(R), 4(O), 8(O), 9(O)
Platanaceae		
Platanus occidentalis L.	No collection	2(R), 4(R)
Polemoniaceae		
Phlox divaricata L.	12, 72, 292 (AUB), 12 (MTMG)	1(F), 2(O), 5(O)
Polygonaceae		
Polygonum arifolium L.	748 (AUB, MTMG)	3(O), 6(O)
Polygonum coccineum Muhl.	809 (AUB, MTMG)	5(O)
*Polygonum convolvulus L.	601, 778 (AUB), 778 (MTMG)	8(O)
Polygonum hydropiperioides Michx.	835 (AUB)	5(O)
Polygonum pensylvanicum L. var. laevigatum Fern.	868 (AUB, MTMG)	8(O)
*Polygonum persicaria L.	451, 486 (AUB), 486 (MTMG)	8(O)
Polygonum sagittatum L.	812 (AUB, MTMG)	3(O), 6(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Polygonum virginianum L.	65, 315, 549, 563, 670 (AUB), 315, 549, 670 (MTMG)	1(0), 2(0), 4(0), 6(0)
*Rumex acetosella L.	7, 138, 182, 241, 263 (AUB), 138, 182 (MTMG)	4(0), 7(0), 8(C)
*Rumex crispus L.	123, 177, 209 (AUB, MTMG)	4(0), 7(0), 8(C)
*Rumex obtusifolius L.	515, 600 (AUB), 600 (MTMG)	3(0), 8(0)
Rumex occidentalis Wats.	805 (AUB, MTMG)	3(0)
Polypodiaceae		
Adiantum pedatum L.	464 (AUB, MTMG)	1(R), 4(R)
Asplenium platyneuron (L.) Oakes	33, 229, 253, 452, 530, 541, 570, 829 (AUB), 253, 452, 530, 829 (MTMG)	1(0), 4(0), 7(0)
Athyrium asplenioides (Michx.) A. Eaton	84, 428, 463 (AUB), 428, 463 (MTMG) det. Wag.	1(0)
Athyrium pycnocarpon (Spreng.) Tidest.	879 (AUB, MTMG)	1(R)
Athyrium thelypteroides (Michx.) Desv.	490, 491, 522, 648, 891 (AUB), 490, 522, 648, 891, 917 (MTMG) det. Wag.	1(0), 6(0)
Cystopteris fragilis (L.) Bernh.	428, 484, 571, 974 (AUB), 974 (MTMG) det. Wag.	4(0), 6(0)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Dryopteris intermedia (Willd.) Gray	67, 306, 424, 632, 844 (AUB), 424, 632, 844 (MTMG) det. Wag.	1(0), 3(0), 4(0), 6(0)
Dryopteris marginalis (L.) Gray	421, 631, 649, 665 (AUB), 421 (MTMG) det. Wag.	1(0), 4(0), 6(0)
Dryopteris spinulosa (Muell.) Watt	256, 286, 367, 504, 508 667 (AUB), 367, 504, 508, 569 (MTMG) det. Wag.	3(0), 4(0), 6(0)
Matteuccia struthiopteris (L.) Todaro	732 (AUB, MTMG)	4(R)
Onoclea sensibilis L.	361, 506 (AUB, MTMG)	3(0)
Polystichum acrostichoides (Michx.) Schott	70, 294, 313, 498, 516, 567, 865 (AUB), 70, 294, 313, 516 (MTMG)	1(0), 3(0), 4(0), 6(0)
Pteridium aquilinum (L.) Kuhn	533, 651 (AUB), 533 (MTMG)	4(0), 8(0)
Thelypteris noveboracensis (L.) Nieuwl.	627, 630, 842 (AUB), 630, 842 (MTMG) det. Wag.	1(0), 4(0), 6(0)
Thelypteris palustris Schott	371, 719, 800 (AUB, MTMG) det. Wag.	3(0), 6(0)
Portulacaceae		
Claytonia virginica L.	19, 2598[a] (AUB, MTMG)	4(0), 6(0)
*Portulaca oleracea L.	827 (AUB)	8(0)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Primulaceae		
*Anagallis arvensis L.	307 (AUB)	1(R), 3(O)
*Lysimachia nummularia L.	388, 562 (AUB)	3(O), 4(O)
Steironema ciliatum (L.) Raf.	497 (AUB, MTMG)	3(O), 6(O)
Ranunculaceae		
Actaea alba (L.) Mill.	17, 78 (AUB, MTMG)	1(F), 2(O)
Anemone cylindrica Gray	894 (AUB, MTMG)	4(O)
Anemone virginiana L.	522, 529 (AUB), 522, 619 (MTMG)	1(F), 4(O)
Anemonella thalictroides (L.) Spach	31, 338, 495 (AUB), 31, 2574[a] (MTMG)	1(F), 4(F)
Caltha palustris L.	53, 288, 900 (AUB, MTMG)	3(O), 6(F)
Hepatica acutiloba DC.	284, 2611[a] (AUB), 2611[a] (MTMG)	1(F), 4(O), 6(O)
Isopyrum biternatum (Raf.) T.& G.	2597[a] (AUB, MTMG)	2(O), 3(F)
Ranunculus abortivus L.	3 (AUB), 3, 226, 2580[a] (MTMG)	2(O), 3(F), 4(O)
Ranunculus fascicularis Muhl.	942 (AUB)	2(O), 3(O)
Ranunculus recurvatus Poir.	25, 215, 227 (AUB), 25, 215 (MTMG)	4(O), 8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Ranunculus sceleratus L.	969 (AUB, MTMG)	3(O)
Ranunculus septentrionalis Poir.	2610[a] (AUB)	2(F), 3(O)
Thalictrum dioicum L.	628 (AUB, MTMG)	1(O)
Rosaceae		
Agrimonia gryposepala Wallr.	547 (AUB, MTMG) det. Wat.	2(O), 3(O)
Agrimonia parviflora Ait.	863 (AUB)	2(O), 3(O)
Agrimonia pubescens Wallr.	532, 845 (AUB, MTMG) det. Wat.	1(O), 4(O)
Agrimonia striata Michx.	803 (AUB, MTMG) det. Wat.	2(O), 3(O), 6(O)
Crataegus cf. *aboriginum* Sarg.	977 (AUB) det. Phip.	4(O), 7(R)
Crataegus cf. *dodgei* Ashe	167 (AUB) det. Phip.	8(R)
Crataegus holmesiana Ashe	21 (AUB), 689 (MTMG) det. Phip.	1(O), 4(O)
Crataegus pedicellata Sarg.	173, 686 (MTMG) det. Phip.	1(O), 4(O), 8(R)
Crataegus cf. *pringlei* Sarg.	639 (AUB) det. Phip.	1(O)
Crataegus punctata Jacq.	73 (AUB) det. Phip.	1(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Fragaria virginiana Duchesne.	41 (AUB), 41, 2596[a] (MTMG)	4(O), 7(C), 8(D)
Geum canadense Jacq.	364, 410 (AUB, MTMG)	2(O), 4(O), 6(O), 7(O)
*Potentilla argentea L.	166, 169, 243, 866 (AUB), 166 (MTMG)	8(O)
Potentilla canadensis L.	866 (AUB)	8(O)
Potentilla norvegica L.	590, 756 (AUB)	4(O), 7(O), 8(O)
*Potentilla recta L.	131, 183, 249 (AUB), 120, 131, 183, 249 (MTMG)	7(C), 8(C)
Prunus serotina Ehrh.	50, 117, 122, 189, 223, 720 (AUB, MTMG)	1(D), 2(D), 3(D), 4(D), 6(F), 7(O), 8(O)
Prunus virginiana L.	136, 179, 612, 730, 937 (AUB, MTMG)	1(O), 2(O), 4(O), 8(O)
*Pyrus malus L.	752 (AUB), 27, 752 (MTMG)	4(O), 8(O)
Rosa fendleri Crep.	190 (AUB)	8(R)
*Rosa multiflora Thunb.	203, 234, 265, 409 (AUB, MTMG)	4(O), 7(R), 8(R)
Rosa palustris Marsh.	395 (AUB, MTMG)	2(R)
Rosa virginiana Mill.	513 (AUB, MTMG)	2(O)
Rubus allegheniensis Porter.	224 (AUB, MTMG)	4(O)
Rubus cf. flagellaris L.	971, 972 (AUB), 972 (MTMG)	1(O), 4(O), 7(O)
Rubus occidentalis L.	973 (AUB, MTMG)	2(O), 3(F), 4(O), 7(O), 8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Rubiaceae		
Cephalanthus occidentalis L.	920 (AUB, MTMG)	3(R)
Galium aparine L.	20, 93, 106, 941 (MTMG) det. Wat.	1(O), 4(O), 5(O)
Galium circaezans Michx.	326, 337, 465 (MTMG) det. Wat.	4(O), 6(F)
Galium kamtschaticum Steller	254 (AUB)	4(O)
Galium tinctorium L.	836 (AUB, MTMG) det. Wat.	5(C)
Galium trifidum L.	712 (AUB), 712, 799 (MTMG) det. Wat.	4(O), 5(O), 6(F)
Galium triflorum Michx.	272, 514 (MTMG) det. Wat.	2(O), 3(O), 4(O)
Mitchella repens L.	328, 434 (AUB), 434 (MTMG)	4(O)
Rutaceae		
Zanthoxylum americanum Mill.	729 (AUB, MTMG)	1(R), 4(R)
Salicaceae		
**Populus alba* L.	922 (AUB, MTMG)	8(O)
Populus deltoides Marsh.	38, 750, 908 (AUB, MTMG)	2(O), 6(O), 8(R)
Populus tremuloides Michx.	392 (AUB), 392, 2587[a] (MTMG)	2(O), 3(C), 4(O), 5(F), 6(O), 7(R), 8(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Salix amygdaloides Anderss.	707, 2588[a] (AUB), 2588[a] (MTMG) det. Arg.	3(F), 5(F), 6(F)
Salix bebbiana Sarg.	373, 930 (AUB) det. Arg.	3(O)
Salix discolor Muhl.	818, 949, 2585[a], 2586[a] (AUB), 2585[a], 2586[a] (MTMG) det. Arg.	2(F), 3(C), 4(O), 5(O), 6(F), 7(O), 8(R)
Salix eriocephala Michx. (S. rigida Muhl.)	875 (AUB) det. Arg.	4(F), 6(F)
Salix exigua Nutt. (S. interior Rowlee)	258 (AUB) det. Arg.	4(O), 6(F)
Saururaceae		
Saururus cernuus L.	489 (AUB, MTMG)	6(O)
Saxifragaceae		
Mitella diphylla L.	13, 291, 339 (AUB), 13, 291, 2577[a] (MTMG)	1(C), 2(O), 4(O)
Ribes americanum Mill.	14, 375, 950 (AUB, MTMG)	3(O), 6(O)
Ribes cynosbati L.	81, 344, 558 (AUB), 81, 2615[a] (MTMG)	1(O), 2(O), 3(O), 4(O)
Saxifraga pensylvanica L.	387, 943 (AUB, MTMG)	3(O)
Scrophulariaceae		
Mimulus ringens L.	700, 824 (AUB, MTMG)	5(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Pedicularis canadensis L.	5, 318 (AUB, MTMG)	4(O), 6(O)
**Verbascum blattaria* L.	447 (AUB, MTMG)	8(O)
**Verbascum thapsus* L.	437 (AUB, MTMG)	7(R), 8(O)
**Veronica agrestis* L.	959 (AUB, MTMG)	8(C)
**Veronica arvensis* L.	36, 100, 2506[a] (AUB), 36, 100 (MTMG)	8(C)
**Veronica officinalis* L.	145, 257, 325, 345, 408 (AUB), 145, 325, 345 (MTMG)	1(C), 4(O), 6(O), 7(O)
Simarubaceae		
**Ailanthus altissima* (Mill.) Swingle	55 (AUB, MTMG)	4(O), 7(O)
Solanaceae		
Datura stramonium L.	760 (AUB)	8(R)
Physalis heterophylla Nees	172 (AUB, MTMG)	8(O)
Solanum carolinense L.	438 (AUB)	8(O)
**Solanum dulcamara* L.	266, 383, 509, 766 (AUB), 266 (MTMG)	3(O), 6(F), 8(R)
Solanum nigrum L.	867, 889 (AUB), 889 (MTMG)	1(O), 9(R)
Sparganiaceae		
Sparganium americanum Nutt.	816 (AUB, MTMG)	5(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Taxaceae		
*Taxus cuspidata Sieb. & Zucc.	745 (AUB, MTMG)	8(O)
Thymelaeaceae		
Dirca palustris L.	728 (AUB, MTMG)	4(R)
Tiliaceae		
Tilia americana L.	56, 320, 688, 706 (AUB, MTMG)	1(O), 2(O), 4(O), 7(R)
Typhaceae		
Typha angustifolia L.	507 (AUB)	5(D)
Typha latifolia L.	703, 721 (AUB), 703 (MTMG)	5(D)
Ulmaceae		
Celtis occidentalis L.	58, 736 (AUB, MTMG)	1(O), 2(O), 4(O)
Ulmus americana L.	11 (AUB, MTMG)	1(R), 4(R), 7(R), 8(R)
Ulmus rubra Muhl.	679, 928 (AUB, MTMG)	1(C), 2(D), 3(D), 4(D), 5(O), 7(R), 8(O)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Umbelliferae (Apiaceae)		
Cicuta maculata L.	652 (AUB)	2(O), 3(R)
Cryptotaenia canadensis (L.) DC.	216, 222, 298, 332 (AUB, MTMG)	1(O), 2(O), 4(F), 6(F)
*Daucus carota L.	439 (AUB, MTMG)	4(C), 7(D), 8(D)
Osmorhiza claytonii (Michx.) Clarke	303, 312, 945 (AUB, MTMG)	1(C), 2(O), 4(O), 6(F)
Osmorhiza longistylis (Torr.) DC.	69 (AUB, MTMG)	1(C), 2(C), 4(F)
Sanicula canadensis L.	85, 470, 698 (AUB) 85, 470 (MTMG)	1(O)
Sanicula gregaria Bickn.	162, 333, 561, 664 (AUB, MTMG)	1(O), 2(O), 4(O), 6(O)
Sium suave Walt.	734 (AUB, MTMG)	6(O)
Urticaceae		
Boehmeria cylindrica (L.) Sw.	550, 780, 802 (AUB), 550, 780 (MTMG)	1(O), 3(O), 4(O), 6(O)
Laportea canadensis (L.) Wedd.	280, 494, 517, 669, 817 (AUB, MTMG)	1(O), 2(O), 3(F), 4(O), 5(O), 6(F)
Pilea pumila (L.) Gray	870 (AUB, MTMG)	1(O), 6(O)
Urtica dioica L. spp. gracilis (Ait.) Selander	191, 496, 564, 705, 823 (AUB, MTMG)	3(F), 4(O), 5(F), 6(O)
Verbenaceae		
Verbena cf. calcicola Small	926 (AUB, MTMG) det. Swa.	8(R)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Verbena hastata L.	701 (AUB, MTMG)	5(C), 7(O), 8(O)
Verbena scabra Vahl	524, 575 (AUB), 575 (MTMG)	1(O), 4(O), 5(O), 8(O)
Violaceae		
Viola affinis Leconte x sororia Willd.	2605[a] (AUB) det. Bal.	2(O)
*Viola arvensis Murr.	44, 99 (AUB) det. Bal.	8(O)
Viola canadensis L.	43, 80, 308, 311, 485, 650, 892, 964 (AUB), 80, 311, 650, 964 (MTMG) det. Bal.	1(D), 2(C), 4(C)
Viola conspersa Reichenb.	16 (AUB) det. Bal.	4(O)
Viola pubescens Ait. var. eriocarpa (Schwein.) Russel	6, 92, 300, 963, 970 (AUB), 92, 963 (MTMG) det. Bal.	1(O), 2(O), 4(O)
Viola rostrata Pursh	18 (AUB) det. Bal.	1(F)
Viola sororia Willd.	2612[a] (AUB) det. Bal.	2(F)
Viola striata Ait.	94, 278, 322, 934, 962 (AUB, MTMG) det. Bal.	1(F), 4(F), 7(O), 8(O)
Viola striata Ait. x rostrata Pursh.	936 det. and kept. Bal.	1(F)
Vitaceae		
Parthenocissus inserta (Kern.) Fritsch	133, 398, 485 (AUB), 398, 485 (MTMG)	3(O), 4(C)

continued ...

Family Species	Collection number[a] (Herbarium)[b]	Habitat[c] (Abundance)[d]
Parthenocissus quinquefolia (L.) Planch.	259, 644 (AUB), 644 (MTMG)	1(O), 3(R), 4(C)
Vitis aestivalis Michx. var. argentifolia (Munson) Fern.	696 (AUB, MTMG)	1(O)
Vitis riparia Michx.	201, 244, 566, 727, 753 (AUB), 201, 566, 727, 753 (MTMG)	2(O), 4(O), 7(O), 8(O)

a: All collection were by Hamodie, except those designated by -a-, which were collected by Dennis Woodland and Kathy Hayes.

b: Herbarium (in brackets) in which specimens were deposited (see Materials and Methods).

c: Habitat abbreviation - 1, upland deciduous forest; 2, the mesic deciduous forest; 3, the forest strip along the northern edge of the marsh; 4, succession forest; 5, the marsh; 6, the stream sides; 7, the dry meadow; 8, the disturbed area; 9, the trail sides.

d: Abundance (in brackets) abbreviation - D, Dominant; C, Common; F, Frequent; O, Occasional; R, Rare.

: All species were native to the Nature Center, except where designated by --; these were introduced.

+: Plants considered as rare in Michigan (Wagner et al., 1977).

#: Plants considered as threatened in Michigan (Wagner et al., 1977).