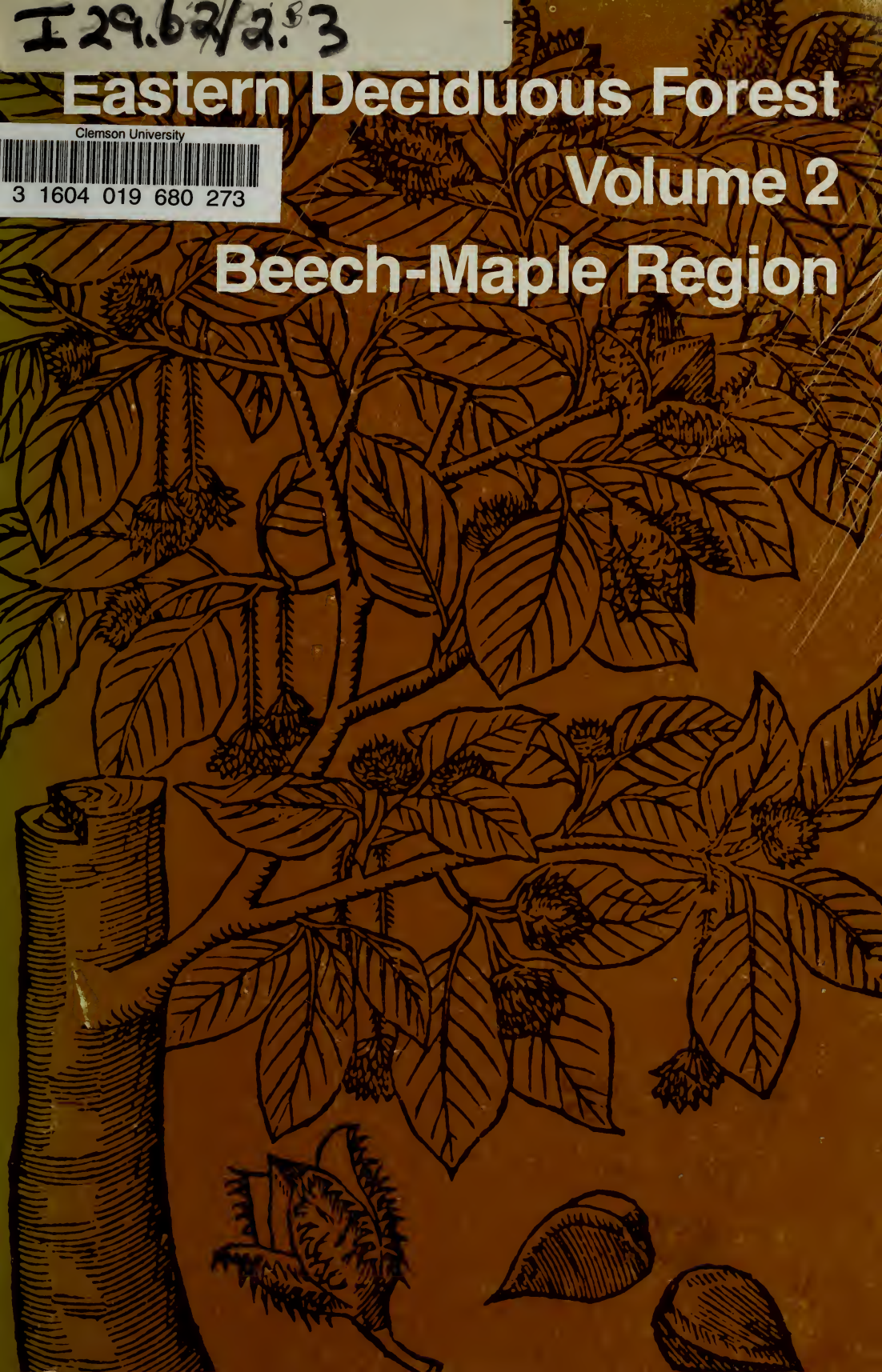
Eastern Deciduous Forest

Volume 2

Beech-Maple Region



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Eastern Deciduous Forest
Volume 2
Beech-Maple Region

Inventory of Natural Areas and Sites Recommended as Potential Natural Landmarks

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As the Nation's principal conservation agency, the Department of the Interior has basic responsibility for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources." The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States–now and in the future.

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Preface

The areas compiled in this book are within the beech-maple or maple-basswood region as mapped by E. Lucy Braun (1950) and are ordered according to location by state and the forest type they represent. Only forested areas are included here; we reported on wetlands and prairies and geological and archeological sites within the two regions in an unpublished supplement (Lindsey and Escobar 1970, Vol. 3). The forests described are not limited to those dominated by those species indicated by Braun's regional names since varied stand types occur within any forest region.

The natural areas of Indiana have been described in detail in a book by Lindsey et al. (1970); since this volume is back in print, it is unnecessary to repeat these descriptions. However, those few forested tracts which have been reported for the beech-maple region in Indiana between the time of preparation of that book and the present writing (1970) are included here.

In addition to the areas we are listing for Minnesota, there are many more which remain to be preserved. A preliminary (unpublished) list, compiled by Thomas Morley, Department of Botany, and L. D. Franzel of Entomology, Fisheries and Wildlife, University of Minnesota, St. Paul, estimates more than 6000 acres of woodland in 13 counties. Of these, nearly 200 acres of maple-basswood forest are listed, 200 acres of oak woods, 900 acres of pines, and 30 acres of savanna. The rest is listed simply as woods or forest. All of these areas are being considered for purchase or other protective measures by the Nature Conservancy. Tract names and exact locations are not furnished. Very little of Minnesota is included in the two forest regions of our present concern.

Long lists of species are relegated to the Appendix, and these are referred to in the text descriptions. Common names of plants are preferable in the text for the present purpose, with the technical name given at first mention. It has not proved feasible to follow any floristic work consistently in use of technical names. The data have been collected from numerous sources, and the original nomenclature has been retained due to uncertainties that would have been introduced by reinterpretation.

The study was made possible by a contract with the U.S. Department of the Interior, National Park Service. Since the authors examined very few of the areas in the field (except in Indiana), we cannot offer firsthand evaluation of the value of areas elsewhere for preservation. However, all areas included are either already protected in some degree, or are judged by qualified local observers to be worth considering for permanent protection.

We are grateful to the individuals and agencies who responded to our inquiries and are named at the ends of the tract descriptions. Thanks also go to Dr. Grant Cottam for permission to use selected data from files of the Plant Ecology Laboratory of the University of Wisconsin.

The authors deplore the newly current use of the term "wilderness" as a propaganda buzz word to characterize even small natural areas in the Midwest. This thoughtlessness corrupts an invaluable concept and confuses public thought. It has no place in factual writing. We know of no lands in the beech-maple or maple-basswood regions that may properly be called "wilderness."

Any hope of a definitive inventory for a large area is futile. Of making many natural areas there is no end, provided that standards of quality are progressively relaxed. In Indiana, for example, inventories made during one decade number fourteen; but high-quality natural areas are still being lost at an average rate of three per year. It is the authors' hope for all regions that the period of emphasis on complete inventories on paper will soon be followed by one of greater activity in and better financing for actually acquiring and preserving the best areas that still lack the fullest possible protection (Lindsey 1968). This will go far toward insuring later enjoyment, education, and detailed scientific study in these most outstanding wild tracts.

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West Lafayette, Indiana

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Foreword

The National Registry of Natural Landmarks is a program of public service administered by the National Park Service under the authority of the Historic Sites Act of 1935. The objectives of the Natural Landmarks Program are (1) to encourage the preservation of sites significantly illustrating the geological and ecological character of the United States, (2) to enhance the educational and scientific value of sites thus preserved, (3) to strengthen cultural appreciation of natural history, and (4) to foster a greater concern for the conservation of the Nation's natural heritage.

Under this program, the National Park Service strives to assure the preservation of such a variety of nationally significant natural areas that, when considered together, they will illustrate the diversity of the country's natural environment.

The Natural Landmarks Program is voluntary on the part of the owners. Landmark designation does not change ownership or responsibility for the property. There is no legislative authority for acquisition of natural landmarks. It is primarily a recognition type of program.

Registered Natural Landmarks may display, but are not limited to, one or more of the following characteristics:

1. Outstanding geological formations or features that significantly illustrate geologic processes.
2. Significant fossil evidence of the development of life on earth.
3. An ecological community significantly illustrating characteristics of a physiographic province or a biome.

4. A biota of relative stability maintaining itself under prevailing natural conditions, such as a climatic climax community.

5. An ecological community significantly illustrating the process of succession and restoration to natural condition following disruptive change.

6. A habitat supporting a vanishing, rare, or restricted species.

7. A relict flora or fauna persisting from an earlier period.

8. A seasonal haven for concentrations of native animals or a vantage point for observing concentrated populations, such as a constricted migration route.

9. A site containing significant evidence illustrating important scientific discoveries.

10. Examples of the scenic grandeur of our natural heritage.

In order to qualify as a Registered Natural Landmark, a site is first recommended as a potential natural landmark in a comparative theme study inventory such as this one concerning the Eastern Deciduous Forest theme. The information in these theme studies is largely based on secondary sources. The area is then evaluated in the field by a professional who is especially knowledgeable about the theme represented at the site. Upon recommendation by the field evaluator, it is further reviewed by the Secretary of the Interior's Advisory Board on National Parks, Historic Sites, Buildings and Monuments. If the Advisory Board concurs in the evaluation, the site is recommended to the Secretary who finally determines eligibility for inclusion in the National Registry of Natural Landmarks. The final step is for the owner, whether public or private, to voluntarily file an application for official Registered Natural Landmark designation. In so doing, the owner agrees to maintain the natural integrity of the site and to manage it in a manner consistent with accepted conservation and use practices. Upon receipt of the application, the National Park Service presents a certificate and an engraved, bronze plaque to the owner.

In the future, this theme study will be updated, and all potential natural landmarks reported in this book that are eventually listed on the National Registry of Natural Landmarks will be identified and described more fully.

As the National Park Service evaluates sites through the Natural Landmarks Program, it is also gradually completing an inventory of the country's natural areas. These studies focus attention on important natural areas and often stimulate communities, states, and conservation organizations to take action in preserving significant areas.

Readers desiring further information concerning the Natural Landmarks Program should contact the Chief Scientist, National Park Service Science Center, National Space Technology Laboratories, Bay St. Louis, Mississippi 39520.

Gary E. Everhardt
Director, National Park Service
Department of the Interior
Washington, D.C.

Part 1

Chapter 1

The Beech-Maple Association

Geological History and Geographic Distribution

Any discussion of the present distribution of vegetation in eastern North America must necessarily begin with a review of the recent geologic events, from the Tertiary to the present.

The great mixed mesophytic forests that were found on the North American continent during the Tertiary were reduced in size with the elevation of the Rocky Mountains and the resultant rain shadow which this elevation produced. The more xerophytic species were segregated from the mesophytic forest as it concentrated eastward toward areas of more favorable moisture conditions; and with the advent of the Pleistocene, the cooler climate forced a migration of the forest southward and a reduction of the original forest area to the north.

The area of this study, the beech-maple forest region as mapped by Braun (1950), lies largely within the area of the latest major glaciation, so that subsequent development of a forest type on this land, sterilized by several thousand years of ice cap, involved migration and succession on this bare land. The migration proceeded from the mixed forest that had been reduced in size but which had largely the same composition as that of the Tertiary forest. This mixed forest had survived during the Pleistocene in nonglaciated areas to the south. Succession involved the preparation of the soil for the invasion of herbaceous

and arboreal species, and the replacement of one by another until a rough equilibrium with climatic and edaphic factors was achieved.

The period of time from the retreat of the Wisconsin stage of glaciation to the present is some 21,000 to 12,000 years Before Present (BP) in Indiana (Wayne 1966) and has been divided by some authors into three rather distinct climatic phases, according to evidence taken from pollen profiles. The first period was one of increasing warmth, producing cool, moist conditions favorable to the establishment of a spruce-fir forest. This was followed by a warmer, dry period and the invasion of the conifer forest by species tolerant of xerothermic conditions. According to Sears (1967), studies of the pollen profiles of the Castalia Prairie in Erie County, Ohio, indicate that the onset of the xerothermic period occurred about 3600 years ago. Peaks of prairie pollen occur within the coniferous lake sediments and indicate that representatives of the grassland community migrated eastward during the time of glacial retreat and were present to become established at the onset of the dry, warm climatic period.

This period of maximum warmth was followed by one of decreasing warmth, leading to the moist mesothermic conditions that prevail today in the beech-maple forest region.

Sears (1942) suggested that there were fluctuations in the postglacial climate that would indicate five major climatic divisions rather than three. Based on evidence from 117 bogs and the work of several authors, he proposes that the first moist, cool period was followed by a dry, probably warmer period, with oak and pine dominance. This was followed by a more humid, warm period, with a maximum of beech and, in places, of hemlock. Another warm, dry period and the establishment of oak and hickory reduced the presence of beech to a minimum. Finally, he notes a last, cooler, moister climate comparable to that of the present.

Since the glaciated area was populated entirely by postglacial migrations, it would be valuable to examine the means and routes of such migrations which led to the establishment of large areas of relatively uniform forest composition. What are the characteristics of beech and maple which have favored their migration into and across this area? First, of course, is their adaptation to the prevailing climate. The second is their ability to establish themselves on the newly glaciated terrain.

Sugar maple *(Acer saccharum)* reproduces very rapidly; in a mature stand, one million seeds per acre can be consistently produced. Distribution is uniform and the wind-blown samaras can travel considerable distances. Seedlings can tolerate long periods of suppression and grow rapidly when released from suppression. Perhaps most important in terms of establishment and dominance, it reproduces well in shade. Of the hardwood species, only beech *(Fagus grandifolia)* equals sugar maple in reproductive capacity. Hemlock *(Tsuga canadensis)* and yellow birch *(Betula alleghaniensis)* produce large quantities of seeds, but they often dry out on the surface of the forest litter (Bourdo 1968). Beech seeds contain large quantities of food for the developing embryo and frequently

reproduce by root sprouts (Ward 1961). Beech is superior to maple in its tolerance of poorly drained and poorly aerated substrate conditions found on younger topography.

It is generally agreed that the migrations occurred mainly from *refugia* in the southeastern United States, probably from the Appalachian mountain and plateau region of the mixed forest which had essentially the same composition as that of the great Tertiary forest. Braun (1950) and Sears (1942) further suggested that some of the species may have migrated from the Driftless Area of Wisconsin, northern Illinois, and eastern Iowa, which had also served as a *refugium* during the period of glaciation. Sears has mapped the occurrence of beech pollen from the bogs of several states and has found that it occurs in the lowest bog strata on the East Coast in New Hampshire, Massachusetts, and Connecticut, and in the same relative position in bogs near the Driftless Area. From these points beech and maple migrated onto the soils prepared for their advance by previous vegetation.

The xerothermic period, in which oaks advanced, delayed the migration of beech and maple into Indiana. Pollen records indicate an early entry of oak and a late entry of the mesophytic species into the central part of the state (Petty and Jackson 1966); and it has been postulated that their further advance north and westward was impeded by the presence of the Prairie Peninsula which acted as a filter barrier to their spread (Benninghoff 1964).

Previous to the arrival of white settlers, the migration of tree species westward may also have been impeded and even set back in some areas by fires set by Indians (Gleason 1922; Transeau 1935).

Beech is a mesophytic species that drops out of the association at the eastern border of Wisconsin. It is interesting to speculate, in terms of its origin and capacity to migrate, how beech reached Wisconsin across the barrier of the Glacial Great Lakes. As previously mentioned, Braun (1950) suggested that there may have been a *refugium* for tree species in the Driftless Area. However, more recent publications by geologists (Frye, Willman, and Black 1965) present evidence for the glaciation of the Driftless Area based on fragments of Precambrian igneous rocks, and Paleozoic chert and sandstone that rest on younger formations. Black believed that Wisconsin glaciers covered the Driftless Area of Wisconsin, but Frye and Willman considered the scattered erratic cobbles in the Illinois part of the Driftless Area as more likely to be remnants of an old glaciation, probably Nebraskan.

If there was no *refugium* for tree species in this Driftless Area, then the migration of beech and maple must have proceeded northwestward from the area of the present mixed mesophytic forest and northward from the western mesophytic forest region.

If we accept five periods of fluctuating temperature as proposed by Sears, a beech maximum occurred in period III in which the migration of beech extended its range farther west than its present limits. The subsequent xerothermic period reduced the western limits of beech to scattered stands along the western edge of Lake Michigan. However, if the migration of beech preceded the oak-

hickory dominance of the forest region, the pollen profiles as recorded in the bogs of the region should demonstrate this sequence.

Since we have already seen that the pollen records of Indiana do not show this sequence, we may turn to another explanation for the migration of beech into Wisconsin and areas to the west.

Beech was present in central and southwestern Michigan some time before pollen records show it to be present in Indiana. A third possibility is that these deciduous species migrated over the area to the north of Indiana and Illinois over terrain now covered by Lake Michigan. Using radiocarbon dating, Flint (1957) proposed a low phase of Lake Michigan and Lake Huron called the Lake Chippewa and Lake Stanley stages and dated these low-level stages at about 5000-6000 years B.P. Drainage of these lakes was presumably through a channel perhaps as low as sea level at North Bay, Ontario, leading into the valleys of the Mattawa, Ottawa, and St. Lawrence rivers. Since then, the channel may have been elevated by crustal uplift to about 600 ft. With this elevation, the channel was closed and the Great Lakes reached a higher Nipissing Great Lakes level.

The possibility of a low-water Lake Chippewa stage provides us with another possible migration route of the beech-maple forest type across the lacustrine soils now covered by the present Lake Michigan. Bog records show a conifer forest in Indiana some 8000 years ago (Wayne 1966), followed by a deciduous forest. The low-water stage of Lake Michigan 5000-6000 years ago falls between that cool, moist stage and the onset of the xerothermic period 3600 years ago as calculated by Sears (1967). This approximate date for the low-water stage also compares favorably with estimates for the dominance of beech and maple in the forests of southern Michigan (Benninghoff 1964).

This would imply that beech, maple, basswood *(Tilia americana)*, and perhaps other species migrated from the southwestern counties of Michigan across the lower area occupied by the present Lake Michigan to Wisconsin without leaving an early pollen record in the bog profiles of northwestern Indiana and northeastern Illinois. We cannot discard, of course, the possibility that animals (such as the passenger pigeon or prehistoric man) may have aided in the distribution of beech across areas that would normally have been unfavorable to their establishment.

Before leaving a discussion of the beech and maple migrations from the Pleistocene *refugia* to their present range, we should examine more critically the evidence presented in bog profiles. Since they are based on the distribution of tree pollen, it is necessary to return to characteristics of the trees themselves. Oaks *(Quercus)* are wind-pollinated and produce pollen early in the spring when there are likely to be more frequent and stronger winds. Beech, on the other hand, although it is also wind-pollinated, flowers later in the spring after the leaves have expanded and when winds may diminish. For these reasons, one might expect oak pollen to be overrepresented in the bog profiles and beech to be underrepresented. Sugar maple, on the other hand, is insect-pollinated and consequently is even more poorly represented in pollen profiles than beech.

Thus, the absence of fossil maple pollen or low pollen counts for beech does not necessarily prove that these species were not in the area. Beech and sugar maple may well have migrated without major obstacles from an Appalachian *refugium* north and west to occupy their present range (or an even more expanded one) and the pollen records may not be accurate enough to point out that migration route.

Although Braun (1950) showed the present distribution of beech-maple forest with a corridor of that forest type extending in a band along the southern tip of Lake Michigan through the northern counties of Indiana and Illinois, this is probably a mapping generalization and does not necessarily indicate that this forest type exists there to any extent, nor does it indicate a migration path of this forest type through those states.

Rohr and Potzger (1950) mapped the original vegetation in northwestern Indiana as taken from land surveys in Lake, Newton, and Jasper counties. They reported that only isolated beech and maple exist in these counties. However, Lindsey et al. (1970:509) recorded the existence of a mature forest of beech-maple composition in La Porte County. Soil data in this woods indicate that prairie probably occupied these soils before the invasion by woodland species. Transeau (1935) mapped beech for all of the northern Indiana counties.

Continuing the mapped band of beech-maple forest around the southern tip of Lake Michigan to Illinois, we see a break in the distribution of beech in Cook County. Although Transeau (1935) mapped beech for Lake County, it appears that it was present only in the ravines of the terminal moraines being eroded by Lake Michigan. Charles Olmsted (pers. comm. 1970) reported that "Braun's boundary in Lake and Cook counties has relatively little meaning . . . even before the days of settlement." Ravines along Lake Michigan in Lake County were the site of fairly good sugar maple stands and a few beech trees.

In other states, maps of the beech-maple forest region are less generalized than that of Braun and we find reductions or expansions of the forest region according to locally determined factors. In Indiana, for example, the map of presettlement vegetation (Lindsey et al. 1965, 1970) showed the beech-maple type farther south on both lobes of Illinoian glaciation. Gordon's (1966) map of Ohio, also based on the earliest land surveys, indicated the eight northwestern counties as occupied by elm-ash swamp forest. Küchler (1964) did not map beech-maple forests in Wisconsin at all; rather he replaced Braun's beech-maple by maple-basswood, oak-hickory, and northern hardwoods. Conflicts of this sort will be more fully explored in the section dealing with forest composition.

Thus, we are left with a migration of beech and sugar maple from the *refugia* of the Pleistocene age onto the recently glaciated terrain from New York to Wisconsin. The pattern of migration is believed to have been northwestward; these species may have crossed into Wisconsin from Michigan north of the present boundaries of Indiana and Illinois. We have seen that the two species of the climax forest are unusually suited to rapid expansion on hospitable terrain. It would now be useful to examine the physiography and soils of the area pres-

ently occupied by the beech-maple forests since edaphic factors certainly determine in large part the vegetation which exists there.

Soils and Physiography

The glacial history of the beech-maple region is not only of interest as it determined the migration pathways and distribution of the deciduous forest, but is perhaps more important as it influenced this forest type through the effects of physiography and the development of soils.

The present distribution of the beech-maple forest, as mapped by Braun (1950), follows rather closely the boundaries of the Wisconsin glaciation. She states that its areal extent within the region it characterizes is determined by existing physiographic characteristics of the recently glaciated landscape. As this terrain becomes more dissected with erosion, other mesophytic species less tolerant of poorly drained conditions will migrate into the area now occupied by beech-dominated forests.

As evidence for this long-term replacement trend, she indicated the transition zone between the more recently glaciated terrain and that of the Illinoian glaciation. Here, more slowly migrating species invade the better-drained sites, and the margin separating the mixed mesophytic forest and the beech-maple forest shifts. Other authors (Jackson and Allen 1969) noted this shift in the transition zone in Indiana where they conducted studies in Versailles State Park, Ripley County, in the Illinoian Till Plain section. They concluded that, as stands mature and dissection increases over long periods, beech may lose importance and the stand become more mixed in total composition.

A successional trend from a mixed mesophytic or oak-hickory-dominated woods to the beech-maple type occurs where dissection becomes less apparent and substrate conditions more mesic. Examples of this trend are illustrated in Graber Woods, Wayne County, Ohio, as reported by Braun (1950:313), and Donaldson Woods, Lawrence County, Indiana (Lindsey and Schmelz 1965). The latter stand is present in unglaciated, and generally more dissected, terrain. For each site, further evidence must be gathered to determine the factors contributing to the successional trend.

In Michigan, all of the state was covered by the Wisconsin glaciation. The southern half of the lower peninsula is mapped by Braun (1950) as being in the beech-maple forest region. The line of transition between this type and that to the north, namely, the hemlock-hardwood forest region, is rather an arbitrary one that does not seem to be governed by edaphic patterns. However, Benninghoff and Gebben (1960) believed that, within the lower peninsula, beech-maple communities are of the nature of edaphically-selected segregates within the oak-hickory region in the south and within the northern hardwoods in the north.

Quick (1923) has divided the lower peninsula into several physiographic provinces, five of which fall into our mapped beech-maple region. Region I, which borders Lake Erie and Lake St. Clair, has soils of lake origin, mostly

lake clays and lake sands laid down in the glacial period. Region II consists of inland moraines of clay and sand; region III, located in southwestern Michigan, has developed similar soils, but more mixed, with glacial outwash of both sand and clay. Region IV soils developed in a northern morainal region and consist of morainal sands and clays, outwash sands and clays, and a small proportion of lake sands and clays. The last region (region V) that Quick mapped which falls into our region of study is located along Lake Huron and contains soils developed from lake sands and clays.

Quick (1923) further reported that generally the soils that support forest stands dominated by beech are those with higher amounts of mineral nutrients and humus, greater moisture-holding capacity, and a greater abundance of soil organisms as compared with those soils which support stands of pines. The wide distribution of these types of soils in regions I, III, IV, and V is considered to disprove any statement as to chemical limitations based on the inorganic soil constituents.

The beech-maple association, although it occurs on soils which vary widely in water content, is twice as frequent on clay soils as on sand in Michigan. Quick reported that sugar maple occurs on both clay and sand, the ratio of occurrence being about 2:1. The climax is reached more quickly on clay than on sand and this explains the greater frequency on clay. Beech is more sensitive to reduced soil moisture than is sugar maple, but will develop in sand if there has occurred a sufficient development of humus and if there is sufficient soil water. It has approximately the same ratio as sugar maple on soils of clay and sand in Michigan. Gleason (1924), in a study of Michigan tracts with sandy soil, correlated the absence of beech seedlings to available moisture. Where water was supplied by seeps, seedlings were abundant and mature trees had a high importance value, while high and level plateaus had only rare specimens of beech.

In Ohio, Sampson (1930b) reported that slopes of valleys in which soils are a mixture of decaying rock fragments, loose soil, and humus may support a mixed mesophytic forest, while upland and flood-plain soils support forests of beech and sugar maple. Physiographically similar slopes but with heavy soils with poor internal drainage are covered by beech-maple stands. Shanks (1953) found the best expression of the association on Miami silty loam soils. Basing his observations on data from original land surveys of Shelby County, Ohio, he found that 67.8% of the trees on this soil were sugar maple or beech. On Miami silty clay loam, the abundance of these two species was reduced to 49.7%. Sugar maple, he noted, decreased more on this heavier soil than did beech. On rolling topography along the Great Miami River, the Miami silty clay loam changes to the slope phase which supports the best expression of the beech-maple association. It is here that sugar maple reached its highest per cent composition (16.7%). Beech did not increase in abundance on the slope phase. In Indiana also, Beals and Cope (1964) found the best expression of sugar maple on Miami silty loam soils. They note that this species is seldom found on poorly drained soils.

Lindsey et al. (1965) analyzed the original Indiana surveyors' records and modern soil maps of the counties to determine correlations between soil type

and the type of presettlement vegetation. Eighty-six soil types were classified according to texture and drainage classes. The forest stands which occurred on these soils were grouped according to the following criteria: if the combined importance value for beech and sugar maple was at least double that for the upland species of oak and hickory *(Carya)*, the soil type was considered to be occupied by the beech-maple forest type. If the oak and hickory combined im-

TABLE 1. Number of soil series characterized by particular forest types, according to drainage-aeration (columns) and texture classes (rows) for 86 principal Indiana soils.

Texture	Excessively drained (VI-V)	Well drained (IV-III)	Imperfectly drained (II-I)	Totals for 3 main types	
Silty clay loam	1-WM	1-FP	1-BM 1-FP	1-BM 1-WM	
Silt loam	1-OH 4-BM 4-WM	9-OH 11-BM 8-WM 4-FP	1-OH 6-BM 2-WM 6-DM 2-FP	11-OH 21-BM 14-WM	12-OH 24-BM 18-WM
Loam	1-OH 1-WM	2-BM 1-WM 1-FP	1-WM	1-OH 2-BM 3-WM	54
Sandy loam	2-OH	1-OH		3-OH	
Fine sandy loam	3-OH	1-OH 1-BM 1-WM 1-FP	1-OH	5-OH 1-BM 1-WM	13-OH 1-BM
Gravelly loam	1-OH 1-WM			1-OH 1-WM	2-WM 16
Loamy fine sand	3-OH			3-OH	
Fine sand	1-OH			1-OH	
No. series by forest types	12-OH 4-BM 7-WM 23	11-OH 14-BM 10-WM 35	2-OH 7-BM 3-WM 12		

OH: Oak-Hickory BM: Beech-Maple WM: Western Mesophytic
FP: Flood Plain DM: Depressional Mixed

Summary figures at bottom of columns and right end of rows consider only the three main forest types.

portance value was at least double that for beech and sugar maple, it was termed oak-hickory. In cases where neither set of species had twice the importance-value sum of the other, the vegetation was assigned to the "mixed" forest type. Table 1 is based on the results that they obtained but summarizes only the totals for beech-maple, oak-hickory, and western mesophytic forest types. Flood plain and lowland depressional mixed stands are not included in the summary totals.

Perhaps the most striking fact illustrated in this table is that of 25 beech-maple-supporting soil types, 21 were soils of silty loam texture, and all but 1 of the 25 were soils of a loam *(strictu sensu)* or finer texture. Among the drainage classes, the beech-maple forest type occurred twice as frequently on well-drained soils (classes III and IV) as on the next most frequent class—imperfectly drained soils—and 3.5 times as often as on excessively drained ones.

Over most of its range, beech is found most often on cooler, moister slopes, in contrast to southern slopes (USDA 1965). Petty and Jackson (1966) reported the same relationship for the beech-maple type in Indiana where slopes are pronounced. In a study of soil types and vegetation in Lewis Woods, Wayne County, Indiana, Beals and Cope (1964) found beech-maple-dominated stands on Miami silt loam, Bethel silt loam, and Brookston silty clay loam, although on this latter soil, American elm *(Ulmus americana)* was more dominant than either of the other two species. They found that sugar maple was the most abundant tree on Miami, Crosby, and Eel soil types, while beech was more abundant on Bethel and Bethel-Brookston intergrade soils. In Lewis Woods, the soils were developed on strongly calcareous glacial till of gravelly loam texture. The Bethel soil is highly leached, and it is here that the beech reach their largest size.

Using original land records, Crankshaw et al. (1965) correlated tree species in Indiana with 11 edaphic factors. The soil properties used in their stepwise multiple regression computations were thickness of A and B horizon and thickness of solum, percentage total nitrogen in the B horizon, pH of the B horizon, percentage of sand, silt, and clay in the B horizon, depth of leaching, available water capacity in the B horizon, and moisture intake rate of the soil surface.

Crankshaw et al. (1965) reported that beech tolerates great variability of leaching (11 inches to over 100 inches) and that beech reaches high importance values on Pembroke, Avonburg, Clermont, Bethel, Jennings, Grayford, Crosby, and Hennepin soils.

For both sugar maple and beech, the major soil textural type was silt loam. Sugar maple showed a 90% correlation with high nitrogen, whereas the soils which supported beech were generally similar in having low percentages of nitrogen (average 0.048), probably due to its association with microrhizal fungi. Other soil variables consistently influential for beech were a low rate of water intake, a high silt: low sand ratio, and a shallow B horizon (average 17 inches). For sugar maple, the presence of a shallow solum was significant at the 90% level. A reinterpretation of their data by the present writers is given in Table 2.

TABLE 2. Ecological gradient of edaphic preferences of certain hardwood tree species.[a]

Species	Available H_2O	Leaching	pH	% N	% Sand	% Silt	% Clay
Black oak	–	+	–	–	+		
Chinquapin oak	–	+		–	+		
White oak			6.1	–	+	–	
W. B. cherry		–	6.1		+		–
Shingle oak			–		+		
Post oak		+	–	–	–		
Upland hickories		+		–	–	+	
Red oak		+					
Tulip tree		+				+	
Sugar maple			+	+		+	
Basswood	+	–	+	+			
White ash	–			+			+
Beech					–	+	
Bur oak		+				+	
Sweet gum		+	–				+
American elm			7.0			–	+
Black walnut	+		7.0		+		
Buckeye	+		+	+			+
Hackberry	+	0	7.0	+			–
Cottonwood	+	0	7.0	+			
Honey locust	+		7.0				
Sycamore	+		7.0				+
Black ash	+	–	7.0	+			+

[a]The plus sign indicates that a high value of the factor favors the species importance expression; minus indicates that a low value of the factor is favorable. The clearest gradient runs from low moisture (top) to high moisture (bottom). Of the three species groups, the upper list belongs largely in the oak-hickory forest type, the middle in the beech-maple type, and the lower in the lowland depressional forest type. (Our reinterpretation of data from Crankshaw et al. 1965.)

Braun (1936) showed that of all shade-tolerant trees, only beech does well on the wet and acid soils of the Illinoian till plain in Ohio. Sugar maple as a species tends to be more tolerant of slightly alkaline soil conditions than beech. The U.S. Forest Service (USDA 1965) reported that the most common soil pH range for stands containing considerable amounts of sugar maple is 5.5-7.3 although the species will tolerate values as low as 3.7. Beech stands are commonly found on soils whose pH range is 4.1-6.0 but seldom exceeds 7.0.

In summary, the beech-maple type is correlated with younger physiographic terrain and soils with silt loam texture. In general, those associations dominated by beech are found on the more poorly drained sites, while maple does better on the well-drained to moderately well-drained soils. More acid soils which favor the microrhizal association are likely to support beech-dominated stands. Braun (1950) reported that as the physiography becomes

more dissected and stands mature, the beech and maple dominace will be replaced by a more mixed stand through the invasion of species less able to invade the recently glaciated terrain.

Climate

The most meaningful discussion of the climate of a vegetational region is not one that presents statistics on means and ranges of separate climatic factors. It is more revealing to integrate the few most ecologically influential parameters for each region and to show where the regions of concern (in this study, the beech-maple and maple-basswood regions) stand in relation to each other and to other regions of the eastern deciduous forest. An improved method for doing this will be presented, based on the Holdridge life-zone concept which has been much used by ecologists working in a number of countries in South America and Central America (Holdridge and Tosi 1964). The reader unfamiliar with Holdridge's concept might well start with the two papers that have related it to United Stats' vegetation (Sawyer and Lindsey 1964; Lindsey and Sawyer 1971) and, for broader application, work through literature references at the end of those papers.

The major unit of the Holdridge system is the life zone, characterized in a particular area by a dominant association of climax vegetation on a zonal soil in a zonal climate. Other association types (edaphic, hydric, etc.) may also be present within the life zone. The life zones are defined by biotemperature, precipitation, and the ratio of potential evapotranspiration to precipitation. A three-axis or triangular graph has each axis logarithmic on the base 2, the logarithmic system making all life zones equivalent in significance. The station data required for classification are normal mean annual biotemperature, normal annual precipitation, and altitude. The biotemperature figure used is found most simply by adding normal monthly temperatures above 0°C and dividing by 12. It is a function of latitude, complicated by elevational differences, and is a convenient integrative device for expressing the combination of climatic parameters which determine the heat factor. These include thermoperiod, photoperiod, and the angle, intensity, and quality of solar radiation. Since latitude and elevation interact to determine the normal annual biotemperature at a station, a three-dimensional relationship exists among them and the humidity factor.

It is perhaps inevitable that any such theoretical scheme as broadly based as this one would have encountered some skepticism and criticism. We have found that the most objectively demonstrable aspect of Holdridge's system (so fundamental that it lends credence to the rest) is his discovery (Holdridge 1962) of the factor 58.93. For a number of weather stations we tested, the results of the complex Thornthwaite (1948) method for determining potential evapotranspiration (a function of solar energy on the earth's surface) were seldom far apart from those obtained by merely multiplying the normal annual biotemperature of the station in degrees C by 58.93.

We base the climatic comparison of eight Braun regions on more than 1400 stations reporting to the U.S. Weather Bureau. The oak-hickory type was

omitted because its western boundary is not clearly determinable.

The application of Holdridge's concept reported herein requires only the skeleton graph (not his hexagons), thus emphasizing the continuous gradients of climatic change rather than the subdivision into life zones and intervening ecotones, humidity provinces, and other relatively fixed classificatory units of the standard Holdridge chart. On the skeleton graph (Fig. 1), an oval or irregular figure was drawn for the climate of the respective forest region to show the limits of the range for that region in terms of the graph parameters being plotted.

The weather stations were classified according to their location within eight of the major forest regions recognized by Braun (1950). Even stations which fall on regional boundaries were used, but their borderline status was recorded.

The station data from the different regions were plotted using distinctive symbols, with the borderline stations so indicated, upon a large graph having the three axes as proposed by Holdridge. To facilitate analysis of results as exhibited by patterns of colored symbols on this elaborate working graph, the latter was used as the basis for Fig. 1, which presents climatic ranges. In Fig. 1, the figures for full range of climate for each type of forest were drawn to in-

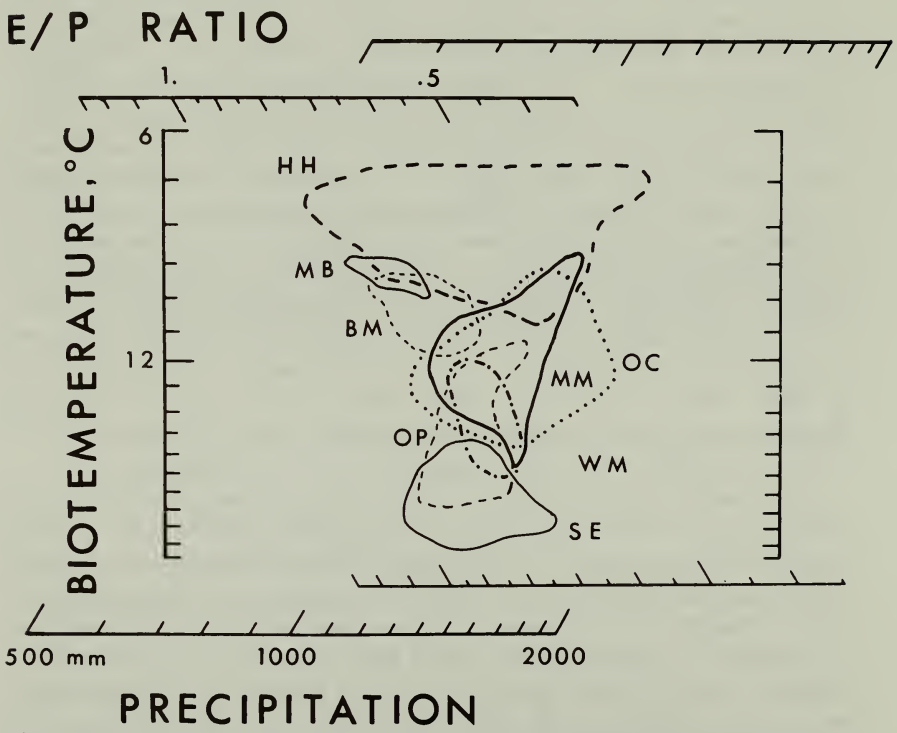

Fig. 1. Three-axis graph from plotting all stations to show climatic amplitudes of the forest regions. (HH, hemlock-hardwoods; MB, maple-basswood; BM, beech-maple; MM, mixed mesophytic; OC, oak-chestnut; OP, oak-pine; WM, western meosphytic; and SE, southeastern evergreen.) (From Lindsey and Sawyer 1971.)

clude essentially all stations located within the given region. Since even the scattered, peripheral stations were included, the figures overlapped considerably. Despite this, Fig. 1 shows that the climatically central forest association is Braun's mixed mesophytic, and that most others diverge from this in different directions on the graph. However, this does not hold for oak-chestnut which is very similar to mixed-mesophytic climatically, indicating that the former can hardly be a climatic climax, but was probably segregated from the mother type by factors more related to substrate or other factors not plotted.

Little of the graph area within the oak-pine figure is not shared with some other figure. This indicates that oak-pine also is not a climatic association but is closely related to several other forests transitionally or serally. Both climatically and geographically, oak-pine is transitional between southeastern evergreen and one of the forests to the north. The hemlock-hardwoods covers a very broad climatic range from its drier portions in the Lake States (left side) to its moister ones in New England, and relatively little of its climatic range is overlapped by any other deciduous forest. This suggests that traditional ecological theory should accord it climatic climax, rather than mere transitional, status.

Beech-maple occupies a relatively compact, narrow-range climatic type which is distinctive for this forest, so that beech-maple clearly appears to be a climatic association. Overlapping at its cooler and drier end is maple-basswood, the climate of which is discussed in another section.

The place of the beech-maple climate relative to the climates of other forest regions emerges clearly from study of Table 3. (The three mean values shown therein for a given region could be plotted together on Fig. 1 as a single dot, which could then be considered the "center of gravity" of the drawn figure representing the climatic range.)

The generally north-south geographic sequence of the forests naturally corresponds well with the increasing biotemperature ranking (first column, Table 3). While the actual precipitation also tends to increase southward, the

TABLE 3. Mean climatic values for vegetation regions of the eastern United States. (They are listed in *descending* order of effective moisture from top to bottom of the last column, which gives potential evapotranspiration:precipitation ratio, the inverse of effective moisture.)

	Annual Biotemperature in °C	Annual Precipitation in mm	E:P ratio
Hemlock-hardwoods	8.5	899	0.556
Oak-chestnut	12.0	1138	0.622
Mixed mesophytic	12.2	1117	0.642
Beech-maple	10.7	889	0.706
Western mesophytic	14.3	1186	0.710
Maple-basswood	9.5	739	0.756
Oak-pine	16.3	1196	0.802
Southeastern evergreen	18.9	1297	0.859

effective moisture, or inverse of the evapotranspiration:precipitation (E:P) ratio in Table 3 does not. The effective moisture is greatest in hemlock-hardwoods, where there is only 899 mm of precipitation, and is least in the southeastern evergreen type, which has the highest precipitation or 1297 mm. Still farther south, the higher biotemperature puts the southern tip of Florida into Holdridge's "Tropical Dry Forest" zone, despite the further increase in precipitation.

The average E:P ratio, since it integrates biotemperature, potential evapotranspiration, and annual normal precipitation from many stations into a single value expressing effective moisture insofar as climatically determined, is considered to be a highly significant numerical index of climate as it affects the distribution of vegetation.

Of the eight regions tabulated, the beech-maple stands only next lowest in amount of annual precipitation, but, because it stands third from the bottom in biotemperature (the warmth tending to raise the evaporation rate), it ranks fourth in potential evapotranspiration to precipitation ratio, and scarcely different from the next higher (western mesophytic). This central position in relative moisture relations shows why beech-maple is considered a mesic type of vegetation.

When, during their developmental history in fairly recent geological time, the five regions (Table 3) listed below the mixed-mesophytic were segregated from the latter, they were evidently becoming adapted to climates having lower effective moisture (higher E:P ratio) levels than the mixed-mesophytic had or now has.

The beech-maple region mapped by Braun (1950) occupies in large part the Indiana and Ohio parts of the life zone that Holdridge calls the "Warm Temperate Montane Wet Forest" and the Michigan part of the southern edge of the "Cool Temperate Moist Forest" (Sawyer and Lindsey, 1964).

The climatic mean position or central dot (not plotted in Figure 1) of the beech-maple forest region does not fall within the climatic range limit line of any other type. This is not true for any other region except perhaps the hemlock-hardwoods, and this might not be true if the data for spruce-fir climate were also plotted.

Thus, the beech-maple forest region has a highly distinctive climate, overlapping relatively little with others, and mainly so with the oak-hickory forest region which is not plotted. The climate of the beech-maple region falls between those of the regions north of it, i.e., maple-basswood and hemlock-hardwoods, and those south and east of it. From the latter, namely mixed and western mesophytic, oak-chestnut, and oak-pine, it differs most by its greater coolness and lower precipitation. It is fairly similar in the mean evapotranspiration:precipitation ratio, while having a narrower range for this. The climatic range of beech-maple overlaps relatively little with its major neighbor to the north, hemlock-hardwoods (Fig. 1).

Climatic relationships are discussed further in Chapter 2.

Association Characteristics and Composition

An association can be defined in various ways, but is here used to designate a climax community of the deciduous forest formation in accordance with the terminology used by Weaver and Clements (1938) and Braun (1950). The beech-maple forest association is differentiated from the other climax associations which border it by the degree to which the two species, beech and sugar maple, dominate the forest canopy. Braun (1950) noted that the dominant species comprise 80% of the forest canopy, on the average, in the beech-maple forest region whereas they comprise only 50-60% of the canopy in the western mesophytic forest region, and 35% on the average in the mixed mesophytic forest region. The number of canopy species in the beech-maple forest region averages 9.5, while for the western mesophytic and mixed mesophytic forest regions, the number of canopy species averages 14.5 and 15.7, respectively.

To the north, in the hemlock-hardwoods forest region, beech and maple share dominance with other hardwood species or with hemlock, and to the west, beech drops out of the association altogether and is replaced by a species more tolerant of drier climatic conditions to form the climax maple-basswood association. Thus we can see that the major characteristic of the beech-maple association is the high degree of dominance within the area of these two species and the relative scarcity of other canopy species.

Within the beech-maple region there are, of course, other forest types as determined by edaphic and physiographic factors. Thus, the often-seral oak-hickory or lowland depressional forest types may be just as climax in places within the relatively uniform climatic province of the beech-maple region as is the beech-maple type on the well drained to somewhat poorly drained sites. Since much of the recently glaciated area open to colonization by forest species was flat to rolling, it was largely occupied by forests of the beech-maple type.

Within the broad limits of the beech-maple type, differences of composition in the association are due to the limits of distribution of some of the component species and although the dominants of the association are beech and sugar maple, the proportions of these two species vary according to local factors. Likewise, the subdominant species of the association change in response to edaphic, physiographic, and microclimatic factors as well as to the influence of the dominants themselves.

Braun (1950) wrote that although the association is referred to as the beech-maple forest, beech is generally the most abundant canopy species while sugar maple dominates the understory. Beech has been shown to be the more important of the two dominant species in Indiana. Potzger et al. (1956) reported that in the southeastern part of Indiana, which is generally mapped as beech-maple forest, beech alone comprised 50% of the witness trees in the original land surveys. The present composition of the beech-maple forest of Indiana also bears out Braun's generalization (Petty and Jackson 1966). Beals and Cope (1964) suggest that this may be due to the fact that nearly all of the forests have been subjected to some cutting. Beech has a relatively low economic value, and therefore a selective advantage in logging operations so that it may dominate

the canopy. Rapid sugar maple reproduction and rapid recovery of the species from grazing may explain higher values for maple in the understory.

Braun (1950) reported on the effects of topography on stand composition in Hueston's Woods near Oxford, Ohio. In this tract taken as a whole, beech represented 58.6% of the canopy while sugar maple represented 24.4%. Upon dividing the stand according to topographic differences, she found that beech represents 72.4% and maple 7.4% of the canopy in the part of the stand lying on rolling and mildly dissected upland, while beech represents 36% and maple 64% of the canopy in the stand on the slopes. Thus, although beech is more numerous in the tract as a whole, its abundance is once again correlated to drainage conditions.

Although the beech- and maple-dominated forests may differ in relative importance of the dominant species, the type is generally characterized by a ground layer of moist humus and a tight canopy which produces dense shade. The presence of associated species in a mature beech-maple stand is largely a measure of their shade tolerance. The ability of the dominant species to reproduce well in their own shade and the relative inability of other species to do so is, of course, one of the factors contributing to the climax status of that forest type. As indicated below, the herbaceous species which characterize the beech-maple forest are largely those spring-flowering herbs which can complete the major part of their life cycle before the trees leaf out.

In order to discuss differences in forest composition throughout the beech-maple forest region, the region has been divided into two sections: the central and southern part of this forest region as found in Indiana and Ohio; and the northern section as found in Michigan, Wisconsin, and New York.

Hueston's Woods, mentioned above, was selected by Braun (1950) to represent that forest composition typical of the beech-maple forest near the southern boundary of the region. Here on the upland, the associated tree-canopy species are tulip tree *(Liriodendron tulipifera)*, white ash *(Fraxinus americana)*, black gum *(Nyssa sylvatica)*, and slippery elm *(Ulmus rubra)*, with small amounts of hackberry *(Celtis occidentalis)*, wild black cherry *(Prunus serotina)*, and hop hornbeam *(Ostrya virginiana)*. White oak *(Quercus alba)* is also a frequent canopy species in the southern beech-maple stands in Ohio.

In Indiana, the most important canopy species in the southern stands dominated by beech and maple are tulip tree, red oak *(Quercus rubra)*, white oak, white ash, and black gum. In the more northern stands, basswood and slippery elm become more dominant. Wild black cherry, although frequently a component of the understory in the southern beech-maple forest in Indiana, has very low importance values there. It has a higher importance in the northern stands.

Figure 2 shows the relative importance of the dominant species in 58 very old growth stands in Indiana, plotted on three axes. The sum of the importance values for sugar maple and beech were plotted against the sums for included tree species representing the oak-hickory and lowland depressional forest types. The species making up the dominant group of the oak-hickory type in Indiana

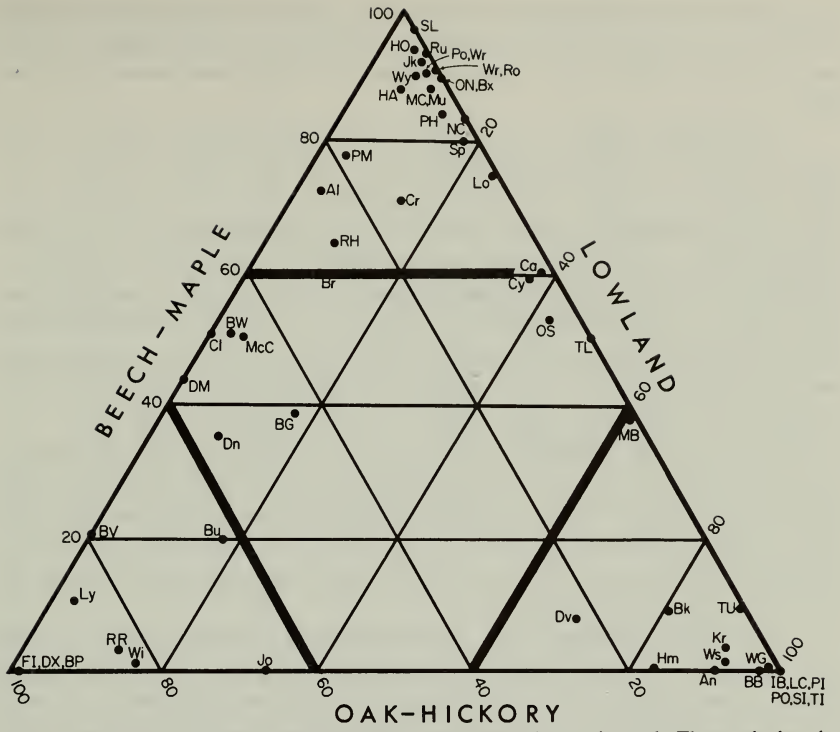

Fig. 2. Locations of 58 hardwood forest stands of Indiana on a three-axis graph. The graph plots the sums of the three species group importance percentages per stand (see text) on the triordinates to determine the stand type. The 60% importance level delimits the three corners where beech-maple, oak-hickory, and lowland depressional stands occur, while the stands falling centrally represent the mixed woods type, in a classification proposed for semi-technical purposes (Lindsey and Schmelz 1970). Some dots represent more than one stand at the same point.

were shagbark *(Carya ovata)* and pignut hickory *(C. glabra)*, and white, black *(Quercus velutina)* and chestnut oak *(Q. prinus)*. The dominant group for the lowland depressional forest type comprised red *(Acer rubrum)* and silver maple *(A. saccharinum)*, shellbark hickory, *(C. laciniosa)*, hackberry, green ash *(Fraxinus pennsylvanica)*, sweet gum *(Liquidambar styraciflua)*, black gum, American elm, sycamore *(Platanus occidentalis)*, and bur *(Quercus macrocarpa)*, pin *(Q. palustris)*, Shumard's *(Q. shumardii)*, and swamp white oak *(Q. bicolor)*. This method requires density and basal area data but avoids the long computations or machine analyses needed for ordination. Hence, it is a convenient approach to stand description for preservation-oriented descriptions rather than for more technical ecological research.

Approximately one-third of all the stands contain more than 80% beech and sugar maple, and the triangle (Fig. 2) clearly demonstrates the high dominance of the two species in the stands in which they are present. One dot on the graph may represent more than one stand where the values were so close that the plotted points would have overlapped. The letters are used to designate specific stands (from Lindsey and Schmelz 1970).

Ohio does not differ greatly from Indiana in the composition of the southern beech- and maple-dominated stands. In the north, however, there are several significant differences in forest composition which merit some discussion here.

Northwestern Ohio presents a large area of swamp forest similar to the lowland depressional type mapped in Indiana. The "Great Black Swamp" covers approximately eight counties as mapped by Gordon (1966), and is of elm-ash-maple composition. Here the beech-maple type exists only on knolls and ridges or where stream dissection has produced sufficiently drained soils (Braun 1950). The forests occupy the old lake bed of Glacial Lake Maumee, flood plains, and postglacial flats (Sampson 1930a). The principal tree species are red and silver maple, black ash *(Fraxinus nigra)*, green ash, pin and swamp white oak, and American elm. Where drainage is improved, the transition is toward the beech-maple or oak-hickory type.

In contrast, the northeastern counties of Ohio contain numerous areas indicative of a transition hemlock-hardwoods type. The areas described for Ohio under the heading of Hemlock-Hardwood Natural Areas in Part Two are of this type. Braun (1950) noted that this transition type on the Allegheny Plateau of northeastern Ohio is an extension of the northern forest type of the high plateau of northwestern Pennsylvania.

This report for Pennsylvania shows that almost without exception hemlock is a member of the forest canopy. In several stands, hemlock is a co-dominant and in some, as in the Jacob Guy Natural Area in Crawford County, all three dominant species are reproducing well. In this stand, yellow birch, basswood, and white pine *(Pinus strobus)* are also present. McConnell's Mill State Park contains more mature stands of beech-maple, again with hemlock present in the ravines. Thus, the northeastern area of Ohio and the part of Pennsylvania mapped as beech-maple forest by Braun (1950) have a composition similar to that found in the northern section of the beech-maple forest region.

Michigan, New York, and Wisconsin contain the most northern regions of the beech-maple type in our study. The stands in Michigan are especially interesting since they represent a transition from the southern type to the northern type in a continuous area. A study of the composition of the climax forest of Michigan was carried out by Quick in 1923. He found that the species which occurred in the beech-maple association were basswood, American elm, white ash, yellow birch, hop hornbeam, red oak, and bitternut hickory *(Carya cordiformis)*. Beech and sugar maple make up about 60% of the stands on the average, while those species mentioned above make up about 30%. The remaining 10% in the southern stands is made up of wild black cherry, swamp white oak, sycamore, sassafras *(Sassafras albidum)*, black gum, and tulip tree. These southern stands, then, have a composition more similar to that of central Ohio and Indiana. Hemlock is found in some of the northern Michigan stands.

A study of Michigan forest stands in the five physiographic regions mentioned in the section of this paper dealing with soils is summarized in Table 4. The table illustrates rather large differences in the proportions of the dominant

TABLE 4. Percentage frequencies of trees of the climax association of southern Michigan (adapted from Quick 1923).

	Region I North of Lake St. Clair, near Richmond	Slightly west of Detroit, near Wayne	Region II Almost on Ohio border in central Michigan, near Clayton	Southeast of Ann Arbor, almost in Region I	Central Michigan, just south of Lansing, near Charlotte	East of Flint, near Davison	Northernmost stand in Region II, border of Sanilac Co., Near Clifford	Region III Southwestern Michigan, near Berrien Springs	Region IV Near Moseley and Grand Rapids	On northern boundary of B-M region, near Clare	Northwestern Michigan, near Hart	Region V North in thumb of Michigan's lower peninsula, near Pigeon	East of Saginaw, near Vassar
As	22	9	53	8	20	23	48	38	24	9	26	8	23
Fg	20	22	18	9	52	41	19	29	43	65	36	12	68
Ta	5	2	2	17	2	8	6	12	13	2	1	4	2
Ua	12	6	6		6	5	13	6	2	1	5	36	
Fa	9	6	6	14	4	3	3	5	4	4	2		
Ov	11		1	7	3	8	5	1	2	1	1		
Qr	2	8	1	4	2	4		2	3	4		1	
Co	4	2	3	1		3			3			2	
Ps			2	1	4		1	1	1		9		
Cc	1	2	1		6			1					
Jc	1				1				2			3	
Qa	1	5						1	2				
Tc							1			12	18		2
Lt	1	1					4	2	2				
Bl	6										1	4	
Other	5	37	7	39		5		2		2	1	30	5

As: *Acer saccharum*, Fg: *Fagus grandifolia*, Ta: *Tilia americana*, Ua: *Ulmus americana*, Fa: *Fraxinus americana*, Ov: *Ostrya virginiana*, Qr: *Quercus rubra*, C: *Carya ovata*, Ps: *Prunus serotina*, Cc: *Carya cordiformis*, Jc: *Juglans cinerea*, Qa: *Quercus alba*, Tc: *Tsuga canadensis*, Lt: *Liriodendron tulipifera*, Bl: *Betula lutea*.

as well as of subdominants in the various physiographic regions.

In the first stand in region I, sugar maple represents 22% frequency, with beech representing 20%. The nearest to them, of the associated species, were basswood, American elm, white ash, hop hornbeam, red oak, and shagbark hickory; these totaled 43% of the stand. In the second stand of region I, beech is more numerous than maple; in neither stand is hemlock present, although yellow birch is found in the first stand.

Of the four stands reported for region II, the sums of frequency percentages of beech and sugar maple were very similar, but varied in the separate stands. In the stand east and south of Ann Arbor, sugar maple and beech comprised 8% and 9% frequency, respectively; in the stand in south central Michigan near Clayton, they were 53% and 18%; in the stand south of Lansing, 20% and 53%;

and near Flint, 23% and 41%. Yellow birch was not present in any of the stands and hemlock was found in only the northernmost stand of this region. It had a 1% frequency there.

In contrast to these data, the five stands reported for regions IV and V show consistently higher percentage frequencies for beech than for maple. Hemlock was reported in three of the stands and yellow birch in two. These stands can be interpreted as having a composition transitional between that of the southern beech-maple forest and the northern hemlock-hardwoods forest. White oak is not important as a subdominant tree species and is represented in only the more southern stands.

Data on the forests of the beech-maple region in Wisconsin were gathered from records on file at the Plant Ecology Laboratory (PEL) of the University of Wisconsin at Madison. Table 5 lists the importance values of species in 32 stands in the southeastern Wisconsin counties mapped by Braun as lying within the beech-maple region. The importance values of the tree species are based on three measurements: relative frequency, relative dominance, and relative density. Thus, the maximum possible importance value for a species is 300 in the Wisconsin method.

The continuum index, as explained by Whitford and Salamun (1954), is found by multiplying the importance value by a climax adaptation number ranging from 1 to 10. A continuum index number of 300 would thus represent a pure stand of intolerant trees such as bur oak, while a value of 3000 would represent a pure stand of very tolerant trees such as sugar maple. Only stands with high continuum indexes were used for the compilation of Table 5.

Data in the PEL files were contributed by various persons, generally during the interval from 1947–56. The areas are organized according to counties to show the limited distribution of beech and other species. The counties are listed in a general north to south direction.

Fond du Lac County, which is the westernmost county in the beech-maple area, and Racine and Kenosha, the southern counties, do not contain beech at all and have high values for red oak. Here, presumably, there is lower effective moisture since these stands have higher importance values for white oak, butternut *(Juglans cinerea)*, and hickories than the stands that contain beech.

Table 5 shows that beech is confined to the eastern counties along Lake Michigan. In the stands in which it is present, it has the highest average importance value (98.3). Maple is present in the greatest number of stands, followed by basswood, hop hornbeam, white ash, and red oak in that order. It is evident, therefore, why Küchler (1964) mapped the southern (Racine and Kenosha) counties as oak-hickory and the others as maple-basswood.

Beech is found north of the area mapped by Braun (1950) as beech-maple in Wisconsin. Marinette County Beech Forest, discussed in part two, is a fine example of these more northern forest types. This area of Wisconsin is mapped by Küchler (1964) as northern hardwoods. Generally, the beech in the area north of the beech-maple forest region, as mapped by Braun (1950), is accompanied by maple, hemlock, yellow birch, and some white birch *(Betula*

TABLE 5. Importance values of tree species for 32 stands in the beech-maple region of Wisconsin.

PEL. stand no.	As	Fg	Ta	Cc	Ov	Ps	Qa	Qb	Ua	Uf	Fa	Co	Jc	Qv	Bp	Others
Fond du Lac Co.																
1007	130		15	6	14			121	3						4	6
1008	109		20				7	78			7	39			3	11
1019 (1948)	50		70	19	29			66			29		3			
1019 (1951)	71.6		13	19	27	3	3	74	5		20		5			6.2
1020	38		78	10	32	7	21	68	10		6		4			
1135	154		21		9	7	3	82	5		7	13				
2028	59		12	3	38	8	20	28			5			15		10
1020	38		78	10	32	7	21	68	10	25	6		4			
Calumet Co.																
1013	7		55	3		13	9	14	3	95	6					11
2015	103	138	13	4	14	4	4	6		4	9					
Sheboygan Co.																
2026	107	123	14		13	8	23			4	18					
2042	129	42	33		18		11		9	19	27	10				
Washington Co.																
1009	30				42	3	76	112		18	15	3				
1010	83		27		18	19	31	57		7	15	42				
1037	50	161	26		30				12	11	10					
2020	167				13	4	57	53	4							
2021	117	37	14		66				49							
2024	117		56		15	10	8	22	25		15	21				
2025	19	123	39		41					38	24				11	3
2049	235	17	15		7		11			16						
Ozaukee Co.																
1036	102	131	48								19					
1038 (2004)	141	90	12		6	5				13	26	6				
2002	127	123	22		4	8					16					

TABLE 5. (*continued*)

PEL. stand no.	As	Fg	Ta	Cc	Ov	Ps	Qa	Qb	Ua	Uf	Fa	Co	Jc	Qv	Bp	Others
Milwaukee Co.																
2039	221	38			18											
2040	56	152	69	3	6											14
2041	83	103	54		20	12		5		6	12					
1249	38		5		26	2	89	58		19				29		33
1250	17		2		49		17	96	6		16	2		7		88(Ar+Qm)
Racine Co.																
1101	15		71	7	24	8	31	22	14	9	94					6
1240	4		86				27	83			55	19		13		5
1252	40		57	5	25	5	20	50			18	44		7		29
Kenosha Co.																
2026			32			9	43	112		22	52					12
1103	117		15		3	3	78	64			23					
# of stands in which present	31	13	29	10	27	18	19	21	11	13	23	9	3	5		
$\bar{x}$ for stands in which present	86.7	98.3	36.3	8.1	23.6	7.2	28.8	60.9	12.1	21.8	21.1	21.0	4.0	14.1		
$\bar{x}$ for all stands	84.1	38.7	33.0	2.7	20.1	4.2	17.8	40.6	4.4	8.6	15.4	5.7	0.5	2.1		

As: *Acer saccharum*, Fg: *Fagus grandifolia*, Ta: *Tilia americana*, Cc: *Carya cordiformis*, Ov: *Ostrya virginiana*, Ps: *Prunus serotina*, Qa: *Quercus alba*, Qb: *Quercus borealis*, Ua: *Ulmus americana*, Uf: *Ulmus fulva*, Fa: *Fraxinus americana*, Co: *Carya ovata*, Jc: *Juglans cinerea*, Qv: *Quercus velutina*, Ar: *Acer rubrum*, Qm: *Quercus macrocarpa*. (Data on file at the Plant Ecology Laboratory, University of Wisconsin, Madison, compiled by permission of Dr. Grant Cottam; maximum species importance value is 300.)

papyrifera). Ward (1958) reported that in the northern beech stands of Wisconsin, sugar maple has an average importance value of 100.4; beech 96.9; hemlock, 33.7; and yellow birch, 10.9. White ash, hop hornbeam, and white birch make up the remainder of the associated species. Ward (1956, 1958, 1961) made extensive studies of the distribution and reproduction of beech in Wisconsin and concluded that, in contrast to Ohio and Indiana, beech is "less climax" than sugar maple there. He believes that beech will continue to maintain itself by vegetative reproduction, but perhaps not at the present level.

In Wisconsin, then, the composition of the beech-maple forest is similar to that in Michigan in many ways, but there is some question as to the dominant position of beech in the Wisconsin forests. Differences in subdominant species composition include the presence of tulip tree and swamp white oak in southern Michigan stands. Hop hornbeam is generally more numerous in the substratum in the Wisconsin counties. Basswood in Wisconsin seems to invade stands after sugar maple is established and increases along with it. Reproduction of the basswood is successful (Ward 1958) although the species seldom shows high abundance.

New York, the easternmost section of our study, completes our state-by-state discussion of the beech-maple association. The lake plains which Braun (1950) maps as beech-maple are mapped by Küchler (1964) as a mosaic of beech-maple, and maple, birch, beech, and hemlock. One of the earliest studies of forest regions by Bray (1915) describes the largest part of our study area as sugar maple, beech, yellow birch, hemlock, and white pine. The rest is mapped as oak, hickory, chestnut *(Castanea dentata)* and tulip tree.

Thus, while beech and sugar maple are most often the dominant tree species in the study area, they are frequently accompanied by, or share dominance with, northern species. Where proximity to the lake has an ameliorating effect on the climate and where there are favorable physiographic conditions, species of more southern distribution become dominants.

Thus far in our analysis of forest composition, we have dealt only with the tree species which characterize the forest association. The species of herbs and shrubs predominant there are adapted to a tight tree canopy, wind protection, and rather uniformly mesic conditions.

In general, mosses and liverworts, in contrast to northern forests, tend to develop poorly in beech-maple and other deciduous forests because the tree leaves are shed each year and cover them. The leaf litter provides an insulation against temperature extremes; but high temperatures are recorded in the leaf litter itself in early spring. These warm temperatures, uniform moisture, and high organic material favor the growth of fungus populations (Curtis 1959). Warm temperatures in the leaf litter also enable the spring-flowering herbaceous species to sprout and mature early, largely protected from spring winds and fluctuating temperatures.

In Indiana, Petty and Jackson (1966) reported that the shrub layer of the beech-maple forest usually included one or several of the following species: pawpaw *(Asimina triloba)*, spicebush *(Lindera benzoin)*, greenbriar *(Smilax* spp.*)*, elderberry *(Sambucus canadensis)*, leatherwood *(Dirca palustris)*,

wahoo *(Euonymus atropurpurea)*, and maple-leaved viburnum *(Viburnum acerifolium)*. Herbaceous species included jack-in-the-pulpit *(Arisaema atrorubens)*, spring beauty *(Claytonia virginica)*, cutleaf toothwort *(Dentaria laciniata)*, pretty bedstraw *(Galium concinnum)*, mayapple *(Podophyllum peltatum)*, false Solomon's seal *(Smilacina racemosa)*, and wild ginger *(Asarum* spp.*)*. In Wisconsin, Ward (1958) reported that the most characteristic herbaceous species was bloodroot *(Sanquinaria canadensis)*, large flowered Trillium *(Trillium grandiflorum)*, sharp-lobed Hepatica *(Hepatica acutiloba)*, wild geranium *(Geranium maculatum)*, mayapple, wild leek *(Allium tricoccum)*, hairy Solomon's seal *(Polygonatum biflorum)*, bedstraw *(Galium aparine)*, and sweet cicely *(Osmorhiza claytoni)*. In the more northern stands, common trout lily *(Erythronium americanum)* and wild lily-of-the-valley *(Maianthemum canadense)* become more prominent as spring-flowering species.

Warren's Woods in Berrien County, Michigan, is an excellent example of an old growth beech-maple forest. Here pawpaw, spicebush, maple-leaved viburnum, and dogwood *(Cornus* spp.*)* are the principal shrub species, while spring beauty, phlox *(Phlox* spp.*)*, hepatica, squirrel corn *(Dicentra canadensis)* and Dutchman' breeches *(D. cucullaria)* are the most common herbs.

It should be noted that many of the characteristic herbaceous species in the beech-maple woods have large storage roots or underground stems; they provide, along with the abundant beech and maple fruits, ample food for birds and small mammals living in the woods.

Summary

We summarize this section on the beech-maple forest type by recapitulating those facts most commonly agreed upon. The beech-maple forest lies largely on terrain covered by the Wisconsin glaciation. The dominant species, by virtue of their capacity for rapid migration, adaptation to a mesothermic climate, and favorable physiographic conditions, became established after glacial recession in a large area extending from New York to Wisconsin. The migration occurred most probably from a southern *refugium*.

This forest association is most highly developed on well to somewhat poorly drained and medium-textured soils. Beech is more abundant on the more poorly drained, poorly aerated, and acid soils than is sugar maple. With the possible exception of Wisconsin forests, beech is generally considered to be the more important of the two dominant canopy species, while sugar maple is more abundant in the forest understory. Associated tree species vary in the southern and northern sections of the beech-maple forest range. Generally these are hemlock, yellow birch, elm, and white ash in the northern stands, and tulip tree, black gum, and white and red oak in the southern stands.

Herbaceous species characteristic of the association are those tolerant of heavy shade, generally flowering in the spring. Although there is not an abundance of shrub species, the trees and herbs provide much food for animal life.

Chapter 2

The Maple-Basswood Association

Geological History and Geographic Distribution

Like the beech-maple forest association, the maple-basswood association had its origins in the great Tertiary mixed forest. Braun (1950) believed that the association is the result of progressive deterioration of a remnant of this Tertiary forest marooned in and near the Driftless Area during the ice age.

Evidence for the survival of basswood in the Driftless Area is found in the early appearance of basswood pollen in the bogs of northern Wisconsin and its relatively late appearance in the bogs of central Indiana and Ohio (Sears 1942). Braun (1960) supported the theory of a Driftless Area *refugium*, with an analysis of the variation in the basswoods *(Tilia* spp.*)*. She reported that American basswood *(T. americana)* appears more stable in the northwestern part of its range, while that in Ohio shows the northwestern form as well as intergrades that are probably the result of introgression with white basswood *(T. heterophylla)*. She suggested that the locations of early entry of American basswood into Ohio and Indiana are north of the bogs whose records show later entry and are near the periphery of the Prairie Peninsula. A spread of basswood south and west would explain the lack of variability in the northern ones.

We have already seen the possible objections to the theory of a glacial *refugium* for tree species in the Driftless Area in Chapter 1. If the basswoods did migrate north and west from a southern *refugium*, it seems that the Prairie

Peninsula did not serve as a deterent to their progress as it did for beech. At the same time, if there was a migration route across the southern tip of Lake Michigan at the low Lake Chippewa Stage, basswood may have used that route along with other tree species.

We have seen from the composition of the beech-maple forests that basswood is often subdominant among the canopy species, generally increasing in importance from east to west. Beech was eliminated from the area of the maple-basswood forest region early in the post-Pleistocene period, probably because of insufficient moisture. Thus, in the deciduous forest west of eastern Wisconsin, basswood has replaced beech and has given rise to the maple-basswood association.

Substrate conditions in the area of the maple-basswood forest region differ considerably from those in the beech-maple region. We shall now discuss the effect of physiography and soils on the development of this climax forest type.

Soils and Physiography

The area of the maple-basswood region, as delimited by Braun (1950), includes the Driftless Area of Wisconsin, northwestern Illinois and adjacent Iowa, and the "Big Woods" section of Minnesota.

Unlike the soils of the beech-maple region, the soils of the Driftless Area, long presumed to be unglaciated during the Pleistocene Age, are old. In many places bedrock is exposed and relief is pronounced. Many of these soils, although not recently glaciated, are greatly altered by a loess cap of Wisconsin age. The loess cap influences the soil development throughout the Driftless Area of Wisconsin; its great depth of deposition covers the soil parent material beneath it, and its high base content provides a favorable substrate for forest growth. Ordinarily, we would expect that the vegetation on the old soils would differ significantly from that on recently glaciated terrain, but this is not the case in Wisconsin.

The Driftless Area is one of mature drainage patterns and rugged topography as contrasted with the glaciated eastern portion of Wisconsin. Soils are largely Fayette and Dubuque loams and silt loams (Wilde et al. 1948). The underlying bedrock is predominantly old sedimentary rock, Cambrian sandstones, and Lower Magnesian, Ordovician, and Silurian limestones (Curtis 1959).

Curtis and McIntosh (1951) found that the soil factors most often associated with the climax maple-basswood forest in Wisconsin are high available calcium, good water-retaining capacity, and high organic matter content of the A_1 soil layer. It was also found that in stands in which sugar maple and basswood were dominants, the soil pH was more neutral than in stands with low continuum indexes.

Some of these factors can be directly correlated with the characteristics of basswood and sugar maple. Basswood leaves decay rapidly and contain high percentages of nutrients (Alway et al. 1933).

According to an anlysis by the U.S. Forest Service (USDA 1965), basswood leaves contained the highest percentage of calcium and magnesium

among 24 hardwoods and conifers analyzed. It also ranked fourth in total nitrogen, seventh in total phosphorus, and ninth in total potassium. A rapidly decaying leaf litter high in exchangeable bases helps to maintain a more neutral soil pH and a high percentage of organic matter in the A_1 soil layer. Unlike beech-dominated stands, then, the soils of the maple-basswood forest type do not show a progressive leaching. Where this forest type has invaded podzolized soils, the general effect of the occupation is to reverse the trend toward podzolization by "pumping" nutrients from the depths to which the tree roots penetrate and depositing the mineral nutrients on the surface of the soil in the leaf litter.

In a study of edaphic controls of tree species in Indiana, outside the maple-basswood region (as mapped by Braun 1950), Crankshaw et al. (1965) showed that basswood was more important as a forest associate on soil textures ranging from loams to silty clay loams where the soils were high in nitrogen and slightly alkaline. It seemed to be most strongly influenced by an increase in the depth of the A and B horizons and by an increase in silt and soil moisture.

Basswood seems to be sensitive to differences in microclimate as influenced by topography and the soil moisture regime. A study of the distribution of basswood in Sawyer County, Wisconsin, showed it to be "absent on wet flats along the Flambeau River and on adjacent swampy upland sites, scarce on very steep slopes and relatively common on dissected flood plains, moderate slopes and rolling uplands" (USDA 1965). Marks (1942) reported that the present Wisconsin sites for maple-basswood forests are on northeast slopes in small protected coves and on rough broken land between ridges and valleys. Sites for this forest type almost without fail have some advantage of exposure or position which would protect them from fires. This does not mean that these stands could not exist on other sites, but rather that frequent fires limited the distribution of this forest type. A further discussion of the fire factor in the maple-basswood forest distribution will be found in the section of this report dealing with forest composition and characteristics.

All of the "Big Woods" of Minnesota lies on drift of Late Wisconsin age. Here soils possess a definite prairie profile, suggesting that during the xerothermic postglacial period, the region of the maple-basswood forest was occupied by grasses. With the onset of a more mesic period, the deciduous forest invaded the prairie area. The maple-basswood type occupied the finer textured soils (Daubenmire 1936).

Studies completed north of the maple-basswood area in Itasca State Park showed that the areas of the fine mineral soils were occupied by maple-basswood forests, while those of coarser textured materials supported fir-spruce-birch forests and peat soils were covered by forests of ash-elm-fir composition (Buell and Cantlon 1951).

Moraines, according to Daubenmire (1936), are favorable to the development of the maple-basswood forest, unless they have a deep water table, when an oak-dominated forest occurs.

Moisture is more limiting to sugar maple than to basswood. Beyond the western limits of the association where maple drops out, there are forests of

basswood and red oak which occupy protected slopes and ravines (Braun 1950). Farther west, moisture becomes the limiting factor in the distribution of basswood, and the deciduous forest gives way to grassland.

Climate

Located in south-central Minnesota, southwestern Wisconsin, and a small area in extreme northwestern Illinois, the maple-basswood region lies entirely within, and near or at the southern edge of, the western end of Holdridge's "Cool Temperate Moist Forest." The latter forms an extensive east-west band across the northern United States from the eastern edge of the Dakotas to New Hampshire.

The maple-basswood region has the narrowest climatic amplitude, as well as the smallest geographic area, of all forest regions recognized by Braun. Its climatic range (Fig. 1) is not as distinctive of the region as the beech-maple is to its own region. Since maple-basswood climate overlaps considerably with that of both beech-maple and hemlock-hardwoods, there is but one-fourth of its plotted climatic range that is exclusive to maple-basswood.

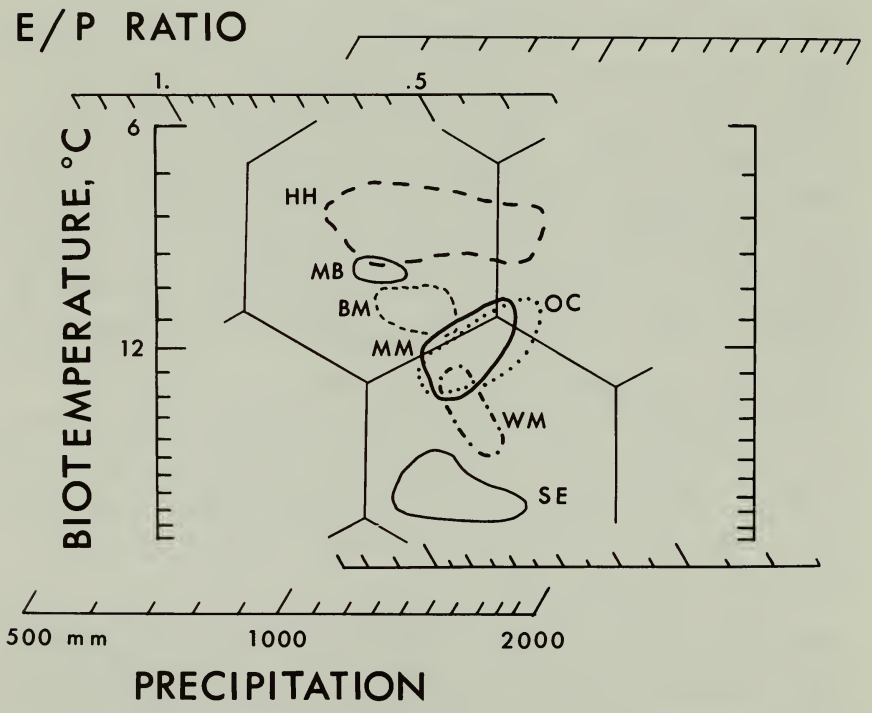

Fig. 3. Three-axis graph from plotting the most concentrated 4/5 of the weather station data in each forest region, to show the most typical climatic conditions in each region. (See Fig. 1 legend for meaning of region symbols. The upper left hexagon delimits the "Cool Temperature Moist Forest" of Holdridge, the upper right shows the "Cool Temperate Wet Forest," and the lower hexagon depicts the "Warm Temperature Moist Forest." The forest climate figures fall largely within the two hexagons representing the moist province.) (From Lindsey and Sawyer unpubl. data.)

The figure for the maple-basswood climate (Fig. 1) lies at the cool and dry end of the beech-maple figure. Table 3 shows that it has the lowest annual precipitation by far of all the regions, so that despite having the next to the lowest of the eight biotemperatures, its 0.756 E:P ratio represents the third from the bottom in effective moisture. That mean value lies closer to the E:P ratio figure for the oak-pine region (0.802) than to that of the beech-maple region (0.706), even though geographically the maple-basswood is much closer to the beech-maple region than to the oak-pine of the South. It is geographically near the prairie, which has lower effective moisture than any of the eight forest regions.

Another graph was prepared (Fig. 3) by encircling only the major concentration of plotted forest symbols, disregarding the one-fifth of all dots that were scattered peripherally. The forest region figures in that graph show little overlapping, except for mixed mesophytic and oak-chestnut which appear even more similar than in Fig. 1. Each of the other forest figures shows a rather distinctive principal climatic range for each region. The maple-basswood figure does not overlap with the beech-maple, and the latter overlaps with only one other type, the mixed mesophytic, and that only slightly.

Association Characteristics and Composition

The maple-basswood association and the beech-maple association are not considered generally as two different forest types, but rather as mesic forest separated by the presence or absence of beech. Ward (1958) and Gilbert and Curtis (1953) reported that, in southern Wisconsin, there is a continuity in herbaceous species and soil characteristics between the two forest associations and that the presence and dominance of beech does not bring about a significant discontinuity between the two associations.

The maple-basswood association, as mapped by Braun (1950), can be divided into two sections: that found in the Driftless Area and that on recently glaciated terrain in Minnesota. However, it should be kept in mind that this association is considered climax in many other locations, such as north and central Illinois, northern Minnesota, eastern Wisconsin, and smaller areas with locally favorable physiographic conditions.

The Driftless Area vegetationally is a transition area (Braun 1950). It contains large areas of oak-hickory forest, as can be seen by the high importance values for oak and hickory in Table 6, and tracts of prairie. With the more recent shift from xerothermic to mesothermic climate, the maple-basswood type seems to be the end point of succession under these mesic conditions. As was seen in the section on soils, north of the Driftless Area the climax association has invaded and established itself on soils previously occupied by prairie (during the xerothermic period).

The maple-basswood association, even under conditions of favorable moisture, was apparently limited westward due to the frequent prairie fires set by the Indians. With the cessation of the burnings, we could expect the oak woods to replace oak savannas and oak woods to gravitate toward the maple-basswood type. This trend would be most evident under constant climate, and

TABLE 6. Importance values of tree species for 34 stands in the maple-basswood region of Wisconsin.

PEL. stand no.	As	Ta	Ov	Ps	Qa	Qb	Ua	Uf	Fa	Cc	Jc	Ar	Bp	Pg	Others
Dunn County															
1122	61.5	21	9		7	149			30			11	8	4	
Pierce Co.															
1028	201	7	6			4	41	26		10	4				
1029	31	21	3	3	31	173		10		3			5	21	
1030	112	70	27		8	15	3	46		11	7				
Eau Claire Co.															
1127	63	29	22		26	93	3			15		15		23	11
Clark Co.															
1078	147	15	7			16	84	19				3			8
Jackson Co.															
1113					76	219									4
La Crosse Co.															
	1112	4		13	51	206	7			3		9		3	3
	1247	25			47	177		13	18		10			6	4
Vernon Co.															
1023	158	3	14		3	75		9	8	13				4	14
1024	46	50	6		37	106	7	9	6	21				3	10
1058		12		6	31	214	6			6	12				12
Crawford Co.															
1089	67	26	14		18	110		19	20		13			5	7
1091	132	46	5		20	27		12	16	12				4	25
1092	90	99				21	13	7	26	13		15			25
Richland Co.															
Harper	91	34	14	2	14	15		31	6	3			1		
1047		10	9		33	228						20			
1061	158	44	29		15			17		24				7	6
Sauk Co.															
1042					62	225			7			3			3
1059	87	30	11		46	56		20	14	7	14				14

TABLE 6. (*continued*)

PEL. stand no.	As	Ta	Ov	Ps	Qa	Qb	Ua	Uf	Fa	Cc	Jc	Ar	Bp	Pg	Others	
Grant Co.																
1054	52		5		72	111	8	6			6				38	
1056		27			9	168		6		7						
1088	60	107	23			35		23			53					
1151	25	19		6	141	67		12		1	6			8	11	
Lafayette Co.																
1107	3		3	14	103	37		69		16	46	9				
1185		37	24	8	105		49		29						37	
Green Co.																
1000	138	30	18		31			83								
1032	93	98	32				9	35	3	3	7	7			31	
1033	171	47	3		11			46							21	
1034	135	39	37				7	82								
1035	131	22	6			18	79			26					17	
1063	131	24	6					97			36				7	
1240	188	26					23	30	5						29	
Jefferson Co.																
1031	93	98	32				9	35	3	3		7			20	
# stands in*	8	8	7	0	1	2	5	7	3	3	2	2	0	0	8	stands
which present	18	22	18	7	22	24	9	18	11	16	11	5	5	12	26	stands
$\bar{x}$ for stands in	135	101	19		11	25	25	58	4	11	5	7			8	stands
which present	88	33	13	7	43	106	23	20	15	11	17	10	7	6	26	stands
$\bar{x}$ for all	135	101	17		1	6	16	51	1	4	1	2			8	stands
stands	61	28	9	2	37	98	8	14	6	7	7	2	1	3	26	stands

As: *Acer saccharum*, Ta: *Tilia americana*, Ov: *Ostrya virginiana*, Ps: *Prunus serotina*, Qa: *Quercus alba*, Qb: *Quercus borealis*, Ua: *Ulmus americana*, Uf: *Ulmus fulva*, Fa: *Fraxinus americana*, Cc: *Carya cordiformis*, Jc: *Juglans cinerea*, Ar: *Acer rubrum*, Bp: *Betula papyrifera*, Pg: *Populus grandidentata*.

*Note: the stands for Green and Jefferson counties (a total of eight stands) are computed separately from the 26 stands that fall in the maple-basswood region as mapped by Braun (1950).

this apparently has not occurred. The wind patterns from the southwestern to north-central United States shift periodically in this climatic tension zone.

Within the maple-basswood association, sugar maple is the most important tree species, followed by basswood, red oak, slippery elm, and bitternut hickory. Red oak does not seem to be a true climax species here since its seedlings and saplings are seldom found under a closed canopy. The relative success of red oak in maintaining itself with the two climax species may be due to the richness of the soil in nutrients under forests containing sugar maple and basswood (Zedler 1968). Bitternut hickory is shade-tolerant in the seedling stage, reproducing well in a wide range of environmental conditions, from open oak forests to dense maple stands (Curtis 1959). A high percentage of the seedlings become saplings, but Curtis reports that the trees as they age appear to become more intolerant of shade and that few survive to become members of the tree canopy.

A measure of the ability of the associated tree species to survive and reproduce in a climax forest is found in the climax adaptation number devised by Curtis and McIntosh (1951). The importance value for each species in a stand is multiplied by an adaptation number, in this case 10.0 for sugar maple representing the best adapted tree species in terminal stands; 8.0 for basswood, slippery elm, and blue beech *(Carpinus caroliniana)*; 8.5 for bitternut hickory, and 9.0 for hop hornbeam. The lowest value (1) would be found for a species such as bur oak which is best adapted to conditions found in initial stands.

In Minnesota, Bergman (1923) reported that the associated canopy species in maple-basswood stands are bitternut hickory, white ash, red oak, white and bur oak, butternut, shagbark hickory, and American elm, although within small areas sugar maple may be an exclusive dominant. Basswood and maple are self-perpetuating, but saplings of the other species seldom occur to any extent in a mature forest of the dominants. The high adaptation numbers for blue beech and hop hornbeam were assigned because of their general "tolerance" which is essential for survival of small trees of the lower canopy.

A study of forest composition in Wisconsin is found in Table 6. The table was derived from data on file in the Plant Ecology laboratory (PEL) of the University of Wisconsin, and used through the courtesy of Dr. Grant Cottam. All of the tabulated stands except for those in Green and Jefferson counties lie within the Driftless Area and that of the maple-basswood type as mapped by Braun. Those for Green and Jefferson counties, although certainly of maple-basswood composition, fall outside the regional boundaries as shown on her map.

Green County, site of seven stands in Table 6, largely escaped glaciation since Illinoian time. Topography is generally rolling but nowhere deeply dissected (Harper 1963). Much of the county was covered by a loess cap of Wisconsin age, which varied in depth from a few inches to more than 2 ft. The study of maple-basswood stands in this county was a special project of the PEL, and Abraham's Woods (page 123) is an excellent example of this forest type. The average importance value for sugar maple in the Green and Jefferson

counties stands was 135 while that of basswood was 101. The only consistently important associate is slippery elm. The high importance values of red and white oak in the stands of the Driftless Area demonstrate the transitional nature of the vegetation of this area.

Daubenmire (1936) reported that the high importance of basswood in the maple-basswood association of Minnesota was probably due to the frequent fires set by Indians. Although sugar maple reproduces rapidly, both it and red oak (to a lesser degree) are sensitive to fire, and their importance tended to decrease in the canopy except in protected areas on the north and east sides of streams and rivers or in protected coves. Basswood, on the other hand, reproduces mainly by root sprouts. Even with repeated burnings, the sprouts can establish themselves and grow rapidly. Studies by the U.S. Forest Service (USDA 1965) show that, although basswood produces large numbers of seeds, few seedlings become established because of the dryness of the substrate or grazing. Basswood seedlings and saplings, which once established grow more rapidly than sugar maple (USDA 1968), are particularly sensitive to browsing (especially by rabbits near the plains or agricultural areas) so that even without fires basswoods reproduce largely by vegetative means. The canopy of the maple-basswood forest is a closed one, like that of the beech-maple type. Since basswood is not as shade tolerant as sugar maple, stump sprouting and root sprouting help it to maintain itself as a forest-dominant.

Daubenmire (1936) found that the reproduction class in Minnetonka Woods in Minnesota showed a total density of sugar maple (per 2500 m^2) to be 15,523 while that of basswood was 89. Comparison of trees 10 inches or more diameter at breast height (dbh) in the same area showed sugar maple to have 25 while basswood had 16. American elm, slippery elm, and red oak showed densities of 5.4, and 3 trees (10 inches or more dbh) per 2500 m^2. In Northfield Woods, the density of trees 10 inches or more dbh were 15 per 2500 m^2 for sugar maple, 26 for basswood, and 21 for red oak.

The climax maple-basswood forest is generally without a dense, well-developed shrub layer (Marks 1942) so that the birds which inhabit these forests are usually canopy-feeding rather than ground-feeding species (Curtis 1959). The woody plants often occur only as two main layers, a crown layer and a layer of ironwood *(Ostrya)* and the reproduction of the dominant tree species. The herb and moss cover is generally poor.

The southeastern Minnesota shrubs include American hazelnut *(Corylus americana)*, Virginia creeper *(Parthenocissus* spp.*)*, American plum *(Prunus americana)*, choke cherry *(Prunus virginiana)*, currant *(Ribes cynosbati)*, rose *(Rosa* spp.*)*, frost grape *(Vitis vulpina)*, and prickly ash *(Zanthoxylum)* (Bergman 1923).

Marks (1942) reported that the most characteristic spring-flowering herbaceous species of the maple-basswood climax forest in Wisconsin were the sharp-lobed hepatica, false rue anemone *(Isopyrum biternatum)*, spring beauty, and bloodroot. In the summer, Dutchman's breeches, squirrel corn, cutleaf toothwort, yellow adder's tongue *(Erythronium americanum)*, bedstraw, and

wild leek were characteristically present. Sweet cicely and fragile *(Cystopteris fragilis)* and maidenhair *(Adiantum pedatum)* fern were also widespread in this forest type. A comparison of this species list with that for the beech-maple forest type showed many species in common.

Summary

The maple-basswood forest association differs from the beech-maple association primarily in the presence and dominance of beech. Sugar maple is the dominant tree species of the association, producing large numbers of seedlings and saplings well adapted to the dense shade which the canopy trees provide. Basswood, although less well adapted to dense shade, reproduces well and maintains its co-dominance with maple by means of root sprouting. The subcanopy associates in the maple-basswood forest are those species well adapted to dense shade, as are the herbaceous species.

Both dominants enrich the soil through a leaf litter which contains high concentrations of mineral nutrients, and the litter increases the amount of organic matter in the upper soil layers.

The spread of the association to the west is inhibited by effectively drier climate, although, in a mesic situation, the maple-basswood association seems able to occupy areas from which it was excluded by periodic fires before the settlement of the United States by Europeans.

Part 2

Inventory and Description of Forested Natural Areas

NEW YORK NATURAL AREAS
Beech-Maple Areas

Beech-Maple Knoll Natural Area, 8 acres

Seneca County, N.Y., Seneca Falls Quadrangle, Lat. 43° 00′, Long. 76° 54′

Owner: U.S. Department of the Interior

The area is part of the Montezuma National Wildlife Refuge.

These sugar maple- and beech-dominated woods are located on rolling topography with low hummocks at an elevation of 386-389 ft. The small wooded knoll lies between a drumlin on the west and a cedar-swamp woodland on the east. Soils have a parent material of glacial till.

The most abundant tree species in the woods is beech, but there is a scattering of other hardwood species such as shagbark hickory, black cherry, and basswood as well as the co-dominant sugar maple. Although the trees in this association are second growth, they are nearing maturity. They average between 12-16 inches dbh and 50-60 ft in height. The average age is estimated to be between 50 and 75 years. The ground cover includes white trillium.

U.S. Department of the Interior, Fish and Wildlife Service, unpublished

Green Lakes State Park,[1] 960 acres

Onondaga County, N.Y., Chittenango Quadrangle, Manlius Township

Owner: Department of Conservation

The park is located east of Fayetteville, 10 miles east of Syracuse and 9 miles south of Oneida Lake. It can be reached on State Route 5 or 290.

This area features a glacial plunge similar to the one at Clark Reservation, but not as spectacular. It also contains a remote forested area in which there are fine old examples of beech, maple, and hemlock.

The area is located at the edge of the Oneida Lake Plain. Topography is rolling; the lakes are situated in deep-sided pockets. Soils are heavy and alkaline, developed over blue clay and shale, and they contain a hardpan in the subsurface horizons. The bedrock is limestone.

The forested area is old growth and undisturbed. The major species are beech, sugar maple, hemlock, and tulip poplar.

The park is best known for its two green lakes. The unusual limnological aspects of the transparent aqua-green water attract scientists from many states. These are 2 of the 11 meromictic lakes reported in the United States and have been studied extensively.

[1]Recommended as a potential Natural Landmark

Interesting fauna in the lakes include a new type of fresh-water sponge and a brilliant red hydra.

The area became a state park in 1929 and the lakes were stocked with sockeye salmon in the 1950s.

Apikian 1965
Eggleton 1956
Russel H. Little, pers. comm. 1970

Hemlock-Hardwood Areas

Bently Woods, 22 acres

Ontario County, N.Y.

Owner: Nature Conservancy

This area lies 18 miles south of Rochester. Take Highway 96 south and about 1.25 mile south of the town of Bushnell Basin turn right onto Fisher Rd. The first time the road forks continue straight on a small, unimproved road; at the second fork take the left fork until the road forks again, then take Cabin Rd. (the right fork) for approximately 0.5 mile and park by the farm house on the right side of the road. The Bently Tract is a few hundred feet west of this farmstead.

About half the Bently tract is a spring-fed, marshy area draining into Irondequoit Creek, which flows through one corner of the property. This part supports a number of mature pine and hemlock. They are surrounded by a dense stand of hemlock of the 8-16 inch dbh class. There is a luxuriant ground cover of moss, ferns, and other moisture- and shade-loving plants. The other half of the tract is on higher ground and was farmed at one time, although not within the past 60 years. Here the white and red oak, elm, ash, and maples predominate. There are large specimens of beech in the tract.

Bently Woods was a gift to the Nature Conservancy by Mrs. Raymond Bently in 1963. It has been designated a Nature Reserve. A committee of local persons interested in the woods has accepted supervisory responsibility. It is working on problems of use by scouts and other conservation-minded groups but with attention to avoiding damage.

Nature Conservancy 1968a
Nature Conservancy, New York Chapter, Bently Tract description, unpubl.

Milford L. Posson Natural Area, 15 acres

Orleans County, N.Y., Shelby Township, T. 14, R. 3 Lot 17

Owner: U.S. Department of the Interior, Bureau Sport Fisheries and Wildlife

Three miles southwest of the village of East Shelby on the east side of South Woods Road.

Part of the 10,800-acre Iroquois National Wildlife Refuge, the Milford Posson Woods encompasses an east-west ridge that runs 6-8 ft above the surrounding swampland. The forest association is one of hemlock, beech, yellow birch, and sugar maple.

The soils are Elnora loamy, very fine sand, moderately well drained, with low natural fertility. This layer is about 18-36 inches and is underlain by a firm layer which limits root growth. High lime clay may occur at depths beyond 3 ft.

Smith (1966) describes the Milford L. Posson tract as

> . . . a near-climax two storied type composed in the first story of co-dominant hemlock and beech. These virgin stems average 16″ dbh and 50′ high with several stems 24-26″ dbh and 60-70′ in height. Pole-sized sugar and red maple, beech, black cherry and yellow birch compose the second story. The ground cover in this type is a low one of ferns, witch hazel, *Lycopodium,* mosses and sugar maple and beech reproduction. The age of the larger hardwoods probably ranges between 150-200 years.
>
> This is the only stand of mature timber of this type within a radius of many miles . . . it should be preserved as a unique feature of the Iroquois National Wildlife Refuge.

This tract was part of a grant to Robert Morris, dated 11 May 1791, from the Commonwealth of Massachusetts.

The swamp-hardwood type which surrounds the ridge lies on well decomposed alkaline Carlisle Muck of some 12-36 inches. The hardwoods present here are largely American elm and red maple, with some green ash. Smith (1966) wrote:

> The swamp stand is open, composed of 6-8″ dbh stems averaging 35′ in height . . . . The ground cover is a 3-10 foot layer predominantly spice-bush *(Lindera benzoin)* but also reproducing elm, ash and red maple. At the west end of the area, this swamp-hardwood type blends with a black willow *(Salix nigra)*-swamp white oak mixture with scattered stems of aspen . . . the average age of this type is 30 years but includes stems at least twice the age.

U.S. Department of the Interior 1968

Mixedwoods

Buckhorn Island State Park,[1] 590 acres

Erie County, N.Y., Grand Island Township

Owner: New York State Park Commission

Take Route 190 north from Buffalo and exit on Long Rd. Continue north to Baseline Rd. and then to East River Rd. Turn west to park entrance.

The park contains woods, bogs, marshes, and creeks. It is a wildlife sanctuary and has been left undeveloped except for the presence of a 2600 ft nature trail and a combination restroom and open-air-meeting shelter building. Plans have been made for the construction of a nature center.

The terrain of the island is flat; soils are muck and clays with a gravel base. After a heavy rain, water pools remain for a long time, which makes it a fa-

[1]Recommended as a potential Natural Landmark

vorite bathing place for the many birds in the area. (Sam Bartolone pers. comm. 1970).

Tree species in the woods include shagbark hickory, basswood, red and pin oak (although this latter species is being killed by wasp gall), black cherry, hawthorn, trembling aspen, speckled alder, black walnut, white ash, and, in the wetter spots, swamp willow. There is an occasional pear tree which probably invaded the woods from a farm that used to be in the area. The largest and finest trees in the tract are basswood, ash, hickory, oak, aspen, and willow. There are dead elms in the woods which are favorite sites for the Brown Creepers that hitch slowly up the trunks of the trees to feed on the insects between the bark and the dead wood. Beech and sugar maple are found at the end of the tract.

Wild grape covers many of the trees and shrubs along the nature trail and the gray-stemmed dogwood forms a heavy bushy growth from 4 to 10 ft tall in spots. Red dogwood is also common. Other herbs and shrubs common in the woods include the thimblewood and wild meadow rose, which flower through June and July, goldenrod and wild bergamot, which flower later in the summer, and wild sunflower. There are also some yellowwood sorrel, evening primrose, jewelweed, self heal, horsetail, and staghorn sumac. Of special interest is the silverweed and purple Angelica.

The fauna includes more than 90 species of birds which nest in the area, including the rough-legged hawk, black and white warbler, gold finch, cedar waxwing, yellow-bellied sapsucker, and red-headed woodpecker. There are also red-eyed vireo (one nesting pair per acre), ovenbird, blue heron, great horned owl, and mocking bird. In late March, as many as 500 whistling swan have been resting in the area, usually for a 2 or 3 week period, and then they continue north. From May to the end of August there are black-crowned herons feeding on the crayfish. The tract is also a favorite nesting place for black duck and the red-winged blackbird. Long-billed marsh wrens nest here from May through June. Off shore, nesting on the breakwater, are found the common terns and sooty terns (Sam Bartolone pers. comm. 1970).

Other fauna include the leopard frog, deer, red and gray fox, racoon, muskrat, gray squirrel, mink, and New York weasel. The marshy areas contain carp and bullhead that spawn there, and the Niagara River waters contain sheephead, rock bass, calico bass, small mouth black bass, gar fish, rough fish, and bluegill.

Dan Bednarski, pers. comm. 1970
New York State Park Commission, Self-guided Tour—Buckhorn Island State Park, unpubl.

Deer Lick, 398 acres

Cattaraugus County, N.Y.

Owner: Nature Conservancy

From Gowanda, Erie County, turn from U.S. Route 62 east on S. Water St. (the first

street south of the bridge) which becomes Commercial St., and then Palmer St. Turn right onto Broadway (main road to Cattaraugus). Continue on Broadway approximately 1 mile, turn left on Point Peter Rd. to Deer Lick.

Within this large Nature Sanctuary on sandy glacial soils is a mixed forest tending toward the beech-maple-hemlock climax type. The ameliorating influence of nearby Lake Erie creates a habitat suitable for such southern species as red cedar, while at higher elevations are found transition-zone plants such as hemlock.

The sanctuary also includes areas of open meadow and reverted farmland, deep gorges, streams, and the little Deer Lick Falls.

The tree species found in this variety of habitats are: blue and American beech, basswood, butternut, yellow birch, honey locust, hemlock, red cedar, hop hornbeam, American and slippery elm, tulip, pin and black cherry, white ash, red oak, trembling aspen, striped and mountain maple, cucumber, and shagbark hickory.

There are many birds which nest in the sanctuary; a list of them is included in the appendix along with a list for the herbs, shrubs, and ferns present on the tract.

No hunting, fishing, camping, or pets are allowed in the preserved area; picnicking is allowed only in designated buffer zones outside of the preserved area. Already a Registered Natural Landmark.

Nature Conservancy
Buffalo Museum of Science, unpubl.

Fiddler's Green, 26 acres

Madison County, N.Y.

Owner: Nature Conservancy

This tract consists of mixedwoods and a bog. It is located near Colgate University.

Nature Conservancy 1968a
D. E. Burt, pres. comm. 1970

Ironsides Island,[1] 20 acres

Jefferson County, N.Y.

Owner: Nature Conservancy

The island is located in Alexandria Bay in the St. Lawrence River.

[1]A Registered Natural Landmark.

The tract is primarily known for its Great Blue Heron rookery and red streaked cliffs overlooking the bay. Ironsides Island was acquired by the Nature Conservancy in 1964.

Nature Conservancy 1968a

Rushing Stream Sanctuary, 50 acres

Chautauqua County, N.Y., Villenova Township

Owner: Buffalo Audubon Society

This natural area lies 8.8 miles south of Forrestville, on Cassadaga Rd., 0.4 miles east of the junction with Farrington Rd.

The Buffalo Chapter of the National Audubon Society reports that this area includes a feeding area serving a large nearby Great Blue Heron heronry, and that it contains interesting animal and plant life. Elevation ranges from 1400 ft to 1450 ft, with some open meadow and marshland.

The wooded area contains beech, hemlock, cherry, larch, hop hornbeam, and sugar and red maple. Sumac, blackberry, shadbush, dogwood, and willow are numbered among the shrubs. A stream crosses the property and there are several springs.

This is a new sanctuary given to the Buffalo Audubon Society 2 years ago. It is undisturbed and largely unknown. Studies have not been completed to establish the botanical content or natural characteristics. So far, the area has only been used for spring wild-flower-collecting and bird-watching trips.

Robert E. Hull, pers. comm. 1970

PENNSYLVANIA NATURAL AREAS

Beech-Maple Areas

Evans Woods, 5 acres

Erie County, Pa., Harbor Creek Township

Owner: Kenneth Evans

On I-90, exit at Wesleyville then turn right onto Hannon Rd about 100 yards past the exit. The stand is located on the property of the first house to the right.

A beech-maple stand is located here on the Ashtabula end moraine where a stream has cut a valley about 50 ft deep. The parent material is glacial drift over Devonian gray shale. Soils are Langford and Erie silt loams, moderately eroded.

The woods contain, in addition to the dominant species, ironwood, red oak, and cucumber tree.

The tract which was pastured until the 1950s is bordered by a higher part of the moraine where hemlock is abundant.

Elizabeth Evans, pers. comm. 1970

Jacob Guy Natural Area, 140 acres

Crawford County, Pa., Townville Quadrangle, Randolph Township

Owner: U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife

The natural area is included in the Erie National Wildlife Refuge. Headquarters of the refuge are located 10 miles east of Meadville on Route 27 and 1.5 miles south of Route 173. The area itself is north of headquarters, 1.5 miles NNE of Guys Mills, Pa., 0.75 mile east of Route 198, and 0.5 mile west of township Route 744.

The Jacob Guy Natural Area is located on a steep, east-facing slope at an elevation of 1325-1475 ft above the marshland at the headwaters of Woodcock Creek.

The forest composition is a transitional one between the beech-maple and hemlock-hardwood forest types, and has as co-dominants beech, maple, and hemlock. These species average 40-50 ft in height and 13-16 inches dbh, with scattered sugar maples as tall as 60 ft and 18-24 inches dbh. All of the dominant species are reproducing well.

The forest is composed largely of second growth, and has an average age of 50 years although some of the larger maples and hemlock are over 75 years old. Most of the original timber in the valley was cut in the late 1800s and early 1900s by a Union City, Pa., furniture manufacturer.

Subordinate species in the stand include yellow birch, black cherry, white ash, red maple, elm, basswood, red oak, and some white pine; they average

30-40 ft in height and 10-12 inches dbh. Some of the larger white ash are as tall as 50 ft and have a dbh of 14 inches. There are still some open areas where thornapple persists.

The ground cover is low and includes witch hazel, *Lycopodium,* and mosses.

U.S. Department of the Interior, Bureau of Sport Fisheries and Wildlife, undated and unpubl.

McConnells Mill State Park,[1] 2000 acres

Lawrence County, Pa.

Owner: State of Pennsylvania

The park is located about 2 miles southwest of the junction of U.S. routes 19 and 422 in Lawrence County.

For nearly 10 miles Slippery Rock Creek flows through a gorge varying from 100 to 400 ft in depth. Although crossed in several places by roads, none follows the creek. Thus the streamside is wild. The central and most beautiful 5-mile section is roadless, with only a minor, unmaintained trail. The tributaries are in very rugged ravines. There are many sheer cliffs, overhangs, and waterfalls.

The gorge contains one of the best hemlock ravine communities in western Pennsylvania, with mature stands of beech-maple and other hardwoods. Some spots may be virgin or near virgin.

The only development is in the upper area near the head of the gorge where an old grist mill has been restored and there is a small mill dam. This area is heavily visited. The remaining area has great potential for botanical study.

Kenneth S. Erdman, Slippery Rock State College, who is at present conducting research in the area, rates the area as valuable geologically as well. He reports (Erdman, pers. comm. 1970) that the gorge was presumably cut by overflow waters from a glacial lake.

Presque Isle (The Peninsula)

Erie County, Pa.

Owner: State Park

Already a Registered Natural Landmark, the area consists of a long, projecting sand bar in Lake Erie.

[1]Recommended as a potential Natural Landmark

Wolf Creek Narrows,[1] 100 acres

Butler County, Pa.

Owner: Mrs. Henry Colvin

The tract is located 2 miles northwest of Slippery Rock along Wolf Creek between Route 258 and West Water Street.

Kenneth Erdman of Slippery Rock State College reports (Erdman, pers. comm. 1970) that Wolf Creek, one of the few streams yet unpolluted by acid mine wastes in this vicinity, flows through a narrow gorge for about a mile. In places sheer cliffs reach heights of 50 ft above the river. Three small tributaries drain into the main stream through beautiful ravines with small waterfalls. Most of the gorge proper and some of the surrounding uplands are on the Colvin property. This tract was part of an original land grant given to a veteran of the Revolutionary War and is still in the possession of his descendants. Land use has been quite restricted. Unfortunately, the upper slopes were logged about 1900 and there are some mine excavations within the gorge. However, since these early operations, the land has been allowed to recover and now it supports a fine, maturing stand of beech-maple. Along the walls of the gorge are stands of hemlock, some of which may be original, if not, certainly mature. Walking fern is very common on the limestone cliffs.

The adjoining properties are also important complements to the central tract. There are two flood plains, above and below the narrows, which contain a wealth of plant growth. The upper area supports a fine stand of large sycamores. There are also woods in varying stages of succession from old fields including hawthorn thickets and oak forests. Two small bog remnants lie on the rim of the gorge.

This area is frequently visited by members of the Biology Department of Slippery Rock College and students have been involved in studying the rich flora. Certainly this is the best outdoor laboratory in the area.

Hemlock-Hardwood Areas

Buchanan Run, 110 acres

Lawrence County, Pa.

Owner: Western Pennsylvania Conservancy

This tract is located just east of Pulaski on Route 468.

This is a small hemlock-hardwood ravine similar to McConnels Mills.

Kenneth S. Erdman, pers. comm. 1970

[1]Recommended as a potential Natural Landmark

Booth Run

Mercer County, Pa., Kinsman, Ohio-Pa. Quadrangle

The area lies just south of Route 358 about 3 miles west of Maysville, Pa.

This is a rather short, shallow gorge which is wooded and limited in extent.

Edward G. Corbett, pers. comm. 1970

OHIO NATURAL AREAS
Beech-Maple Areas

Ansell's Ledges

Geauga County, Ohio, Russell Township, South Russell Quadrangle, T. 7 N., R. 9 W.

The tract lies south of Route 87 about 2.3 miles east of Route 306. You can hike southeast from the American Society for Metals to the ravine.

This is a beautiful, largely second-growth beech-maple woods on scenic rough and rocky terrain. The wooded valley has conglomerate ledges at the east edge, with mature beech and sweet birch. Hemlock and mountain maple are present, but there is no yellow birch.

There is a rich herbaceous flora.

Herrick, J. A. 1962, revised 1965. A summary of data, natural areas project. Ohio Biol. Surv. unpubl.

Blacklick Woods Metropolitan Park,[1] 200 acres

Franklin and Fairfield counties, Ohio

Owner: City of Columbus, Metropolitan Park District

The park is located 10 miles east of Columbus and 1 mile south-southeast of Reynoldsburg. The entrance to the park is 0.75 mile east of the intersection of Livingston Ave. and Brice Rd. in the middle eastern section of Franklin County.

Labeled one of the finest unspoiled woodlands in central Ohio by Herrick (1962 unpubl.), this beech to elm-ash-oak swamp forest is situated on the Late Wisconsin till plain on very gently rolling to flat terrain. The low-line till overlies Mississippian shale.

The dominant trees are American elm, white ash, and red maple in the swamp forest and beech and sugar maple on the tops of gentle knolls which extend to the margins of the depressions in well drained to poorly drained sites. The medium acid soils are Bennington silt loams to silty clay loams.

The tree species, as surveyed by Sudia (1960), include as associates several species of oak, including white, swamp white, bur, pin, and red oak, black walnut, black cherry, shagbark and bitternut hickory, honey locust, red elm, and hackberry. Small trees include flowering dogwood, blue beech, and ironwood.

Some of the common herbaceous and shrub species are swamp buttercup, swamp rose, spring beauty, cut toothwort, blue phlox, Dutchman's breeches, Greek valerian, wild carrot, false mermaid, smooth yellow violet, jack-in-the-

[1]Recommended as a potential Natural Landmark

TABLE 7. Attributes of trees 4 inches dbh and over in an 11-acre sample in Blacklick Woods Metropolitan Park. (Sudia 1960)

Tree species	Basal area	Stems per acre
Fagus grandifolia	62.9	37.4
Ulmus americana	33.6	40.0
Fraxinus americana	12.0	19.0
Acer saccharum	6.2	8.4
Acer rubrum	2.6	2.6
Others	9.4	16.0
Carya ovata		3.1
Carya cordiformis		1.7
Prunus serotina		1.5
Juglans nigra		0.5
Quercus alba		0.4
Quercus rubra		0.3
Quercus bicolor		0.2
Quercus palustris		0.2
Quercus macrocarpa		0.1
Gleditsia triacanthos		0.1
Total	126.6	123.4

pulpit, bulbous bittercress, Solomon's seal, purple violet, jewelweed, and sensitive fern as well as several species of *Trillium*. Gooseberry, poison ivy, elderberry, spicebush, creeping wahoo, and moonseed vine are also present.

Data on the basal area and stems per acre for the dominant tree species are included in Table 7.

A few trees (mostly white ash) were cut from the area before it was made a park, but the canopy is closed except where trees have suffered windfall.

Fritts 1958
Gareth Gilbert, pers. comm. 1970
Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Bradley Farm

Butler County, Ohio, Oxford Quadrangle, Oxford Township

Owner: Private ownership

The area lies 2 miles north of Oxford on Brown Rd.

On this farm is an area of hills and ravines which supports a rich flora. The wooded section is dominated by beech-maple on the more mesic sites and the oak-hickory association on the drier soils. Very large specimens of beech occur in the woods as well as oaks up to 4 ft dbh.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Chance Creek Recreation Area, 64 acres

Lorain County, Ohio, Vermilion Quadrangle, T.6 N., R.19 W., Brownhelm Township
Owner: Oberlin College

The tract is located southwest of Brownhelm. To reach it, take Ohio Route 6 to just east of Vermilion, turn south on Vermilion Rd., then go just under 5 miles to Peasely Rd. Walk down the road to the southwest.

This is a forested stream valley with beech-maple, beech-hemlock, and flood plain deciduous vegetation. The bedrock is Devonian age black shale, with a few lenses of limestone that contain many fossils. Topography includes a winding gorge that has been cut in the shale and a broader flood plain by the Vermilion River. It is mostly a dissected glacial till plain with a bit of the Maumee Ridge.

Soils are derived from glacial clay and degraded shale and vary in texture from heavy to light.

The species of trees and shrubs in the forest include beech, sugar maple, hemlock, tulip tree, red and white oak, shagbark and bitternut hickory, black gum, sassafras, sycamore, box elder, black maple, river-bank grape, black locust, hornbeam, and hop hornbeam.

This Oberlin College Study Area was purchased 40 years ago as an area of recreation for the men of the college, but has been little used for that purpose. Its principal use has been for class trips and as a collecting area for study materials.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.
George T. Jones, pers. comm. 1970

The Cincinnati Nature Center,[1] 600 acres

Clermont County, Ohio

Owner: Cincinnati Nature Center, Inc.

From Cincinnati, travel west on Route 32 to Tealtown Rd. Turn north and the center is located at number 4949 Tealtown Rd., Milford.

This large Nature Center contains a beech-maple woods on glacial gravels, meadows, field, and a 4.5-acre lake.

In the woods, basswood, red and white oak, hickory, and black gum are subdominants. In the wetter areas, sycamore and dogwood are included in the understory. There is an abundance of spring-flowering herbaceous species present.

Fauna include deer, fox, skunk, raccoon, opossum, groundhog, shrew, mole, and mice. More than 150 species of birds have been spotted in the center,

[1]Recommended as a potential Natural Landmark

including the pileated woodpecker and pine siskin, as well as mallards, other ducks, and kingfishers.

The Cincinnati Nature Center, undated leaflet

George Rogers Clark Park, 150 acres

Clark County, Ohio, T.4 N., R.9 W., sec. 27, N1/2

Owner: City of Springfield

The park is located along Route 440, 5 miles west of the city of Springfield.

George Rogers Clark Park is situated on a ground moraine overlooking the Mad River outwash valley. Topography is rolling and hummocky and supports beech-maple-hemlock and oak-hickory forest on the uplands. The tree species in order of importance are white, red, and black oak, shagbark hickory, sugar maple, white ash, hemlock, and beech.

Soils are mostly well drained silt loams of the Miami catena developed over calcareous Wisconsin glacial till. There are a few exposures of the underlying Silurian-Niagaran-Cedarville and Springfield dolomite bedrock.

The area was damaged by highway construction a few years ago, but is still a good wildlife area of special interest to Wittenberg University in Springfield.

Kenneth Hunt, pers. comm. 1970
Ronald de Langlade, pers. comm. 1970

Conneault Creek—Tract A

Ashtabula County, Ohio, Kingsville Township

Owner: H. Blakeslee

The tract lies on both sides of Conneault Creek (for about 1 mile east and west) north of Interstate Route 90 and south of South Ridge Rd.

The south face of the ridge (south of South Ridge Rd) supports a rich spring flora and a good quality beech-maple forest. The flood plain is comprised of walnut, which has been cut recently, silver maple, ash, and elm as well as many herbaceous species. The north-facing slope has hemlock, striped maple, and black maple.

Herrick (1962 unpubl.), who visited this stand in the course of the Ohio Biological Survey, notes that this is the only place in Ohio where striped maple is found.

Conneault Creek—Tract C, 35 acres

Ashtabula County, Ohio, Conneault Quadrangle, Kingsville Township

Owner: Wharram Nature Club Sanctuary

This tract lies approximately 1 mile east of the Thayer property on the north side of South Ridge Rd.

A small, 10-15 acre woods are located here on top of a ridge. The dominant species are beech and sugar maple. This part of the tract has had little if any disturbance in the last 40 years. Along the north edge of the woods is a 300 ft strip of nearly pure hemlock. The rugged slope, facing north to the creek, still has its original vegetation, including roundleaf dogwood and striped maple.

The remainder of the 35-acre tract is old orchard and old field.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Flint Ravine

Franklin County, Ohio, N.W. Columbus Quadrangle, Sharon Township

The ravine crosses Route 23.

This is a spectacular exposure of a rock formation called the Ohio Shale. The rocks are of the Devonian age and the glacial till over them has been eroded away. There is iron and sulphur present which has formed iron pyrite (fool's gold), which dissolves readily in the moisture that seeps from the rocks forming a dilute solution of sulfuric acid.

A stream flows through the ravine to the Olentangy River. Along it in several places are large "cannon ball" concretions which were formed after the shale was deposited.

The upper and lower slopes of the ravine walls are well drained and support a characteristic beech-maple association, which is particularly marked on the north-facing slope and the area to the southwest of the girls' camp (Camp Mary Orton). Other slopes also support beech-maple with the addition of several other hardwoods such as white oak and hickory, which are common on the slopes to the southeast of the girls' camp.

Herrick (1962 unpubl.) reports a rich fauna and flora in this unusual area; a partial list of the plants in the ravine is in the Appendix. An early study of this area and other ravines along this river was reported by Fisher (1906).

Allene C. Barans, pers. comm. 1969
Ohio State University, Dept. of Biological Sciences, unpublished mimeo, Botany 406, *Flint Ravine Field Trip*

Helser's Woods

Allen County, Ohio, Bluffton Quadrangle, Secs. 25-26

The area lies just south of the junction of Bently Rd. (north-south) and Lima-Ada Rd. (east-west).

This was a tract of original forest or old second growth, which is traversed by a branch of the Little Hog Creek. There is a flat upland area, a meander bluff varying in topographical age from current cutting to "mature" slopes, and a flood plain with vernal oxbow pools. The upland type was originally beech-maple and the lowland type was swamp forest. The younger, steeper bluffs tend toward the oak-hickory type.

The second growth is patchy since the stand was not clear-cut.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.
Charles C. Laing, pers. comm. 1969

Heronry

Ashtabula County, Ohio, Andover Quadrangle, Richmond Township

The heronry lies 2000 ft south of Hole Rd. between State Route 7 and Pymatuning Lake Rd.

A mature beech forest lies here which supports a Great Blue Heron rookery. It has been estimated that about 100 nests are in this tract.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Hueston's Woods

Butler and Preble counties, Ohio

The woods are located on the county line, 5 miles north of Oxford.

This is a beech-maple forest which lies within a state park. It has never been cut over, although some very large tulip trees were removed from the tract many years ago.

The topography includes rolling and mildly dissected upland slopes and alluvial terraces.

A species list for the trees in this woods is taken from Braun (1950).

Fagus grandifolia
Acer saccharum
Liriodendron tulipifera
Fraxinus americana
Nyssa sylvatica
Celtis occidentalis
Quercus alba
Carya ovata
Ostrya virginiana
Gleditsia triacanthos

Ulmus fulva — *Carya cordiformis*
Ulmus americana — *Aesculus glabra*
Prunus serotina

These data are taken from a transect which includes rolling land, slopes and an alluvial terrace. The last tree species, while not within the transect, were located in the area. (Braun, 1950)

Suggestions for the preservation of this exceptional area include the removal of picnic tables from that part of the park.

Already a Registered Natural Landmark.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.
Kenneth Hunt, pers. comm. 1970

Mill Creek Park,[1] 2389 acres

Mahoning County, Ohio, Youngstown and Boardman Township

Owner: City of Youngstown

The park lies within the city limits of Youngstown. The main entrance is at Falls Ave. and 816 Glenwood Ave. (U.S. Routes 7 and 62 pass Falls Ave. south of Central Square.)

This city park, which is some 7.5 miles long, includes many different geological and vegetational aspects. The southern 839 acres are mainly beech-maple forest, with about 160 acres of swamp. The northern part is hemlock-hardwood in nature and includes 172 acres of lake, some old coal mines, and sulfur springs. The 73-ft deep Mill Creek Gorge has been carved in the sandstone and shales of the area. Mr. Vickers, the park naturalist, reports that the last glacier passed over the top of the existing rocks leaving glacial scratches in several places and filled the bed of the 300,000 year old Sangamon River. The present gorge has been carved since the retreat of the glacier (Vickers, pers. comm. 1970).

The bedrock is chiefly Massillon sandstone and shale; the last coal veins of the Carboniferous Period are underlain by Mississippian sands and shales; and there are Mercer limestone outcrops in the southern portion of the tract.

In these rocks have been found a variety of fossil forms including those of *Lepidodendron, Sigillaria,* calamites, ferns, and brachiopods.

Soils in the park vary from sands to clays; most are of a clay loam texture with a pH of 6.5-7.0. Parent material is sandstone, shale, and glacial till.

Four climatic provinces converge in the area of the park, making the weather very hard to predict and providing an abundance of differing microclimates.

There are more than 70 species of native trees in the park in habitats that vary

[1]Recommended as a potential Natural Landmark

from dry sandstone cliffs to swamplands. Shrubs include viburnums, *Cornus, Sambucus,* willow, *Ribes,* sumac, alder, filbert, witchhazel, buckthorn, and *Prunus*. Vickers estimated more than 1000 species of herbs are present here, including 28 species of ferns (Vickers 1910). Some of the rarer plants that are found here are the purple-fringed orchid, ladies tresses, golden seal, ginseng, pipsissewa, globe flower, blue-eyed mary, white *Erythronium,* twin leaf, and three species of club mosses.

Fauna is especially rich in the undeveloped southern area of the park. Some 215 species of birds are found here including the yellow-crowned night heron, which set a 1968 nesting record; 28 species of mammals including beaver, deer, gray and red fox, and red and flying squirrel; and many species of reptiles and amphibians. The lakes, although suffering the effects of pollution, support some 25 species of fish.

Mill Creek Park was established as a Township Park in 1891 by an act of the State Legislature and is controlled by a Board of Park Commissioners appointed by the Common Pleas Judges of Mahoning County. There are three commissioners, one being appointed each year. The commissioners have the power to levy taxes, purchase property, develop, maintain and extend the park area and to employ the help necessary to carry out their program.

The northern part of the park, which includes the Mill Creek Gorge, has been developed with the additions of a golf course, tennis courts, a garden center, and a Nature Education Center. The southern acres are largely undeveloped.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Virginia Kendall Park, 1600 acres

Summit County, Ohio, Peninsula Township

Owner: Metropolitan Park

The park contains both beech-maple and oak forests, with hemlock found along the cliffs. Although attempts are made to maintain part of the park as a natural area, it sees very heavy use.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Lisowski Property

Ashtabula County, Ohio, Conneault Quadrangle, Kingsville Township

The tract lies on the north side of Fox Rd. between Route 84 and the township line, about 0.25 mile west of the east end of Fox Rd. The property extends north to the Conneault River.

Here on rolling hills is located a beech-maple forest. Some of the trees are ma-

ture, but many have been cut over the years. The flood-plain stand contains yellow birch and hemlock of fair size. There are beaver present.

The upland stand has good spring flora, and the flood plain supports much *Amelanchier laevis*.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

Prall Woods

Logan County, Ohio, Monroe Township

The tract is located at the head of Macochee Creek off Vassar Rd. about 6 miles southwest of Middleburg.

Herrick (1972 unpubl.) has reported an excellent sugar maple stand, several "sinks," and two boggy ponds in this tract.

Sigrist Woods,[1] 20-30 acres

Stark County, Ohio

Owner: Stark Wilderness Center, Inc.

The Wilderness Center is located 1 mile northwest of Wilmot, Ohio, on Route 250.

Although the area lies some 25 miles south of the beech-maple region as mapped by Braun (1950), it does lie at the edge of the glaciated area, and has been recommended for dedication as a National Natural Landmark.

Part of the tract contains a magnificent stand of beech, sugar maple, oak, and hickory. There is a 400-year-old bur oak that measures 16 ft in circumference and 5 ft dbh. The rest of the area includes marshy spots, lakes, creeks, and oldfield. This is a productive wildlife habitat. A list of the vertebrate species found in the Clark Wilderness Center is included in the Appendix.

Trees in Sigrist Woods include white, red, and bur oak, black walnut, black gum, sugar maple, beech, hop hornbeam, flowering dogwood, sycamore, shingle oak, black oak, red maple, slippery elm, blue beech, pignut, shagbark, and bitternut hickory, American basswood, American elm, white ash, black cherry, and sassafras. Elderberry, wild grape, white baneberry, Virginia creeper, wood nettle, poison ivy, and an abundance of wild flowers are found here also.

In all, there are five tracts of mature timber in the center. Although the original owner did some very limited logging, the area has been disturbed very little, and is one of the best in this part of Ohio. The area is being protected with zeal.

Herbert Hager, Report to the National Park Service, Sept. 1969, unpubl.
Trail Guide, Sigrist Woods, 1966, unpubl.
Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.

[1]Recommended as a potential Natural Landmark

Tree Farm, 78 acres

Defiance County, Ohio, T.4 N., R.5 E., Richland Township, Secs. 23 and 26

Owner: Elmer Greenlee, Route 6, Defiance

The tract lies about 1.5 miles west of the Defiance-Henry County line. Take Route 281 from Defiance east. The area is between the road and the Maumee River.

A beech-maple-white oak forest has developed here on Hoytville soils. There are many mature trees in this stand, which is completely wooded except for a small opening on the east side. The area is bisected by a small stream which drains into the Maumee River and which is dry most of the year.

The woods provide a good example of the type of forest which existed in this area in presettlement times, but which has been removed to provide agricultural and developed lands. The woods are bordered on the east and west by croplands.

A study of the fauna in the woods shows that 7 species of reptiles, 6 species of amphibians, and 14 species of mammals including the short-tailed shrew, raccoon, red fox, white-tailed deer, woodchuck, and prairie white-footed mouse live in the woods.

The owner plans to keep the area in essentially its present condition and to collect syrup from the maple trees.

Herrick, J. A. 1962. Ohio Biol. Surv. unpubl.
Ruffer et al. 1968

Van Sickle Woods, 39 acres

Holmes County, Ohio, Millersburg Quadrangle, Killbuck Township, Sec. 8

Owner: Nature Conservancy

The woods can be reached on County Rd. 48

This beech-maple woods lies on steep and hilly unglaciated sandstone at the edge of the glacial border. The soil has a pH of 5-6. It is a second-growth stand and includes tulip tree, white ash, wild black cherry, dogwood, bitternut hickory, sassafras, and red oak. There is an excellent ground cover of wild flowers and *Lycopodium*. On the east side of the property is a beautiful waterfall.

The area has been protected for over 60 years from fire and grazing.

Easterly 1969
Nature Conservancy 1968a
Nature Conservancy 1969a

Villars Chapel Woods, 500 acres

Clinton County, Ohio, Blanchester Quadrangle, Vernon Township

Owner: Many owners

The area lies south of Route 350 and east of Villars Chapel (junction of routes 730 and 350).

The woods consists of red maple, elm, and pin oak in the poorly drained areas, with some spots of beech-maple and some of beech and white oak. The area is one of poorly drained silt loams and clays on a mostly level Illinoian till plain.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Vort Woods, 50 acres

Ashtabula County, Ohio, Jefferson Quadrangle, Windsor Township

Owner: Private ownership

The Vort residence is located on Hudson Rd. Vort Woods is about 1500 ft north along a dirt road.

This is a stand dominated by beech and maple, with tulip tree, yellow birch, hop hornbeam, and basswood. The trees are large and there is an excellent herbaceous flora. Herrick (1962 unpubl.) reports that this is an excellent sample of this forest type.

Wilberforce Beech Woods,[1] 200 acres±

Greene County, Ohio

Owner: Central State College

The woods are located on the property of Central State College, immediately north of the campus on a river bluff above Massey Creek.

Kenneth Hunt (pers. comm. 1970) indicates that this is a climax forest, dominated by beech, which lies on glacial deposits. He evaluates it as being third in natural value in southwest Ohio. There has been some disturbance and history of grazing. Presently, the area needs protection from dumping.

The pileated woodpecker has been reported as present in this woods.

Arthur B. Williams Memorial Woods,[1] (North Chagrin Reservation), 65 acres

Cuyahoga County, Ohio, Mentor Quadrangle, T.8 N., R.10 W.

[1]Recommended as a potential Natural Landmark

Owner: Cleveland Metropolitan Park District

Travel 15 miles east of Cleveland, Ohio, on Route 91 and I-271 to the area, which lies north of the Chagrin River and south of Som Center Rd.

This excellent beech-maple forest lies on the southern boundary of the 1719-acre North Chagrin Reservation of the Cleveland Metropolitan Park District. Within the reservation, the land slopes to the east for 1 mile, then drops steeply to the level of the river, giving rise to bluffs, short gullies, and ravines. The 65-acre Williams Memorial Woods is located in this area of rougher terrain. It slopes to the northeast from 860 to 760 ft above sea level.

The area is one which has Cleveland shale as its bedrock material. Over this occurs Volusia clay loam, which is derived from glacial deposits of shale and sandstone material. The soil is 0.4-9 inches deep, friable and porous, and is poorly drained; the loose and spongy humus layer is some 1-4 inches in depth. The subsoil is a dense yellow clay.

Due to the heavy subsoil, pockets of rainwater accumulate in the area, especially in the wetter seasons of spring and winter. Otherwise, much of the rainfall is lost as runoff due to the slope of the land.

The climate of the area, as measured from 1932 to 1935, showed a 4-year average of 31.62 inches of precipitation, with average temperatures of 71°F in the summer and 20°F in the winter. Extremes of temperature in this period were 96°F and −13°F. Relative humidity is high, usually between 75 and 90%. These data probably reflect the influence of Lake Erie, a short 5 miles to the northwest of the woods, which minimizes the fluctuations in temperature found further inland.

Williams Woods includes four vegetational divisions. Along the eastern edge of spurs and ravines is a forest of beech, hemlock, red oak, and chestnut. (Although there were large standing trees of this last type in 1936, none were living.) In the ravines in moister areas is a forest of sugar maple, tulip, and in some places hemlock. This is regarded as the beginning of a transition stage toward a swamp-forest.

In the southwest corner of the woods, where there is standing water during part of the year, and along the western edge, is a younger forest of black ash, American elm, basswood, and red maple.

The interior forest is one of beech and sugar maple. Williams believed that the hemlock and red oak were tending toward exclusion in 1936, and that tulip tree and white ash were secondary succession trees with the most important tree species being beech, sugar maple, and red maple. He postulated that the oaks, hickories, and sassafras will be eliminated through failure to reproduce.

The cucumber tree and tupelo will probably continue for some time as associates within the climax.

When the opportunity presents itself for secondary succession (such as by the uprooting of a large tree and exposure of the yellow clay subsoil), it is the tulip tree and white ash which frequently appear and not the sugar maple nor the beech which cannot germinate on this surface.

TABLE 8. Ecological classification of plants in Arthur B. Williams Memorial Woods.

In beech-maple association	In beech-hemlock-oak-(chestnut) mictium	In ravines (flood-plain extensions)
	1. Primary dominants	
Beech	Beech	Hemlock
Sugar maple	Hemlock	
	(Chestnut)	
	2. Secondary dominants	
Red maple	Red maple	
Tulip	Red oak	
White ash		
Northern fox grape		
	3. Incidental dominants	
Shagbark hickory	Shagbark hickory	American elm
Cucumber	Cucumber	Basswood
Red oak	Tupelo	Slippery elm
White oak	Sassafras	Butternut
	White oak	Black walnut
	Wild black cherry	Bitternut
	Pignut	
	Black birch	
	Scarlet oak	
	4. Sub-dominants	
Hop hornbeam	Hop hornbeam	Shrubs, vines, herbs, ferns,
American hornbeam	American hornbeam	and other plants.
Shrubs, vines, herbs, ferns,	Flowering dogwood	
and other plants, as listed	Shadbush	
in Table 37[a]	Shrubs, vines, herbs,	
	ferns, and other plants	
	as listed in the Appendix.	

An ecological classification of plants in this tract taken from Williams (1936) is presented in Table 8.

The age of the forest as measured by the counting of annual rings on tree stumps indicates a figure of well over 280 years.

Spicebush and maple-leaved viburnum are the most common shrubs in the woods and red-berried elder is found where the soil has been disturbed.

There is an abundance of early flowering herbs in the beech-maple forest including such species as Dutchman's breeches, *Trillium,* spring beauty, cutleaf dentaria, yellow adders tongue, and yellow violet. There are fewer species

present under the beech-hemlock association forest. A list of the plants in Williams Woods is in the Appendix.

Faunal studies in Williams Woods in the 1932–36 period showed the presence there of the smoky shrew and the flying squirrel. A more complete list of fauna is in the Appendix.

Williams Woods has been protected since 1927. The last logging on record took place there in 1871. No hunting is allowed within the boundaries of the 1800-acre reservation. These woods have been thoroughly studied, and documented observations have been made since those of Williams in the 1932–36 period. Williams Woods is now under consideration as a National Natural Landmark by the National Park Service. The reservation includes nature trails, a museum, and nature center.

Charles A. Brown, pers. comm. 1969
Williams 1936

Oak-Hickory Area

Ferguson Woods, 100 acres

Green County, Ohio, Bellbrook Quadrangle, Beaver Creek Township, Sec. 26 SESE

Owner: Beaver Creek Board of Education

The area lies beside the Beaver Creek High School, 5 miles from Dayton on old U.S. Route 35.

Ferguson Woods is a mature oak-hickory woods, with a maple understory which has long been protected from grazing. The best part of the tract lies on the north side and contains huge white and red oaks and walnut. Kenneth Hunt (pers. comm. 1970) wrote:

> The soils are silt loams of the Miami Catena, largely the more poorly drained Celina, Crosby, and Brookston members. The parent material is calcareous glacial till over dolomitic limestone. The physiography of the area is rolling, the climate mesic, measuring 35 inches of precipitation and an annual mean temperature of 50°F.
>
> The area has never been completely cut over and has been designated as a natural area and school forest for the Beaver Creek High School.
>
> There are in the woods, in addition to the dominant species, elm, ash, and sugar maple, with redbud, dogwood, and blackhaw in the understory.

Beaver Creek Board of Education, pers. comm. 1970

Fort Hill,[1] 2 square miles±

Highland County, Ohio, Bainbridge Quadrangle, Brush Creek Township

[1]Recommended as a potential Natural Landmark

Owner: State park

Although this area lies to the south of the beech-maple boundary as mapped by Braun, it has been labeled as probably the "finest natural area in Southern Ohio" (Herrick 1962 unpubl.). The tract includes deep ravines and a Niagara limestone gorge.

A reference for the tract is Shelford (1926:365)

Goll Woods,[1] 190 acres

Fulton County, Ohio, German Township, Alvordton Quadrangle, T.7 N., R.4 E., sec. 24

Owner: Department of Natural Resources

From Archbold travel north to the junction of routes 66 and 2, then west to the third crossroad, then north 0.5 mile. The woods is to the east.

Goll Woods is of the oak-hickory type and includes as dominant species yellow, bur, and white oak and hickories. Associated tree species are American basswood, beech, white ash, elm, and silver, black, and sugar maple. Spicebush, pawpaw, blue beech, and witch hazel are found in the understory.

Goll Woods lies on flat, lake-plain terrain and is divided into two sections, the east woods and the west woods. The soil along the western border is sandy. Here are numerous beeches and a tulip tree nearly 3 ft dbh.

The area is one of sandstone and shale covered by Late Wisconsin calcareous till. The major soils are Blount silt loam, Tewamo silty clay loam, and Morley silt loam, with a slightly acid (pH 6.0-6.5) A horizon. The soils are imperfectly drained and are ponded in the spring. Byron Kent (pers. comm. 1970) reports that there is a perched water table here and that the area is thick with mosquitoes in the summer months.

In the buffer areas surrounding the woods, trees of the types found in the stand are being planted. There are nature trails through the woods and, during the summer months, the Ohio Department of Natural Resources, which purchased the area, provides guides for nature walks through the woods.

Interesting features include the large bur oaks which are "well over 3 feet in diameter and possibly 100 feet in height. The great boles stretch upward 40 feet or more without a limb" (Thomas 1969). There is a large chinquapin oak in the woods that is at least 30 inches dbh.

Herbaceous plants include Virginia waterleaf, wild ginger, white snakeroot, turtlehead, hog peanut, zig-zag goldenrod, blue waterleaf, bellwort, and heartleaf aster. There are several fern species present including maidenhair, spinulose, sensitive, and tapering fern and narrow-leaf spleenwort.

Herrick (1962 unpubl.) reports that some of the trees in Goll Woods have been cut in recent years, but that the woods is still in excellent condition and includes

[1]Recommended as a potential Natural Landmark

yellow oaks 4 ft dbh. He calls it "one of the best nearly virgin woods in northwest Ohio."

Thomas (1969) reports that the Tiffin River, which borders the stand on the west, is scheduled for ditching and straightening which would remove woody growth for 60 ft on either side. This action, if taken, will seriously reduce the value of the woods as a natural area.

The tract was named for Peter Goll, a French immigrant who came to the United States in 1836. The woods remained in the Goll family until 1966 when it was purchased by the Ohio Department of Natural Resources (Thomas 1969).

Glen Helen, 960 acres

Greene County, Ohio, Miami Township

To reach Glen Helen, travel I-70 and exit south on Route 68 at Yellow Springs. Turn left at the first light and continue 0.25 mile. The entrance to the area is opposite Antioch College.

Glen Helen consists of an old-growth oak-hickory forest and second-growth woods and fields. The area is one of ravines carved by glacial meltwater, flood plains, and talus slopes. Silurian dolomitic limestone, which contains fossils of Brachiopods, crinoids, and trilobites, forms the bedrock formation, and is covered here by Wisconsin glacial till. Drainage is good, principally through the Yellow Springs Creek to the Little Miami River, and there are numerous springs to be found on the valley sides.

The old-growth forest lies on rather level uplands adjacent to the stream valley and has Milton silt loam soils; while the talus slopes and valley bottom are principally Fairmont silty clay loam and Randolph silt loams. The second-growth forest is on Genesee, Ross, Russell, and Fox silt loams.

White oak is dominant on the uplands and is accompanied there by red, black, and shingle oak. Muhlenberg oak is present on the talus slopes. Bur oak is found in the valley with walnut, white and blue ash, sugar and black maple, and sycamore. Other species present are bitternut, shagbark and mockernut hickory, American basswood, dogwood, redbud, Kentucky coffee tree, and tulip poplar.

About 200 acres are in the old-growth forest. Most of the canopy is white, bur, and Muhlenberg oak, more than 270 years old. In the valleys, which support a wider diversity of species, reproduction is largely sugar maple, which is scarce in the canopy.

The remainder of Glen Helen is successional, plantation, and farm. There are 150 acres of livestock farm. A water power mill on the Grinnell Road and a unique type of covered bridge on the Jacoby Road are within the tract.

Glen Helen was designated a Registered Natural Landmark in 1965.

Kenneth W. Hunt, pers. comm. 1969

Hartzel's Green Island, 60 acres

Shelby County, Ohio, McClean Township, Secs. 6, 1

Owner: Hartzell Industries, Piqua, Ohio

From Laramie travel 2 miles east on Anna Turnpike and then turn north. The woods lie south of the lake.

This has been reported as a good natural area which contains very old, large trees. White oaks here have been measured at 50 inches dbh, red oaks at 50 inches dbh, swamp white oak at 40 inches dbh, and hickory up to 36 inches dbh.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Highbanks Metropolitan Park,[1] 150-200 acres

Delaware County, Ohio, Orange Township

Owner: Columbus Metropolitan Park District

To reach the park, take Route 23 north from Worthington, Ohio.

The park features an oak-hickory forest on rough topography. The area was glaciated, but much of the low-lime till has been removed from the slopes and the tract has dissected terrain, with well-drained, steep slopes.

Soils are Alexandria silt loam and silty clay loam.

The tract shows the effect of excessive drainage from undercutting and is changing in its dominant species from the former beech-maple association to one of oak-hickory.

Oliver Diller, pers. comm. 1970
Gareth Gilbert, pers. comm. 1970

Jacoby Creek Valley

Greene County, Ohio

Owner: Several private owners

The Jacoby Creek flows along the edge of Yellow Springs and into the Little Miami River south of this village. The valley of the creek is part of several privately owned tracts and is characterized by woodlands and pasture. Yellow Springs Village imposes an income tax which will be used for the purchase of land in this area.

Wooded tracts, which have been disturbed by grazing, are composed largely of oak and hickory. White oak is the most common species, with red and black

[1]Recommended as a potential Natural Landmark

oak second in importance. Muhlenberg oak is common on well-drained slopes and bur oak is found on the bottom lands. Bitternut and shagbark hickory as well as walnut are also found in the woodlands. White ash is also common, as is blue ash on the wetter soils. There is a scattering of basswood and sugar maple. Where the understory has been allowed to develop, it has been of the beech-maple type. Miami mist, *Phacelia purshii,* has been reported here.

The land purchased by Yellow Springs Village in the Jacoby Creek Valley will be held in perpetuity as undeveloped land.

Kenneth W. Hunt, pers. comm. 1970
Easterly, N.W., 1969 unpubl.

Lynds Jones Memorial Study Area (Jones Quarry), 25 acres

Lorain County, Ohio, T.6 N., R.18 W., Amherst Township

Owner: Oberlin College

To reach the area, take new Ohio Route 2 northwest of Amherst north of Oak Point Rd., then west on Cooper-Foster Park Rd. to part way up a rise and into the area just west of a gate.

The study area consists of a dry oak-hickory woods on sandy soils which overlie Berea sandstone. This was formerly a cliff facing Lake Warren, but has been quarried. The disturbances in the area consist of the abandoned quarry hole and back-fill on the original sandstone knob.

The tree species which are present are white, red, and black oak, shagbark and bitternut hickory, red maple, big-tooth aspen, sassafras, and sycamore. Shrubs and herbs include poison ivy, witch hazel, spicebush, river-bank grape, flowering raspberry, and many wild flowers, especially the large-flowered *Trillium.*

The tract is a memorial to Lynds Jones, a professor of zoology at Oberlin College from 1892-1930, and was purchased by funds donated by friends. The area was donated to the college in 1953. Five additional acres were added in 1955. It has been used for field and collecting trips and also for research in plant succession and limnology.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
George T. Jones, pers. comm. 1970

Sheldon's Folley, 54 acres

Erie County, Ohio, Sandusky Quadrangle

The tract lies along the former Cedar Point Rd.

According to the 10 October 1961 edition of the *Cleveland Plain Dealer*, this

tract has never been cut. The dominant tree species are red and white oak, beech, hickory, and black walnut. The area also includes marshes and beaches.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Spring Hollow, 200 acres

Franklin County, Ohio, Sharon Township

Owner: Columbus Metropolitan Park District

The tract includes a stand of mature forest dominated by oak, and some old-field areas that are being allowed to undergo succession.

There have been some efforts to keep the area in a natural state and to use it for nature education and conferences.

Gareth Gilbert, pers. comm. 1969

Steidman Wildlife Sanctuary, 65 acres

Wood County, Ohio, Liberty Township, Sec. 12

The sanctuary is located just south of Portage on the west side of Route 25.

Here, on soils derived from sands, is a second-growth stand of timber which consists largely of oak. Pin oak, elm, and buttonbush are found in the low spots.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Oak Savanna Areas

Maumee State Forest,[1] 2945 acres

Fulton, Henry, and Lucas counties, Ohio T.6 N., R.8-9 E.

Owner: Department of Natural Resources, Division of Forestry

This area includes part of the original prairie forest border area of Ohio termed "oak openings." It includes wet prairie areas in the forest and some areas of dunes.

Flora include big and little bluestem in the prairie areas, as well as huckleberry and blueberry. Boggy areas contain sundew and species of orchid.

Public hunting is permitted in the park; animal species include pheasant, rabbit, squirrel, deer, and woodcock.

[1]Recommended as a potential Natural Landmark

Department of Natural Resources, pers. comm. 1970
Gilfillan 1959
Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Oak Openings Metropolitan Park, 3200 acres

Lucas County, Ohio

Owner: Toledo Metropolitan Park System

The tract lies in the western part of Lucas County.

Within this large tract are dry, sandy areas with prairie species and scattered stands of oak. Sand hills support big and little bluestem, huckleberry, and blueberry. Lower, boggy areas harbor sundew and orchids.

The soils are poor, and lack clay in the surface horizons, resulting in sand ridges, low sand dunes, and blowouts. There are slight variations in the elevation of the tract.

Lark sparrow and badger occur in the tract.

Gilfillan 1959
Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Hemlock-Hardwood Areas

Armstrong Hemlock Grove, 4-5 acres

Ashtabula County, Ohio, Conneault Township

Owner: Mr. Armstrong

The area lies 2 miles south of Conneault, 1000 ft south of Daniels Ave. on the west of old Route 7.

There is a pure stand of mature hemlocks on the north and south sides of a small sphagnum bog.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Berlin Heights Ravine

Erie County, Ohio, Vermilion Quadrangle, Berlin Township

The tract is located in the southwest corner of the village of Berlin.

The area consists of the ravine formed by Old Woman Creek. It features steep sides, cliffs, and flood-plain sites that provide many habitats for diverse flora.

Herrick (1962 unpubl.) reports that there are many hemlock (up to 18 inches dbh) in the tract and that butternut are numerous, with many large ones, and that there are mature specimens of other tree species.

John Bryan State Park

Greene County, Ohio, Clifton Quadrangle, Miami Township

The area lies along Route 343, less than 1 mile west of Clifton.

The park includes the Registered Natural Landmark, Clifton Gorge. The gorge comprises about 16 acres and was cut in the dolomitic limestone of southwestern Ohio by glacial meltwaters.

The area contains northern relics such as red elderberry, mountain maple, yew, and hemlock, as well as limestone-loving, prairie, and southern species. White cedar is abundant, occurring on the cliffs and on fall blocks in the middle of the stream, and there are some large specimens of beech. Hemlock is not found elsewhere in western Ohio.

Asplenium ruta-muriaia var. *ohionis*, which is found in only one other station in the world, is also found here.

Above the rim of the gorge on thin soil are low pH plants such as deerberry bush and bluets.

The Nature Conservancy acquired the area in 1963 and it is now under the administration of the Ohio Department of Natural Resources with a reverter clause to the Nature Conservancy. The state has agreed to acquire all remaining properties adjoining the gorge and to manage the area as a nature sanctuary.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
Kenneth Hunt, pers. comm. 1970
Oliver Diller, pers. comm. 1970

Clear Fork Gorge Natural Landmark (Mohican White Pine-Hemlock Forest), 5-6 acres

Ashland County, Ohio, Perrysville Quadrangle, Hanover Township, Sec. 17

Owner: Department of Natural Resources, Division of Parks and Recreation

The stand lies 300 yards north of the fire tower in the Mohican State Park.

Part of the Mohican State Forest, this tract was designated a Registered Natural Landmark in 1967. It consists of a small original remnant of white pine and hemlock.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
Norville Hall, pers. comm. 1970

Conneault Creek—Tract B, 160 acres

Ashtabula County, Ohio, Conneault Quadrangle, Kingsville Township

Owner: John Thayer

The tract lies along Conneault Creek directly north across South Ridge Rd.

The terrain of this wooded area is diverse, including level ridgetop, steep slope, and flood plain along Conneault Creek. The extent of the ridge-top section is approximately 100 yards.

Herrick (1962 unpubl.) reports that the slope supports much hemlock and other northern species and that the flood plain is also rich in northern flora. He considers this to be a unique type in Ohio.

Hemlock Falls

Richland County, Ohio, Worthington Township

The area is located 0.5 mile south of the bridge over Clear Fork Creek on Newville-Bunkerhill Rd. Follow the old lane north to the falls area.

Here on sandstone cliffs is a rich flora including hemlock, trailing arbutus, wintergreen, *Ilex verticillata*, and walking fern. The last named species is found a short distance southwest from the bridge.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Kitts Gully

Lake County, Ohio, Mayfield Heights Quadrangle, Kirtland Township

The area extends from the western edge of Kirtland Township from the loop of the Chagrin River for about 1.25 miles to Hobart Rd.

This is a lovely area of hemlock-hardwoods which has developed on the steep sides of the gorge. The gorge is some 100-200 ft deep, with a falls where the stream enters the gorge. Many strata of rock are exposed. Herrick (1962 unpubl.) noted that the vegetation along the gorge has been little disturbed due to the rough terrain. Northern species present here include white pine, hemlock, and Canadian honeysuckle.

Little Mountain

Geauga County, Ohio, Chardon Township, Lake County, Concord Township, Mentor Quadrangle

Owner: Private ownership

Crittenden (1940) wrote that the woods had been cut over, especially the part in Lake County, but that an excellent stand of white pine remained on the hill which is the highest point in the region in Geauga County.

The cool climate and 50-60 inches of rainfall provide conditions favorable for the growth of the conifers; Herrick (1962 unpubl.) reports white pines, up to 110 ft in height, and mature hemlocks.

The underlying bedrock is shown by outcrops of conglomerate rock.

The area is being protected from most destruction, although some trails and homes have done damage. The dead trees have been cut and some planting has taken place, but Herrick still labels it a "unique area for the state," and it has been recommended for preservation.

Mill Creek Gorge

Trumball County, Ohio, Mesopotamia Township

The gorge is located 2 miles from the village on Route 534 W about 1 mile on Sweet West Rd. The gorge parallels the road on the north.

This is an east-west gorge, carved in sandstone. It contains mature hemlock, yellow birch, beech, maple, and red oak.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Mill Creek Hogback

Lake County, Ohio, Chardon Quadrangle, Madison Township

Owner: Metropolitan Park Board

The hogback can be reached by walking in from the north end of Emerson Rd.

The tract consists of the hogback and flood plain between Grand River and Mill Creek, near their junction. The north-facing slope is steep, with a substrate of shale and clay; the south-facing slope is more gradual. Herrick (1962 unpubl.) reports that the varied terrain provides many habitats for a wide variety of species including roundleaf dogwood, hemlock, white pine, buffalo berry, and a rich spring flora.

Paine Hollow

Lake County, Ohio, Chardon Quadrangle, Leroy Township

Owner: Metropolitan Park Board

From a point about 0.75 mile north of Leroy Center Rd. and 0.25 mile south of Trask Rd. on Brockway Rd., follow a logging road west 0.5 mile to the gorge.

This is the wild and deep gorge of Paine Creek. The vegetation is the hemlock-hardwood type, with some pine. There has been no cutting in the last 50 years.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Paint Creek Gorge

Ross County, Ohio

The gorge lies between U.S. Route 50 and Falls Rd.

This limestone gorge extends from the county line east to the end of the gorge. It contains arbor vitae. Herrick (1962 unpubl.) has evaluated it as one of the best areas of its type in the state.

Parkman Gorge

Geauga County, Ohio, Garretsville Quadrangle, T.6 N., R.6 W.

This tract consists of the gorge of the Grand River near the center of Parkman (from bridge to bridge).

Herrick reports that the north-facing wall has a fine stand of *Taxus canadensis*, large hemlocks, and mountain maple. Beech and birch are associated species. This slope appears to retain its original cover.

The hemlocks are located only in the upper part of the gorge where a small creek comes to the main branch just north of town. The banks are quite steep and there is a good exposure of rocks; the contact line between conglomerate and shale can be seen here. The gorge is narrow at this point; farther down the stream, there are no hemlocks and a different type of vegetation is present.

Herrick states that there is also a good natural area about the Tributory to the south.

Crittenden 1940
Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.

Penitentiary Gulch

Lake County, Ohio, Chesterland Quadrangle, Kirtland Township

The area is located about 0.25 mile west of Booth Rd. on Kirtland Chardon Rd. Enter on the drive of the Halle Estate (home of the caretaker).

Herrick (1962 unpubl.) reports that this area is much like Stebbins Gulch in Geauga County. It parallels the Kirtland Chardon Rd. for about 0.5 mile.

Spruce Run

Medina County, Ohio, Sharon Township

The woods is on the north side of county road 126 about 0.5 mile west of the Summit County Line Rd. Enter via the lane to the Bramley home. The stand lies just east of the house.

This is a young valley cut in the sandstone bedrock. The forest consists of mature hardwoods, including mountain maple and some hemlock. Herrick reported that the stand was not virgin, but a "choice spot."

Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.

Stebbin's Gulch, 600 acres

Geauga County, Ohio, Chesterland Quadrangle, Chardon Township

Owner: Holden Arboretum, 9500 Sperry Rd., Mentor, Ohio 44060

The entrance to the area is from Mitchell Mills Rd., about 1.5 miles west of Auburn Rd.

This deep east-west ravine has a cool, moist microclimate which supports a wide variety of northern species. The forest is of the hemlock-hardwood type. Trees in the elevated areas are beech, maple, tulip, oak, witch hazel, and hemlock. In lower areas yellow and black birch, sycamore, blue beech, mountain maple, and hemlock are found.

There are unusual species of ferns here as well as disjunct herbaceous species. Shrubs include blueberry, elderberry, and *Taxus canadensis*. Animal life includes leopard frog, raccoon, opossum, mice, shrew, deer, junco, Canada warbler, magnolia warbler, American redstart, and Louisiana water thrush.

The area lies on Chagrin and Cleveland shales. Soils are well drained, slightly acid loams.

The area is maintained in the natural state by the Holden Arboretum and is part of Holden Natural Areas, a Registered Natural Landmark.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Taxus Habitat

Lake County, Ohio, Chardon Quadrangle, Madison Township

The tract consists of the south wall of the Grand River Gorge about 0.25 mile west of Ledge Rd.

This is a steep slope containing a hemlock-hardwood stand and dense stands of *Taxus*.

Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.

Warner's Hollow

Ashtabula County, Ohio, Jefferson Quadrangle, T.8 N., R.5 W., Windsor Township

Owner: Private ownership

From Windsor travel 0.75 mile west on Route 322, then south about 0.75 mile, and then west on a road parallel to the hollow.

Phelps Creek, a shallow, spring-fed tributary of the Grand River, winds from west to east along the floor of a glacial and river-worn gorge which was carved in the sandstones, shales, and limestones of the region. The Hollow, which is 110 ft at its deepest point on the south wall, represents an abrupt change in the predominant northeastern Ohio landscape; the 2-mile long and 20-1200 ft gorge opens abruptly in the midst of gently rolling landscape.

This part of Ashtabula County was once characterized by beech forests (Gordon 1966), but the cool, damp, protected habitat provides conditions characteristic of a "Canadian Life Zone" (Joseph 1950). Here are many stands of hemlock and mountain maple. Canada yew occurs and lichens and bryophytes are common. The wet and shaded gorge walls support liverworts and mosses. Horsetails, ferns, and club mosses are found on both bottom and upland wooded areas.

Part of the gorge wall is bare rock, sometimes sheer and jutting, and in at least one place there are small caves. One such is "Barometer Cave, so called because of the response of its air currents in relation to weather fluctuations" (Joseph 1950).

Both Indian artifacts and fossils have been found in the Hollow.

There are foot paths along both sides of the cliff. The one on the north side leads to one of the larger of many springs.

In addition to the disjunct vegetation, the area is unusual in providing habitats for many newts and salamanders. *Triturus viridescens* is the most numerous and *Plethodon jordani* and *Eurycea lucifuga* are also plentiful, often seen crawling among the ledges and wooded areas.

A 4-H camp has been constructed on the southwest edge of the Hollow, and part of the "table rock" has been defaced by campers.

In 1950 Tom White owned a good part of the land comprising Warner's Hollow.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

White Pine Bog Forest,[1] 50-100 acres

Geauga County, Ohio, Burton Township, Garrettsville Quadrangle, T.7 N., R.7 W.

Owner: City of Akron?

[1]Recommended as a potential Natural Landmark

The forest is located 0.5 mile slightly west and south from Fern Lake.

This is what appears to be an original peat bog forest and has been labeled by Herrick (1962 unpubl.) as "one of the most unusual natural areas of all Ohio."

There are mature white pines here, associated with beech, tamarack, and yellow birch. The beech is co-dominant with the pine on the slopes, but the pines are mainly confined to the moister soil in the lower areas and seldom occur very far from the swamp. Many of the white pines are small, varying from seedling size to trees 1 ft in diameter, the largest of these are 60 ft or more in height.

A partial list of the herbs and shrubs in the tract include *Cynoxylon canadense, Azalea nudiflora, Aquilegia canadense, Gautheria procumbens, Leptamnium virginianum, Osmunda cinnamonea, Lycopodium complanatum,* and *Selaginella apoda.*

Crittenden 1940

Mixedwoods

Arsenal Land, 280 acres

Portage County, Ohio, Paris Township

Owner: Kent State University

On Route 5 from Kent, cross the Pennsylvania Railroad tracks south to Holcomb Rd. The area lies to the south.

The tract contains part of the Cuyahoga River, farmland, and woods. About 140 acres will be managed as a natural history study area.

The tract was deeded to Kent State University by the U.S. Government.

Herrick, J.A. 1970. Use of the Kent State University natural areas. Kent State Univ. unpubl.

Aullwood Audubon Center, 70 acres

Montgomery County, Ohio, T.3 S., R.6 E.

Owner: National Audubon Society

From Springfield take I-70 west and exit north on 48. Turn right to cross Englewood dam and right again onto Aullwood Rd.

The center contains several natural habitats including open fields, prairie, woodlands, a spring-fed stream, pond, and marsh.

Fauna include fox, raccoon, skunk, opossum, over 50 species of breeding birds, as well as fish, frogs, turtles, etc.

There is a large Nature Interpretation Building with classrooms, library, and seasonal exhibits. There is a self-guiding nature trail in this area. The center opened in 1957, a gift of Mrs. John W. Aull to the National Audubon Society.

National Audubon Society pamphlet #12M, 1968 unpubl.

Aullwood Children's Farm, 120 acres

Montgomery County, Ohio

Owner: National Audubon Society

From Vandalia take Route 440 west to Frederick Rd.; turn south. The entrance to the farm is on your right.

Part of this farm contains a maple woods which has been left undisturbed except for annual tappings for syrup. The rest of the tract is farmland, herb garden, a pond, springs, and a stream.

The farm was donated to the National Audubon Society by Mrs. John W. Aull and was opened in 1962.

National Audubon Society pamphlet #12M, 1968 unpubl.

Auten Property

Ashland County, Ohio, Hanover Township, sec. 22

The tract borders the Mohican State Forest at the junction of Sellers Rd. and Pine Run Rd.

This is a fine disjunct area which features large specimens of white pine and large oaks. Herrick (1962 unpubl.) reports that the area may never have been cut.

Beverly's Retreat, 40 acres

Portage County, Ohio, T.1 N., R.8 W., Randolph Township

Owner: Leased from the National Audubon Society by Kent State University

The property is located on the south side of Fairground Rd. in the town of Randolph, a short distance east of Route 44.

The tract is essentially flat, slightly depressed below the level of the surrounding area. It includes a small stream and a 0.25-acre pond.

Soils are poorly drained and are covered with a second-growth stand of mixed deciduous forest. The major tree species are red maple, white elm, swamp white oak, pin oak, and some white ash. In the oak-elm swamp zone, there are areas of buttonbush swamp as well as stands of beech-maple composition. Most of the

trees are small, but there are many of saw-log size.

Herrick's (pers. comm. 1970) biology class has noted 20 species of trees in the tract, 15 species of shrubs, and 60 species of herbs, ferns, and woody vines, although he notes that neither the wildflower flora nor the bird fauna are especially rich.

This swamp land typical for northeastern Ohio was extensively cut about 40 years ago. Its value as a nature sanctuary is expected to increase with time in this densely populated area of the state.

Nature Conservancy 1969a

Blendon Woods Metropolitan Park

Franklin County, Ohio

Owner: Columbus Metropolitan Park District

The tract lies northeast of the city of Columbus along Route 161.

The area consists of upland and swamp areas. The terrain is rough, and much is second-growth timber. The tract is well protected.

Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.

Brecksville Reservation,[1] 2479 acres

Cuyahoga County, Ohio

Owner: Cleveland Metropolitan Park District

The reservation lies to the east and south of the intersection of routes 82 and 21 and to the west of the Cuyahoga River.

This tract contains a mixed forest, nature and wildflower trails, two museums, and Deer Lick Cave.

Harold E. Wallin, pers. comm. 1970

Cedar Bluff, 37 acres

Pickaway County, Ohio, Harrisburg Quadrangle, Darby Township

This tract is bounded by the Big Darby Creek and the Harrisburg-Darbyville Rd., just north of Sterling-Commercial Pt. Rd.

This area features a ravine with a steep slope of clay, shale, and limestone. Along the top of the bluff is an oak-dominated forest; the sides of the ravine are covered

[1]Recommended as a potential Natural Landmark

with mixedwoods, and the flood plain of the stream supports typical moisture-loving species. Herrick (1962) reports that the area of greatest interest is the slope where slippage has prevented invasion by forest. There are prairie and swamp species as well as river bottom and forest forms.

More species occur in this 37-acre tract than any comparable area in the county. There is an extensive species list for the area in the Ohio Biological Survey file. The tract has been highly recommended as a natural area.

Cincinnati Waterworks Park

Hamilton County, Ohio, Newport Quadrangle, 5400 Kellog Avenue

The woods lies at the junction of the Little Miami and Ohio rivers.

This has been reported as a very good example of a mixed mesophytic forest with tall trees and undergrowth. Tree species include beech, white basswood, white ash, sugar maple, black cherry, hackberry, American elm, buckeye, and red oak.

Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.
Withrow 1932

Cook's Woods, 80 acres

Ottawa County, Ohio, Danbury Township

Owner: Chemstone Company

The tract is bounded on the south and east by Bay Shore Rd. and lies about 1 mile east of Route 138.

The company that owns this woods is interested in quarrying limestone. The tract is reported to include a wide variety of trees, shrubs, and herbs. Rattlesnakes are present.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

The Country Common[1]

Greene County, Ohio

Owner: Private and State-owned lands

The Country Common is a cooperative, open-space project which includes Glen Helen, now a Registered Natural Landmark, John Bryan State Park, a Boy Scout and Girl Scout Camp, and the State Orphan's Home Camp. These properties total

[1]Recommended as a potential Natural Landmark

1800 acres; the aim, upon adding easements to the properties, is to own a total of 3600 acres. The properties which are added in this project are recorded with the County Planning Commission. The Country Common is not incorporated; instead, the added properties are included in already existing ones with the agreement that the land will not be developed.

Kenneth Hunt, pers. comm. 1970

Crall Woods,[1] 40 acres

Ashland County, Ohio, New London Quadrangle, Ruggles Township

Owner: William Crall

On U.S. Highway 250 from Wooster through Ashland and Savanah 5 miles to Route 224, west 5 more miles to the tract which lies along Town Line Rd. 79 near the juncture of three counties; Huron, Richland, and Ashland.

This near-original forest remnant of exceptional beauty is under consideration for Nature Conservancy acquisition. It is found on undulating, nearly level terrain at 1170 ft above sea level, on a Bennington silt loam of medium texture and imperfect drainage. The soil is derived from glacial till, sandstone, and limestone materials. The climate in this area is favorable for the development of this mesophytic forest. It has a well-distributed mean annual precipitation of 37.8 inches and an average temperature of 49.4°F. Deep snows are infrequent and the growing season numbers about 140 days.

Crall Woods is bordered to the north by 9 acres of a second-growth forest stand and to the south by a 44-acre field dotted with red cedars, *Juniperus virginiana*. The field has two small cattail marshes and there is a farm pond on the southeastern corner of the forest. The woods to the north include basswood, red oak, white ash, shagbark hickory, beech, and sugar maple.

An inventory taken of Crall Woods in 1961 showed it to have an average of 51 saw-log size trees per acre and many trees exceeding 3-4 ft dbh. The most important tree species in the woods are sugar maple, basswood, beech, tulip tree, American elm, red oak, and shagbark hickory. Other trees present are red maple, bitternut hickory, flowering dogwood, white and black ash, black walnut, hop hornbeam, mazzard and black cherry, white oak, black locust, and slippery elm. A list of the large trees taken from Aughanbaugh's report in 1964 includes 38, 41, and 50 inch dbh basswoods, an American elm of 42 inches dbh, a 39 inch dbh white ash, red oaks of 38 and 40 inches dbh, and tulip trees measuring 37, 38, and 40 inches dbh. The tallest tree in the woods was a 132-ft tulip tree, towering over the canopy which had an average height of 105 ft. Small timber measuring less than 12 inches dbh comprised 18% of the woods, while 14-20 inch trees comprised 53% and large timber of 22-50 inches dbh comprised 29%.

[1]Recommended as a potential Natural Landmark

The shrubs and lianas of the woods are a mixture of beech-maple and oak-hickory types including:

Leatherwood
Running euonymus
Mapleleaf viburnum
Virginia creeper
Pasture gooseberry
Winterberry
Partridgeberry
Pagoda dogwood
Fox grape
Spicebush
Poison ivy
Common greenbriar
Witch hazel
Moonseed
Cat greenbriar

The abundance of wildflowers attracts visitors and students to the woods. There are more than 80 species recorded there. Among the rare or unusual species listed by Aughanbaugh (1964) are:

Wild leek
Speckled beadlily
Squirrelcorn
Smallflowered leafcup
Lavender waterleaf
Dwarf ginseng
Hairy fairybells
Harbinger-of-spring
Goldseal
Dwarf trillium
American ginseng
Smooth yellow violet

Ferns and scouring-rushes are well represented. Of the 18 species recorded by Aughanbaugh (1964), only the less common are listed here. There were fewer species of lichens and mosses.

Maidenhair, brittle, and broad-beech fern, narrow-leaved athyrium, oblique grape fern, ebony spleenwort, silvery glade fern, and cinnamon fern are also found there.

There is an abundance of fauna in Crall Woods, with 36 species of birds alone recorded. Thirty-two more species of birds have been noted in the field adjoining the woods. These observations were made in midsummer and do not include transient species or winter visitors to the woods. Among the species noted are:

Northern pileated woodpecker
Ovenbird
Veery
Red-eyed vireo
Yellow-throated vireo
Cerulean warbler
Scarlet tanager
Turkey vulture
Wood thrush
American redstart
Red-bellied woodpecker
Ruby-throated hummingbird
Eastern wood pewee
Eastern-ruby-crowned kinglet
Red-shouldered hawk
Acadian flycatcher
Carolina wren
Brown creeper
Northern crested flycatcher
Eastern house wren

Crall Woods has been rated biologically undisturbed and a naturalist's paradise, providing exceptional opportunities for field research. It is hoped that the tract will continue to be preserved.

Drew Woods, 16 acres

Darke County, Ohio, Greenville Quadrangle, Brown Township

Owner: Pike Lumber Company, Akron, Ind.

Travel north from Ansonia on Route 118 to the second crossroad. Turn west to Michael Rd., then north to Zumbrum Rd. The woods lies to the south of Zumbrum Rd.

Many large specimens of oak are found in this woods which includes small buttonbush ponds. The largest specimens are of bur, swamp white, and Shumard's red oak.

The University of Dayton uses Drew Woods, and it has been designated as a Nature Preserve, but Pike Lumber Company retains title to the tract.

Herrick 1969

Eyeman Estate,[1] 150-170 acres

Fayette County, Ohio, Wayne Township

Owner: Charles Fabb, Trustee

From Washington Court House, travel southeast on Route 35 for about 7 miles to Boyd Rd. Turn right. Eyeman Woods is the first woods on the left (about 0.5 mile).

One of the last remnants of original timber and semi-prairie in Ohio, the area includes a stand of bur and white oak on level, poorly drained soil. Bedrock is Monroe limestone covered by 25 ft of Late Wisconsin calcareous glacial till. Soils are Crosby and Celina silt loams and Brookston silty clay loam.

In addition to the dominant tree species, there are red oak, ash, hackberry, honey locust, hickory, elm, and soft maple.

The area is part of the Eyeman farm and, under the conditions of the deed, no part of the land is to be subdivided or sold. Profits from the sale of dead trees are used to maintain the estate.

Byron F. Kent, pers. comm. 1970

Fillingham Road Woods, 70 acres

Ashtabula County, Ohio, Jefferson Quadrangle, Rome Township

The tract lies in the southeast corner of the township on the north side of Fillingham Rd., half way between Boque and Dodge Roads.

This is a second-growth forest on level clay soil terrain. Most of the trees are under 10 inches dbh but there seems to have been no disturbance since one

[1]Recommended as a potential Natural Landmark

thorough cutting. Tree species include elm, maple, basswood, and oak. Herrick (1962 unpubl.) reports many spring-flowering herbaceous species.

Fort Ancient

Warren County, Ohio

Owner: Ohio State Museum

The area can be reached by turning southeast at Lebanon on Route 350.

This is a very scenic area, although not unusual ecologically, and is famous for its Indian mounds and ridge-like fortifications. It could qualify for a natural landmark of archeological interest.

Kenneth Hunt, pers. comm. 1970

Furnace Run

Summit County, Ohio, Peninsula Quadrangle, Richfield and Boston Townships

Owner: Privately owned

Located north of the city of Akron, the valley extends for about 2 miles in a southeasterly direction, beginning where Furnace Run crosses underneath State Highway 303, to Everett Rd.

This is a young valley cut into glacial till, and supports a mixed mesic forest on steep slopes and terraces. There is a wide variety of edaphic, moisture, and exposure situations resulting in a rich flora that includes the crested dwarf iris, yellow ladys slipper, fairy-wand, downy rattlesnake plantain, spotted coral-root, golden saxifrage, and American columbo.

There is a metropolitan park, which has the same name, to the immediate northwest of this tract.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
Herrick, pers. comm. 1970

Galpin Wildlife Preserve

Erie County, Ohio, Sandusky Quadrangle

The Preserve lies within the limits of the village of Milan, Ohio.

The Huron River, which drains into Lake Erie, comprises one border of this tract which consists of bottom land and wooded hills adjacent to the river. Herrick (1962 unpubl.) reports that there is a rich flora in the tract.

The land for Galpin Wildlife Preserve was willed to the village of Milan "to be preserved in its wild state as long as time shall endure."

Germantown Woods

Montgomery County, Ohio, T.2 N., R.5 E.

Owner: Dayton-Montgomery County Park System

The woods lies to the southwest of Dayton on Route 4, nearly within the limits of the city of Germantown.

The terrain of this mixed hardwoods forest is diverse. Beech is found in the flat areas and oak and walnut are the prominent species elsewhere.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Graber Woods

Wayne County, Ohio, T.17 S., R.11 W., Marshallville Township

Owner: Andrew Johnson

Take Route 57 north from Orrville 3 miles, then turn east and travel 1 more mile.

The oak-maple stand located here has an understory of white oak and sugar maple. There is no beech present in the area.

The tract lies within the glaciated region (Wisconsin stage) of Ohio, just south of the beech-maple line as delineated by Braun (1950).

Kenneth W. Hunt, pers. comm. 1969

Gross Woods, 40 acres

Shelby County, Ohio, Jackson Township, sec. 33

Owner: Privately owned

This is an original mixedwoods-type forest, owned by Miss Cora Gross of Jackson Center.

Hardscrabble Heronry

Medina County, Ohio, West View Quadrangle, Liverpool Township

From Hardscrabble travel west on Grafton Rd. about 0.75 mile to the top of the hill. Follow the lane north 2000 ft. The woods is on the left.

Here, on flat, wet, clay soil is found a woods of elm, beech, maple, and white

ash trees. The great blue heron nests, which number about 20, are located in the beech trees.

Herrick reports that although the area is not virgin, there has been no recent disturbance.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Hazelwood Botanical Preserve, 75 acres

Hamilton County, Ohio, Mason Quadrangle, Sycamore Township, sec. 9

Owner: University of Cincinnati

The tract lies about 16 miles north of Cincinnati on Cornell Rd. east of Sharonville.

The Preserve was acquired in 1926 primarily due to the presence of a number of boreal species which exist here in a region of climax mesophytic species. Approximately 40 acres of the tract are in forest and 10 are in swamp land.

The Preserve is traversed in the southwest corner by a main ravine, with several smaller tributary ravines entering at approximately right angles. The main ravine and the two larger branches have swampy, flat-bottomed floors and are cut by streams. The angle of the slope of the south bank of the main ravine is relatively steep in comparison with that of the north bank; the slopes and uplands are forested (Segelken 1929).

Soils in the area are clay loams and silts, with a pH range of 6.7-7.7, and were developed over Illinoian and Wisconsinan till on the Maysville formation substratum. The area is drained by Cooper Creek.

Tree species in the wooded tract in order of importance are beech, sugar maple, white oak, black cherry, and black walnut. There is also a relic community of *Lycopodium*. The beech occupies the slopes and upland level portions of the tract. At the western end on the south slope there is beech, sugar maple, tulip, and red oak. On the northern slope, beech has sour gum, white oak, and tulip tree as associates. Segelken (1929) reports that this stand differs from other forest communities of the Cincinnati region in that it contains a greater percentage of beech.

The understory of the woods is similar in composition to that of the canopy but indicates a trend to a mixed mesophytic type and beech becomes less important. Associated trees and shrubs in the understory are hop hornbeam, flowering dogwood, maple-leaf viburnum, blue beech, spicebush, hydrangea, sawbriar, smooth carrion flower, greenbriar, and wild grape. A complete list of the herbaceous species is in the Appendix.

The only disturbance in the forested area was limited cutting of the white oak and tulip tree about 100 years ago. There are second-growth areas on the south bank of the ravine.

Since 1940, the cultivated area of the Preserve has been allowed to revert to natural vegetation. It has been invaded by poison ivy, blackberry, tulip poplar,

and sugar maple. There has been some damage in the low swampy areas due to an adjacent road-building project.

W.A. Dreyer, pers. comm. 1970
Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Heistand Woods, 18 acres

VanWert County, Ohio, Pleasant Township, sec. 24

Owner: VanWert County Foundation

This wet forest, which lies directly south of Willow Bend Country Club and east of the hospital, is preserved as a natural area. Herrick believes that it is essentially virgin.

Herrick, J.A. 1962 Ohio Biol. Surv. unpubl.

Highbanks

Pickaway County, Ohio, Era Quadrangle, Monroe Township

Travel north from Williamsport approximately 2 miles to the junction of Darbyville-Williamsport Rd. and Dawson-Yankeetown Rd. From there walk south to the edge of the bluff.

The forest lies at the top of the bluff and along the north end of the tract along the stream. The slopes are too steep to support tree species and in the clay slippage areas prairie species can be found.

Herrick, J.A. 1962 Ohio Biol. Surv. unpubl.

Huntington Reservation, 105 acres

Cuyahoga County, Ohio

Owner: Cleveland Metropolitan Park District

The tract lies to the north of Wolf Road.

This is a small section of the Lake Erie Shore Line.

Indian Point

Lake County, Ohio, Chardon Quadrangle, Leroy Township

Owner: Metropolitan Park Board

Indian Point is located between the west end of Seeley Rd. and the Grand River.

This tract, which lies between Paine Creek and Grand River, consists of Indian earthworks which are located on the high, flat-topped point and on the steep slopes leading to the creek. The slopes support essentially virgin stands of hardwoods.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Jennings Woods, 70 acres

Portage County, Ohio, T.3 N., R.7 W.

Owner: Kent State University

The tract lies about 2 miles northeast of Ravenna on the north side of McCormick Rd.

Jennings Woods is primarily one of oak composition, but there are also small stands of swamp forest and an old, 20-acre sugar bush on the western half of the tract. A buttonbush swamp is located on the eastern half. The slopes of the hills support a red oak stand and across the top of the plateau there are about 10 acres of wet woodland with much temporary ponding, on clay soil. In this area there are also many pin oak trees.

The eastern boundary of the tract, with a black and white oak cover on the bluffs, overlooks the Mahoning River, which crosses the tract from south to north.

Along the flood plain of the river is a stand of American elm, sycamore, blue beech, white ash, yellow birch, and sugar maple.

The sugar bush contains many beech, some red oak, hop hornbeam, and flowering dogwood. There are many spring-flowering herbaceous species in the woods due to the variety of habitats found there. One of the more interesting species is the dwarf ginseng.

Some disturbance has occurred in the tract where a gas line passes through the property. In the past, the owners pastured a few horses and cows in the woods.

The tract was purchased by Kent State from Mrs. Ralph Jennings.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
Herrick 1969.
Herrick, pers. comm. 1970

Kimball's Woods[1], 98 acres

Lake County, Ohio

Owner: Kent State University

The tract is located off Route I-90 in the southwest corner of Madison, Ohio. To enter, use Route 85 (West Main St.) and enter from the south.

[1]Recommended as a potential Natural Landmark

Kimball's Woods consists of 57 acres of "near virgin" hardwood forest and 41 acres of oldfield, second-growth elm, swamp woods, and abandoned vineyard.

The area has low spots which contain American elm, and does not vary by much more than 25 ft throughout the whole tract. The dominant tree species are red oak, tulip tree, beech, American basswood, sugar maple, cucumber tree, magnolia, and black and white oak. Shrubs include spicebush, witch hazel, and maple-leaf viburnum.

The property was a gift of Mr. and Mrs. Carl Kimball to the Nature Conservancy and the title to the tract has been transferred to Kent State University. Its use is restricted to classes and investigation.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.
Herrick, J.A. 1970. Kent State Univ. unpubl.
Herrick, pers. comm. 1970
Nature Conservancy 1969a

Kiser Farm Woods, 50 acres

Champaign County, Ohio, St. Paris Quadrangle, Urbana Township

Owner: Private ownership

Herrick has reported that this woods contains the best stand of walnut in a six-county area. The deep, alluvial soils along the old Teays Valley have provided edaphic conditions appropriate for excellent growth of the hardwood species in this stand, and he reports that growth of "walnut, tulip and beech is extreme."

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Knight Property

Summit County, Ohio, Franklin Township

The tract lies approximately 1 mile northeast of Clinton, Ohio, on Van Buren Rd.

Herrick reported that the property consists of a mixed woods of red oak, tulip, and cucumber.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

New Rochester Woods

Wood County, Ohio, Montgomery Township, sec. 4, Freedom Township, sec. 33

The tract lies east of Route 23, about 1 mile south of Route 6.

[1]Recommended as a potential Natural Landmark

Herrick has reported this as a large woods lying north and south of Hallomb Rd. Some of the woods is swamp and part lies on higher ground. The stand is not original but is one of the best available for spring flora.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Shelton Woods

Huron County, Ohio

This woods is located about 2 miles south of Route 303, where Route 60 contacts the Vermilion River.

Herrick declared in his unpublished (1962) report to the Ohio Biological Survey that Shelton Woods is "as near virgin as can be found around here."

Silver Lake Area

Miami County, Ohio

The area is located 1 mile north of Ohio 517 in the southeastern part of the county.

The woodland is in rugged kame-moraine country. Three-fourths of the lake shore is privately owned (Easterly 1969).

Herrick, J.A., 1962. Ohio Biol. Surv. unpubl.

Stumpy Basin, 22 acres

Summit County, Ohio, Boston Township, Northfield Quadrangle, T.4 N., R.11 W.

Owner: Kent State University and private ownership

The Ohio turnpike serves as the northern boundary of the area which lies immediately north of Peninsula, Ohio.

Part of the Ohio Canal System, this small but valuable tract is bounded on the west by the Cuyahoga River. It includes the old canal basin and an area of marsh habitat. A mixed forest covers the slopes, with small spots of prairie species on the clay slippage slopes. An oak forest, which is located on the highest land, contains bur and yellow oak.

Rare or unusual species in the Basin include buffalo berry, two species of juniper, dwarf gray willow, showy orchis, fringed, bottle, and stiff gentian, yellow fen orchid, rough leaf dogwood, soapberry, shining ladys tresses, scarlet painted cup, one-flowered cancer-root, and prairie grasses.

The land was deeded in 1965 to Kent State University by the State of Ohio.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Sunderland Falls, 18 acres

Montgomery County, Ohio, Tipp City Quadrangle, Butler Township

Owner: Private ownership

The tract lies at the junction of old Route 40 and Cassel Rd. at the eastern edge of Vandalia.

A thicket and a small stream at the side of Route 40 mark the north edge of the area. From the thicket a path leads to the waterfall for which the tract was named. The stream flows over a lichen- and moss-covered limestone ledge, where golden corydalis is found, into a small valley carpeted with wildflowers. The cliff itself supports walking fern and columbine. Other wild flowers abundant in the valley are sweet cicely, ginger, three species of *Trillium, Camassia,* spring beauty, jack-in-the-pulpit, common blue violet, Dutchman's breeches, toothwort, blue cohosh, and yellow violet. There are also fragile fern and purple cliff brake.

The path passes a stand of pawpaw and a spring where purple cress, rue anemone, bloodroot, and mayapple abound. Farther south along the floor of the hollow is a more poorly drained area with skunk cabbage, liverworts, and mosses. Jewelweed, swamp buttercup, and bishop's cap are also present here.

The east slope of the valley supports a stand of beech where showy orchis, beech drops, and geranium abound. Here also is blue beech and phlox. The steep western slope has a small stream and supports hydrangea.

There are many mature trees in the tract. Species listed for the area include elm, blue ash, Kentucky coffee tree, yellow and white oak, bladdernut, buckeye, hackberry, and beech.

About 1955 a wind storm uprooted and downed several of the largest trees. They lie where they fell. A gate has been placed across the lane which leads to the hollow to prevent people from dumping trash into the falls.

The Sunderland Falls area is an acquisition project of the Dayton-Montgomery County Park District.

Thelma Ellis, Report to the Nature Conservancy, 1959 unpubl.
Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Tea Hills

Ashland County, Ohio, Lake and Mohican Townships

From Mohicanville, travel southeast about 2 miles on Route 179, then north on Route 132 about 1 mile to a stream which dissects Tea Hills.

This largely timbered area lies slightly south of the beech-maple border as mapped by Braun. It features rugged terrain, a deep gorge, springs, and bogs. Herrick (1962 unpubl.) reports that much of the area has never been pastured. Plant species of interest in the area include arbutus, ginseng, and golden seal.

Tinkers Creek Gorge (Bedford Reservation), 1335 acres

Cuyahoga County, Ohio

Owner: Cleveland Metropolitan Park District

From Cleveland take Route 14 south and east to Egbert Rd. Turn right along the southeastern border of the Bedford Reservation.

A 400-acre portion of this reservation has been designated as Tinkers Creek Gorge Registered Natural Landmark.

Harold E. Wallin, pers. comm. 1970

Trumbull Memorial Nature Sanctuary, 13 acres

Summit County, Ohio, Hudson Township

Owner: Kent State University

The land lies at the junction of old Route 14 and I-80.

The Nature Sanctuary consists largely of second-growth forest. It is crossed by Tinker's Creek and there is a small cabin on the property.

In 1969, Dr. and Mrs. Harlan Trumbull deeded the Sanctuary to Kent State University with a reverter clause to the Nature Conservancy.

Herrick, J.A. 1970. Kent State Univ. unpubl.

Weiser Woods, 80 acres

Delaware County, Ohio, Delaware Quadrangle, Troy Township, Sec. 2

Owner: Private ownership

The tract is located 3.3 miles north of the center of Delaware on Route 23.

Weiser Woods is largely of oak, hickory, and maple composition. Half of the tract has never been grazed and half has some history of grazing but is in good condition. Herrick reports that some of the white and red oaks are large, reaching over 4 ft dbh.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

West Sister Island,[1] 80 acres

Lucas County, Ohio, Lat. 41° 44′ 30″
Long. 83° 06′ 30″

[1]Recommended as a potential Natural Landmark

Owner: U.S. Department of the Interior, Fish and Wildlife Service

The island is situated 15 miles east of Toledo, Ohio, and 9 miles off the southern shore of Lake Erie.

West Sister Island is owned by the U.S. Department of the Interior, Fish and Wildlife Service, and is administered by the refuge manager, Ottawa National Wildlife Refuge, Oak Harbor, Ohio. It is presently considered for inclusion in the National Wilderness Preservation System (USDI 1969).

The island was formed from solid limestone rock which was subsequently shaped by glacial action, and has a very slight slope from the center of the island to stony cliffs 15-20 ft high at the water's edge. At its highest point the island reaches an elevation of 610 ft above sea level. There are apparently no mineral deposits of significance on the island; Tymochtee shale forms the parent material from which 3 ft of Randolf fine sandy loam is derived. The soil supports an almost pure hackberry stand, containing trees 40-50 ft tall, covering over 75% of the island.

The average length of the growing season on West Sister Island is 192 days, with a maximum summer temperature in the low 90s and a minimum winter temperature of −15°F. Smaller daily fluctuations in temperature are recorded on the island than on the nearby mainland.

Sixty-four acres of the 85-acre island are covered by hackberry, while on the forest floor around several ponds are found jack-in-the-pulpit and trout lilies. The remaining acres are open grassland with an occasional chokeberry or wild plum. A total of 86 species has been reported on the island and include the following as collected and identified by W. Alan Wertz and Dennis Anderson, August 1968 (Ohio State Univ. unpubl.)

Trees	Shrubs
Celtis occidentalis	*Cornus rugosa*
Fraxinus quadrangulata	*Parthenocissus inserta*
Gleditisia triacanthos	*Parthenocissus quinquefolia*
Gymnocladus dioica	*Rhus radicans*
Populus deltoides	*Rhus typhina*
Populus tremuloides	*Rosa* sp.
Prunus virginiana	*Sambucus canadensis*
Quercus muehlenbergii	*Syringa vulgaris*
Salix amygdaloides	
Salix nigra	
Ulmus americana	
Ulmus rubra	

A list of the herbaceous species is included in the Appendix.

On the western end of the island stands a lighthouse, property of the United States Coast Guard, which will remain there in the event that the island is included in the National Wilderness Preservation System.

The Wildlife Refuge is managed principally for the migratory birds which nest there, especially the Great Blue Herons, Black-crowned Night Herons, and Common Egrets. More than one thousand nests have been counted in the

hackberry trees on the northern end of the island. The island does not, however, provide enough food for the birds and they must fly several times daily to and from marshes on the mainland in search of food.

Other species of birds that have been reported on the island include the Bald Eagle, Purple Martin, Barn Swallow, Starling, Song Sparrow, Warbler, Crow, Catbird, and Red-winged Blackbird. Fauna also include garter snake, blue racer, blacksnake, and water snake.

Acres 1969, Vol. VIII, No. 3, leaflet.

Whittam Memorial Forest, 90 acres

Geauga County, Ohio, Hambden Township

Owner: Geauga County

The tract can be reached from Route 6 north onto Route 608 to Pearl Rd., and then west about 1 mile.

This woodland tract contains many tree species. It is preserved and is to be used for "viewing only" (Herrick 1962 unpubl.).

Wickliffe High School Tract

Lake County, Ohio, Mayfield Heights Quadrangle, Willoughby Township

Owner: Board of Education

The tract lies just behind Wickliffe High School on Rockefeller Rd., south of Route 84.

This is a large woods and swamp area used as a school forest by the high school.

Herrick, J.A. 1962. Ohio Biol. Surv. unpubl.

Flood Plain Forests

Rocky River Reservation, 5395 acres

Cuyahoga County, Ohio

Owner: Cleveland Metropolitan Park District

A flood plain woods (Mastick Woods) lies within this long, narrow reservation which follows the Rocky River from its mouth at Lake Erie approximately 17 miles south.

MICHIGAN NATURAL AREAS
Beech-Maple Areas

Beck's Woods

Wayne County, Mich., Northville-Plymouth Township, T.1 S., R.8 E., sec. 33

Owner: Private ownership

This beech-maple woods lies on the border of the lake plain and the morainic upland. It is located on a surface spotted with small, poorly drained depressions.

In an investigation of the frequency composition of the woods, it was found that sugar maple occurs in 75-100% of the plots, beech is in 50-75%, and that basswood is in only 5-25% of the plots, but has numerous individuals, as does hop hornbeam. Green ash is in less than 5% of the plots but is plentiful, as is white ash. Slippery elm is present in 75-100% of the plots, while American elm has numerous individuals but is in only 5-25% of the plots. American hornbeam is in 50-75% of the plots.

Lindera benzoin was a predominant shrub in this stand, although it did not occur in other stands in a southeastern Michigan study. Sugar maple was the most important species in the shrub strata.

Benninghoff and Gebben 1960

Brookville Road Woods

Washtenaw County, Mich., Salem Township, T.1 S., R.7 E., sec. 28

This is a typical beech-maple woods for southeastern Michigan. Sugar maple, beech, basswood, and red oak all occur in 75-100% of the plots studied, while black cherry and American elm are in 50-75% of the area. Red maple, hop hornbeam, and white ash have a frequency of 25-50% in the plots; and green ash and bitternut hickory have a frequency of 5-25% but have numerous individuals. Slippery elm is numerous but occurs in less than 5% of the plots.

Sugar maple is the most important species in the shrub stratum. Grazing disturbance is inferred from the absence of red maple, black cherry, red oak, and hickory saplings in the shrub stratum.

Benninghoff and Gebben 1960

Haven Hill,[1] 640 acres

Oakland County, Mich., T.3 N., R.8 E., secs. 19, 30, White Lake and Highland Townships, secs. 24, 25

[1]Recommended as a potential Natural Landmark

The area is located 3 miles east of Highland, between Ford and Duck Lake Rds., bounded on the north by highway M-59.

Haven Hill was purchased in 1923 by Edsel Ford for an estate. This tract, which is fenced, contains a large diversity of plant communities including swamp forest, cedar swamp, tamarack bog, black spruce bog, and some marshy areas as well as upland communities of beech-maple, oak-hickory, and mixed hardwoods.

The topography of the area was determined by the Wisconsin glacier which left glacial tills forming an interlobate moraine. The rugged glacial hills and ridges found on the estate are a part of this moraine. There are also extensive areas of outwash plain and some small ponds in glacial potholes.

The oak-hickory forest, dominated by white and black oak and small pignut hickory, is found on the ridges and hills. Soils that retain more moisture support red maple, ironwood, and red oak.

The presence of a white cedar swamp community, which is rare in southern Michigan, is explained by the protective influence of the surrounding hills and by the slow drainage in the area. The dominant trees here are white cedar and yellow birch.

The low, flat ground on the estate, which is often flooded in the spring, is covered with swamp forests. Here the principal tree species are black ash, white elm, and basswood. Leatherwood, which is not common in southern Michigan, abounds here associated with spicebush and highbush cranberry. Ginseng, another uncommon plant, is also present.

The beech-maple forest is situated on "islands" above the wet outwash plain. Associated with the dominants are white ash, black cherry, basswood, and red oak. A rare plant, the dwarf ginseng, is abundant locally.

The tamarack bogs occupy the wetter areas where water movement is slow. Associated with the tamarack are highbush blueberry, poison sumac, bog birch, and dwarf raspberry. The black spruce bogs are found in much the same conditions as the tamarack bog, but are dominated by *Picea mariana*.

Haven Hill is unusual in that it comprises a large area and a wide diversity of habitats.

A complete species list for the various communities is in the appendix.

The area has been made a part of the 5000-acre Highland Recreation Area and the northwestern portion of the Haven Hill tract has been designated a Nature Reserve by the Michigan Natural Areas Council.

Benninghoff and Gebben 1960; Thompson 1953a, b.

Irwin's Woods

Washtenaw County, Mich., Sharon Township, T.3 S., R.3 E., sec. 4

This is another typical beech-maple woods for southeastern Michigan. The relatively high frequency values for basswood in all the strata, as well as for beech and maple, point to the typical expression of this forest type. White and

green ash are important species in this stand, and although red maple is present, it is not of much importance here.

Benninghoff and Gebben 1960

Proud Lake Woods

Oakland County, Mich., Commerce Township, T.2 N., R.8 E., sec. 17

The area is part of the 3500-acre Proud Lake Recreation Area.

Proud Lake Woods (beech-maple) is situated on a ridge adjacent to a swamp forest and is bordered on the south by the Huron River and its associated chain of lakes.

The soil profile exhibits a heavy accumulation of decaying humus over a thin podzol soil in the A horizon and a red-brown B horizon.

The stand exhibits swamp-like characteristics by the presence of yellow birch and by the relatively high frequency and importance values for red maple. Basswood is poorly represented in the stand.

Seventy-five to one-hundred percent of the plots have sugar maple, beech, hop hornbeam, and black cherry. In the 75-50% frequency class is red oak, while red maple represents 25-50% and American hornbeam, 5-25% of the plots.

In 1965, part of the woods was deeded to the Detroit Edison Company and 30 acres were cut subsequently for a 200-ft wide right-of-way.

The alteration of the woods will be difficult to control since there are plans by the Huron-Clinton Metropolitan Authority to build a scenic parkway along the south portion of the "natural area."

Benninghoff and Gebben 1960; Michigan Natural Areas Council 1960 unpubl. Proud Lake Recreation Area, Site Committee unpubl.

Toumey Woods, 15 acres

Ingham County, Mich., T.4 N., R.1 W., sec. 30, NE¼SE¼

The stand is located 2 miles south of the East Lansing campus of Michigan State University.

The predominant soil in this stand is Hillsdale sandy loam developed on calcareous sandy loam till. Although the native vegetation on the Hillsdale series is predominantly oak-hickory in nature, these soils appear to have a higher moisture-holding capacity and are able to support the more mesic beech-maple association (Harlan and White 1967).

The climate is humid, with 30 inches of precipitation evenly distributed throughout the year. Annual temperature is 48°F and the average growing season is 146 days.

Sugar maple and beech, the most abundant tree species, comprise 60 and 20% of the mean basal area of the tract. Other important trees are slippery and American elm, white ash, red oak, basswood, black cherry, and bitternut hickory. The mean basal area is 137 ft^2 per acre and the mean number of stems per acre 587. Ninety percent of all stems are 10 inches dbh or less, and only 3% are larger than 20 inches dbh.

The area was bought from the Frank Bennett estate in 1939 as an ecological reserve for biological research. Prior to that date dead trees were removed for firewood. The tract is bordered by a road on one side and agricultural land on the other three sides.

Mathies and Schneider 1967; Schneider 1966.

Warren's Woods, 312 acres

Berrien County, Mich., Chickoming Township, T.7 S., R.20 W., sec. 27, NW¼

Owner: Edward K. Warren Foundation

Travel Route 12 through Union Pier to Warren Woods Rd., and then east 3 miles to the Galien River. The forest lies to the south. The area is 3 miles north of the town of Three Oaks.

This beech-maple forest is leased for 99 years from the Edward K. Warren Foundation by the State of Michigan, Department of Conservation.

It is situated on rolling terrain, with the small Galien River cutting diagonally through it. Upland soils are alluvial sands and Nappanee silt loam, partly wind-deposited and characterized by heavy, mottled gray and yellow subsoil. There are also areas of marshy lowland. Surface drainage of the upland areas is good, but underdrainage is poor (Cain 1935).

The area's climate is tempered due to the closeness of Lake Michigan. The growing season is about 180 days; precipitation varies between 32-36 inches yearly (Cain 1935).

This forest is typical of the forest that once covered southern Michigan. There are many large trees in the tract, including outstanding individual specimens of sycamore, beech, maple, and other northern hardwoods. Some of the trees have diameters of nearly 5 ft dbh with towering branch-free trunks extending to a height of 125 ft. The average height of the beech is 105 ft, with an average diameter of 26 inches. Average height of the sugar maple is 110 ft, with an average diameter of 29 inches (Society of American Foresters 1960).

The most common tree in the climax stand is beech, but there are also appreciable quantities of sugar maple, elm, red oak, and black cherry as well as some ironwood scattered through the tract. The understory is mainly maple seedlings; the canopy of the forest is so dense that the herb and shrub layers are sparse except in spring and early summer before the trees leaf out.

The stand on the flood plain part of the tract differs in species composition

TABLE 9. Density and frequency of woody plants in Warren's Woods[a] (Cain 1935).

Species and layers	Under 1 ft. high		Over 1 ft. & under 1 in. dbh		1 in. dbh and over		Total	
	D	F%	D	F%	D	F%	D	F%
A. Superior arborescent layer								
Acer rubrum	132	40	14	20	5	20	151	52
A. saccharum	3923	100	1055	100	82	92	5060	100
Carya cordiformis	38	60	3	12	1	4	42	64
C. ovata	1	4	1	4	3	12	5	20
Celtis occidentalis	1	4	0	0	0	0	1	4
Fagus grandifolia	156	80	230	100	97	100	483	100
Fraxinus americana	105	56	30	44	2	8	137	64
Liriodendron tulipifera	7	24	2	4	2	4	11	24
Prunus serotina	69	40	9	16	6	20	84	44
Quercus alba	4	8	1	4	0	0	5	8
Q. borealis var. *maxima*	52	56	4	16	4	8	60	64
Tilia glabra	31	28	8	20	3	12	42	40
Ulmus americana	235	60	3	12	6	20	244	64
U. fulva	1	4	2	8	2	8	5	16
B. Inferior arborescent layer								
Amelanchier laevis	9	4	1	4	1	4	11	8
Asimina triloba	3	12	7	12	0	0	10	16
Carpinus caroliniana	75	48	53	68	25	52	153	76
Cornus florida	7	8	3	8	0	0	10	8
Ostrya virginiana	22	16	18	40	23	48	63	60
Prunus americana	29	12	21	4	1	4	51	16
C. Tall shrub layer								
Hamamelis virginiana	11	20	30	36	5	16	46	40
Benzoin aestivale	713	92	732	88	3	8	1448	96
D. Shrub layer								
Dirca palustris	0	0	6	12	0	0	6	12
Grossularia cynosbati	24	24	5	8	0	0	29	24
Lonicera canadensis	41	24	9	12	0	0	50	28
Sambucus canadensis	4	16	1	4	0	0	5	16
S. pubens	0	0	8	12	0	0	8	12
Smilax rotundifolia	15	20	0	0	0	0	15	20
Viburnum acerifolium	217	32	180	40	0	0	397	48
V. affine	0	0	1	4	0	0	1	4
Total density (2500 m^2)	5925		2437		271		8633	

[a]Based on 25 quadrats 10 × 10 m each.

TABLE 10. Frequency percentage of herbaceous species in Warren's Woods. (Cain 1935)

Species	Frequency percent
Ferns	
Aspidium noveboracense (L.) Sw.	16
A. spinulosum var. *intermedium* (Muhl.) D.C.E.	64
Adiantum pedatum L.	8
Asplenium filix-femina (L.) Bernh.	8
Onoclea sensibilis L.	4
Osmunda claytoniana L.	4
Polystichum acrostichoides (Michx.) Sch.	20
Grasses and sedges	
Brachyelytrum erectum (Schreber) Beauv.	4
Glyceria nervata (Willd.) Trin.	8
Hystrix patula Moench.	8
Carex grayii Carey	4
C. laxiflora Lam.	12
C. pennsylvanica var. *leucorum* (Willd.) Fern.	20
C. plantaginea Lam.	56
Carex spp.	20
Other herbs	
Actaea alba (L.) Mill.	16
Arisaema triphyllum (L.) Schott.	64
Boehmeria cylindrica (L.) Sw.	4
Caulophyllum thalictroides (L.) Michx.	20
Circaea alpina L.	4
C. lutetiana L.	20
Dentaria maxima Nutt.	4
Dioscorea villosa L.	4
Epifagus virginiana (L.) Bart.	16
Galium aparine Michx.	56
G. circaezans Michx.	4
G. concinnum T. & G.	16
G. triflorum Michx.	4
Geranium maculatum L.	4
Geum canadense Jacq.	8
Hepatica acutiloba D.C.	4
Impatiens pallida Nutt.	8
Laportea canadensis (L.) Gaud.	4
Maianthemum canadense Desf.	16
Mitchella repens L.	4
Osmorhiza claytoni (Michx.) Clarke	20
Phytolacca decandra L.	4
Pilea pumila (L.) Gray	4
Polygonatum biflorum (Walt.) Ell.	12
Polygonum virginianum L.	12
Ranunculus abortivus L.	8
Smilacina racemosa (L.) Desf.	36
Solidago caesia var. *axillaris* (Pursh.) Gray	4

TABLE 10. (*continued*)

Species	Frequency percent
Trillium grandiflorum (Michx.) Salisb.	4
Viola canadensis L.	8
V. papilionacea Pursh.	20
V. scabriuscula Schwein.	4
V. striata Ait.	4
Total: 48 species	

from that in the beech-maple upland. There are swamp white oak here along with red maple and basswood, some sycamore, tulip tree, tupelo, white ash, butternut, and hackberry as well as the dominant species in the climax forest tract. Here there is a thicker shrub layer consisting of pawpaw, blue beech, spicebush, and redbud (Michigan Natural Areas Committee 1960 unpubl.). Dutchman's breeches is common on the upland, jack-in-the-pulpit and skunk cabbage are common on the flood plain. Ferns, mosses, and basidiomycete fungi are also common.

Lists of the trees by density and frequency as well as herb species lists are found in Tables 9 and 10.

Cain (1935) published notes on the history of this woods; he wrote that the last cutting, which removed about 10% of the timber, took place in 1891. There were once two sawmills and a bolt mill on the property. Sugar maple and white oak were cut at that time for the fashioning of whip stocks. Some basswood, tulip poplar, and black cherry were also removed.

Fifty years ago, beech was not as predominant as it is today, and 85 years of heavy maple reproduction has been noted.

Billington reported in 1924 on the flowering plants and ferns.

The fauna of the woods is varied and abundant. Evidences of skunk, muskrat, raccoon, opossum, squirrel, and chipmunk are seen. Birds sighted in the tract include red-headed woodpeckers, nuthatches, chickadees, thrushes, peewees, creepers, and sapsuckers. Already on the National Registry of Natural Landmarks.

Suter and Park 1962.

Woldumar[1] (Anderson Farm) (Olds Estate), 160 acres

Eaton County, Mich., T.4 N., R.3 W., sec. 35

Owner: Nature Way Association of Lansing

The tract lies between old highway 27 and the Grand River at Millet, Michigan.

[1]Recommended as a potential National Landmark

A farm and adjacent natural areas have been purchased to provide a conservation education center and outdoor laboratory. The tract includes 3000 ft of frontage on the Grand River, a lagoon, and some small islands which provide habitats for waterfowl, river flood plain, a section of sugar bush, two ravines, a buttonbush swamp, a willow swamp, and a strip of beech-maple forest.

The descriptions below are quoted from the Woldumar Reconnaissance Committee Report, by the Woldumar Site Committee (1967 unpubl.).

Sugarbush. An excellent stand of beech-maple forest is located at the south end of the tract along the west bank of the Grand River. Although sugar maple is the principal tree species of this area, there is beech scattered through the stand, mixed with black cherry, red oak, and ironwood *(Ostrya virginiana)*. The limited growth of shrubs and seedlings suggests that the area has been heavily used during its past history. The ground flora includes a number of spring flora species.

Beech-Maple Peninsula. A long peninsula of upland lies adjacent to the lagoon area. This woodland area resembles that above except that the beech is more prominent and the area appears to have had less disturbance in the past. At the tip of the peninsula bordering the river is a small piece of low ground that possesses a small strip of swamp forest vegetation.

River Floodplain. Directly south of the above area, bordering the Grand River, is a portion of low flat land covered principally with red osier dogwood and the sandbar willow *(Salix interior)*. A number of semi-aquatic and aquatic plants are to be found along the river border of this area. A long finger of water, which extends inland from the river, furnishes a slightly different habitat at the base of the peninsula and the border of the floodplain.

Lagoon. The lagoon is connected directly to the Grand River to the eastward. Initially this body of water was artificially created by the removal of earth from a low area of land. The lagoon contains four small islands that would be useful to waterfowl. The borders of the water are lined with red osier dogwood and shrubby willows.

This portion of the tract would serve as an excellent waterfowl sanctuary. The introduction of desirable water plants to supply food for ducks, geese, and marsh birds would attract such species. Plantings of other shrubs, especially those that have edible fruits that birds like, would attract more species and form a shelter screen along the borders of the lagoon.

Buttonbush Swamp. A small buttonbush swamp lies just west of the sugarbush area. There is a considerable area of open water with buttonbush as a predominating shrub. The borders of the swamp include a number of different tree species, such as white elm, willows, blue beech, red maple, and soft maple. The swamp supplies different species of water plants and furnishes a different type of habitat attractive to certain species of birds.

Willow Swamp. This area located just west of the lagoon, is bordered with willow and elm and a number of different species of shrubs, including gray dogwood and red osier dogwood. An interesting plant that occurs here in considerable numbers is the bittersweet nightshade *(Solanum dulcamara)*. The white-tail deer sometimes use this area for shelter.

Ravine Communities. Two ravine areas are found on the Woldumar Tract; one of these at the southwest corner, the other north of the lagoon. Both contain low areas with hilly valley walls. A stream runs through the latter ravine. These provide, in addition to the wetland plants of the low areas, plants of the field type, since considerable portions of the valley slopes are open. Thickets on the high ground of the south ravine are dominated by hawthorn and prickly ash, making excellent shelter for small animals.

Conifer Plantings. A large area directly south of the lagoon area has been planted with several hundred specimens of white pine and white spruce. As these grow to a more mature size, this will provide an interesting plant community quite different from any of the above vegetational communities.

South of the acquired area is a cattail marsh which is owned by the Lansing Board of Water and Power. It is an excellent site for the study of waterfowl. Northeast of the tract is an undisturbed beech-maple forest adjoining a lagoon. This area is owned by the Anderson family and efforts are being made to add it to the tract described above.

Plans for Woldumar include nature trails and the acquisition of adjacent areas. Part of the more open area is to be periodically burned to establish a wet sand prairie. The lagoon will be managed for waterfowl.

The southern acreage is dedicated as a Nature Study Area for ecological work.

A study of the area has been made by the National Audubon Society, Nature Centers Division. Survey Report and Educational-Use-Plan Outdoor Laboratory Lands, Tri-County Region (Lansing, Michigan unpubl.)

Michigan Natural Areas Council 1967 unpubl.

Oak-Hickory Areas

E. S. George Reserve, 1268 acres

Livingston County, Mich., Putnam Township, T.1 N., R.4 E., secs. 19, 25, 29, and 30, Unadilla Township, secs. 24 and 25

Owner: University of Michigan

The tract lies 4.5 miles west of Pinckney.

The Reserve is located on the rugged topography of rolling glacial outwash formed during the retreat of the Cary substage of the Wisconsin glacier. There are many eskers, kames, and kettle holes in the large outwash plain. The gray-brown podzolic soils are formed from well-drained sands, loamy sands, and sandy loams on the coarse-textured, glacial-outwash parent material.

The main esker in the Reserve cuts through the "Big Woods" area which is at an altitude of 110 ft above the marshes in the southeast part of the Reserve. Here, in some areas of great relief, the soil is excessively drained and is classified as Bellefontaine sandy loam.

The climate is of the Dbf, humid microthermal type in the Köppen system and shows long summers and winters with short transitional seasons. Average annual temperature taken at East Lansing is 46.9°F. The precipitation is fairly well distributed throughout the year, but the summer months do register more than the other seasons. The average growing season is 145 days.

About one-third of the Reserve is upland and is covered by second-growth black and white oak and hickory in patches of from 1-2 acres to 125 acres. The forest tracts cover the summits of hills, spread down the slopes, and occupy kettle holes and other areas less fit for cultivation. With the dominant oak and shagbark hickory species are associated black walnut, red oak, basswood, black, green, and white ash, flowering dogwood, scarlet oak, American hazelnut, beech, silver and red maple, American elm, sassafras, and sugar maple. The rest of the tract is in old field and wet lowland.

The lowlands are covered by bogs with a leather leaf-*Sphagnum* association, marshes and swamps are covered with tree and heavy shrub growth. The major bogs are the Big Cassandra of 16 acres and Buck Hollow of about 1 acre in extent. The marshes and swamps cover the rest of the lowland.

The wooded area was extensively logged and grazed between 1860 and 1900 when it was abandoned. In 1926, the tract was purchased by Colonel Edwin S. George and subsequently transferred to the University of Michigan in 1930. It is now fenced.

Common herbs and shrubs in the woods include *Hepatica americana, Amphicarpa bracteata, Lysimachia quadrifolia, Monarda fistulosa, Phryma leptostachya, Hamamelis virginiana,* and *Trillium grandiflorum*. A complete list of the plants in the Reserve has been compiled by Arthur W. Cooper (unpubl.) and is available from the director of the Reserve upon request. It includes 7 species of orchid, sundew, 3 species of *Equisetum, Lycopodium,* 16 species of fern, 2 of juniper, 55 of grasses, and more than 325 species of other flowering herbs.

A deer herd is maintained in the tract and has been recently reduced to 25 animals per square mile. It appears that succession has become more rapid since the grazing pressure has been reduced (Cooper 1961). Other studies of fauna in the Reserve include taxonomic work on ants by Mary Talbot (unpubl.), on Crane flies by Rogers (1942), and on the ecology of Orthoptera and Dermaptera by Cantrall (1943).

Francis C. Evans, pers. comm. 1970

Harvey N. Ott Preserve, 315 acres

Calhoun County, Mich., Emmett Township, T.2 S., R.7 W., secs. 3, 4, 9, 10

Owner: Albion College

The Preserve is located on rolling land that includes bogs, lowland hardwood, and upland hardwood stands. The upland areas were listed as "thinly timbered with white, black and bur oaks with no undergrowth" in the 1826 original land

survey. This original oak savanna is now described as a second-growth, closed-canopy oak forest (Catana 1967).

Soils are Plainfield sands on the uplands and Carlisle muck in the swampy areas.

The tree species in order of importance in the upland areas are white, black, and red oak, black cherry, sugar maple, choke cherry, jack oak, shagbark hickory, wild plum, mockernut hickory, slippery elm, beech, pignut hickory, American elm, and red maple. The dominant trees in the lowland stands are sugar and red maple, yellow birch, American and slippery elm, basswood, blue beech, and tamarack with some hackberry, beech, black cherry, red, black, bur, and white oak, wild plum, and choke cherry.

A list of the herbs and shrubs for the Preserve is in the appendix.

Robinson Preserve, 30 acres

Berrien County, Mich., Chickoming Township, T.7 S., R.20 W., sec. 21 W½NW¼

Owner: Nature Conservancy

From freeway I-94 exit at Union Pier, turn right at the first stop sign and continue west to an overhead traffic light. Turn right onto Red Arrow Highway and continue to the town of Lakeside. On the second road past the "Business District" sign, turn right onto East Rd. Travel east on East Rd. for 0.9 mile. Turn left off East Rd. onto a hidden driveway and continue 0.5 mile more to the property.

This is a climax hardwood forest of oak-hickory composition, which also has some beech, tulip poplar, sour gum, maple, and ash. There is also some sassafras, chokeberry, and hawthorn near the road. Rare flowers in the tract include trailing arbutus and ferns on the ravine slopes, showy orchis, and closed gentian.

The area was donated to the Nature Conservancy by Mr. and Mrs. William Robinson along with 50 more acres of reverted farm land and a small open prairie.

W. A. Elkins, 1968. Natural area project proposal, Robinson Preserve. Nature Conservancy, unpubl.
W. A. Elkins, pers. comm. 1970
William S. Robinson, pers. comm. 1970
Floyd Swink, pers. comm. 1970
The Nature Conservancy 1969a

Stinchfield Woods

Washtenaw County, Mich.

Owner: University of Michigan

At the time of settlement, this was very hilly oak land, with Boyer sandy loam soils and an elevation of approximately 990 ft.

When the University of Michigan began the purchase of the area, it was second-growth oak-hickory woods dominated by black, red, and white oak with shagbark and pignut hickory. There are some groves of big-tooth aspen.

The tract was grazed by sheep until 1935, when it was purchased by the University of Michigan.

Andrejak and Barnes 1969

Mixedwoods

Cooper's Glen

Kalamazoo County, Mich.

The tract lies 7 miles north of the city of Kalamazoo.

This is a stand of maple, basswood, elm, and white ash in a north- and south-facing valley. There is a narrow, shallow stream which flows through the bottomland from west to east.

The second-growth stand occupies the 30 m wide bottomland, 58 m of the north-facing slope, and 31 m of the south-facing slope. The age of the stand has been estimated as 60-80 years. The midstory on the north-facing slope is sparse and consists largely of maple reproduction. The understory is dense.

On the bottomland, sugar maple, American elm, and beech are the dominant tree species. The midstory is denser than that of the north-facing slope and consists of sugar maple and white ash reproduction and low-growing *Zanthoxylum*.

The south-facing slope stand is more open at the canopy and midstory levels. Sugar maple, basswood, and beech are dominant here along with white ash. The midstory includes chokeberry.

Robinson 1966

Drayton Plains, 55 acres

Oakland County, Mich.

Owner: Natural Science for Youth Foundation

This is a wooded tract, dedicated to use for nature study (Nature Conservancy 1968a).

Fernwood, 18 acres

Berrien County, Mich., T.7 S., R.19 W.

Owner: Fernwood, Inc.

The area can be reached by traveling north from Buchanan on Walton Rd., which meets Range Line Rd. Make a left turn, and continue to the eastern border of the area. There is a parking lot to the left of Range Line Rd.

Fernwood is located on the shore of the St. Joseph River and encompasses a variety of river-border habitats. The elevation drops some 125 ft from the top of the east hills to the river below. Soils on the tract vary from sand to clay to rich leaf mold and from dry to wet. The area includes high dry lands, steep wooded ravines, and low marshes, springs, pools, and streams.

This area of the St. Joseph Valley is of interest in that it has more than 100 indigenous tree species. A complete list of the trees and shrubs at Fernwood is in the Appendix.

The undisturbed woods at Fernwood is part of a 62-acre tract which has been dedicated to nature study. The developed areas will house a gift shop, library, herb garden, rock garden, and several planted areas. Some of the land, however, is being preserved as a "wilderness area."

Prominent tree species in the tract are beech, bur oak, red maple, hickory, white oak, dogwood, and sassafras on the well-drained upland soils, while black oak, butternut, and sugar maple are more common at a somewhat lower elevation where the spring-cut ravines begin. On the moist ravine slopes are a variety of herbaceous species including Christmas fern, rue anemone, violets, trout lily, wild ginger, bloodroot, solomons plume, and *Trillium*. Here, too, are beech and black cherry on the steep north-facing ravine sides, associated with witch hazel, huckleberry, and spicebush. On the very moist lower ravine slopes are tulip tree, sycamore, Chinquapin oak, elm, and pawpaw. Jack-in-the-pulpit, bladdernut, skunk cabbage, and Goldie's and ostrich fern accompany the dominant tree species here.

On the exposed sandy ridges are white and black oak, blue beech, shadblow, low huckleberry, and blueberry, with an herbaceous layer of bird's foot violet, false foxglove, and pussy toes. The alluvial flats support red oak, beech, hickory, and large-tooth aspen.

Two very old apple trees are found growing in the tract, old enough to have been Johnny Appleseed trees. Fernwood was purchased in 1941 by Fernwood, Inc., and dedicated by the Michigan Natural Areas Council on 6 October 1968. Information is contained in *Fernwood Notes*, distributed from time to time by Fernwood, Inc., 1720 Range Line Road, Niles, Mich.

Horner Woods, 44 acres

Washtenaw County, Mich.

Owner: University of Michigan Botanical Gardens

Horner Woods was obtained with the aid of a gift of 22 acres made by the

Michigan Botanical Club. It is reported as containing fine twin-leaf and *Trillium* species.

Nature Conservancy 1968a

Newton Woods,[1] 160 acres

Cass County, Mich., Near Dowagiac

Owner: Michigan State Univ.

Part of the 580-acre Fred Russ Forest, this tract consists of old growth and mixed hardwoods.

The stand lies on level to undulating terrain between the inner and outer ridges of the Kalamazoo moraine. The soils of the 40-acre stand are drained by Dowagiac Creek and are classified as Miami sandy loam. The area was originally formed in an outwash plain from sandy drift of glacial origin.

White oak is the dominant species in the woods, followed by black oak and sugar maple. Also present in smaller quantities are red oak, black cherry, American elm, black walnut, yellow poplar, white ash, beech, and basswood. It would appear that there is a transition taking place from white oak as the dominant species, since no oak trees below 4 inches dbh occurred in the stand; most of the seedlings and saplings found were sugar maple. The reverse is true above the 23-inch dbh class. Here, there was practically no sugar maple represented. White oak trees exceeding 32 inches dbh are not uncommon.

It has been postulated that a catastrophe of some kind, such as a severe fire, may have occurred here 100-150 years ago and may have left the area in a condition favorable for the establishment of a fairly even-aged stand of red, white, and black oak.

The forest has suffered some light disturbance in past years, which included cutting of black walnut logs prior to World War I, cutting of white oak during World War II, and some light cutting during the last 20 years.

The area was donated to Michigan State University in 1942 by Fred Russ, of Cassopolis, Michigan, who acquired it in 1935 from the Newton family who had owned it for 99 years.

Shadbush Natural Area,[1] 80 acres

Macomb County, Mich., T.3 N., R.12 E., sec. 29

Owner: Michigan Conservation Dept. Division of Parks

The tract is located a short distance north of Detroit in the Rochester-Utica Recreation Area. It is bounded by Ryan Road on the west and Clinton River on the east.

[1]Recommended as a potential Natural Landmark

(This tract) is a portion of the relatively flat glacial lake plain which was covered at one stage in post-glacial history by an extensive river delta. At a later stage, a broad valley was deeply cut into the delta by glacial melt waters, creating a steep hillside approximately fifty feet high at its southern boundary, with a narrow, low terrace at its base. These steep slopes are now covered by a mature mixed hardwood forest. The natural drainage from this high terrain has left the low strip of land at the base of the hill quite swampy, with the result that a boggy forest composed largely of white cedar and tamarack occupies most of this band along the base of the hillside. To the north of the wet forest, especially towards the west, is a cattail marsh and sedge meadow, whereas this area in the eastern section, bordering the river, is partially open meadowland in character.

Because of the variety of habitats—hardwood forest, cattail marsh, cedar swamp, and riverside meadows—this tract has a wide range of birds, small animals, and plant life. The natural isolation resulting from the steep terrain and the wetness of the low ground has provided protection for the natural features found here, and has discouraged most types of recreational use, so that there has been relatively little disturbance of the area. The forested slopes possess a rich spring flora, and the boggy areas of the low ground contain interesting and unusual plants. Ferns, mosses and liverworts are common. The fact that more than fifty species of trees and shrubs are found in the tract makes it particularly desirable for use as a nature study area. The shadbush or Juneberry is quite plentiful in this area and some of these are of unusual size; two specimens exceeded forty inches in trunk girth (circumference). *Shadbush Tract Site Report*. Mich. Nat. Area Council.

The nature of the terrain with many ravines makes it unsuitable for most uses, and the proximity of the area to Detroit makes it valuable as an outdoor laboratory in an area that is largely occupied by subdivisions and commerical developments.

Michigan Natural Areas Council, Shadbush Natural Area Site Committee, 1965 unpubl.

Simonds Ravine, 100 acres

Allegan County, Mich.

Owner: Private ownership

The ravine lies several miles south of Saugatuck, adjacent to Lake Michigan.

A climax forest exists here in a natural ravine of about 1 mile in length. A small, clear, unpolluted stream meanders through the valley which is filled with large, old trees. The largest trees are beech, red oak, sugar maple, and tulip tree. There are also large white and yellow birch and an excellent stand of hemlock.

More than 50 years ago the owner planted rhododendron and azalea here, and they are still found thriving in isolated clumps.

There are trails along the stream and birds and other wildlife are plentiful in this protected environment.

The area is being defended from possible destruction by a proposed superhighway which would pass through this natural arboretum.

Thompson, P. W. (undated). Save those priceless areas. Cranbrook Inst. Sci., Bloomfield Hills, Mich., unpubl.

Flood Plain Forests

Lew Sarett Sanctuary, 130 acres

Berrien County, Mich., Hager Township, T.3 S., R.18 W.

Owner: Michigan Audubon Society

From St. Joseph travel northeast through Benton Harbor to the Red Arrow Highway. At Twelve Corners turn left and continue to Duncan Rd. The Sanctuary borders this road.

The Sanctuary is located on lowland along the Paw Paw River. Much of the land is flooded periodically. Soils reported for the site, according to the Berrien County Soil Conservation Service, are: imperfectly drained Ottawa loamy sand, Seward loamy sand on rolling topography, St. Clair silt loam, Eel loam, Spinks loamy sand, and Adrian loamy sand.

Habitats found within the tract are bottomland hardwoods, canary grass, mixed mesophytic hardwoods, an alder-tamarack-shrub association, and a tamarack bog.

The bottomland hardwood stand is of the elm-ash-maple type with American elm, black ash, red maple, sycamore, and willow as dominants. The elms are being reduced due to Dutch elm disease. Other trees within the stand are swamp white oak, sassafras, hemlock, white pine, and cottonwood.

Canary grass covers much of the marshy area. Where the land is slightly higher, there is red-osier dogwood and other shrubs.

The dominant tree species of the upland mixedwoods are yellow poplar, red oak, beech, ash, and elm. Hawthorn, sumac, spicebush, black-berried elder, and blackberry are present in the understory.

Red-osier dogwood, red-stemmed dogwood, highbush cranberry, service berry, pussywillow, spicebush, speckled alder, tamarack, and cottonwood also occur in associations primarily along the eastern border of the Sanctuary.

Fauna include several species of birds, deer, raccoon, woodchuck, muskrat, rabbit, and opossum.

Interesting flora found in the Sanctuary include the Michigan lily, pitcher plant, closed gentian, fringed gentian, and small purple-fringed orchis.

Development of the area includes a nature trail which crosses the present area. There are plans for the purchase of 40 additional acres of upland along the southern boundary of the present tract. Part of this new area is planned for the construction of a Nature Interpretation Center.

National Audubon Society, undated, unpubl.

IOWA NATURAL AREAS
Mixedwoods

Retz Memorial Woods,[1] (Kopp Tract), 49 acres

Clayton County, Iowa

Owner: Nature Conservancy

From Elkader, take Highway 13 south to County Highway G (2 miles). Go southeast on G about 2.5 miles to a crossroad, then north to Turkey River. Cross the bridge spanning Turkey River and keep right. At the fork in the road continue along the river for 1 mile. The Retz tract is up the hill on the left.

The tract features a high woodland and a lush ravine. The woodland is a high, gently rolling forest, with a crown of maple and oak interspersed with hickory, basswood, wild cherry, two species of ironwood, birch, and black and white walnut. The forest floor has large patches of maidenhair fern and many species of spring-flowering herbs.

The ravine is rugged, strewn with massive limestone boulders. Its rocky slopes are covered in places with solid stands of walking fern and there are many mosses, lichens, and liverworts in this area.

Disturbances in the tract have been few; a wagon trail once crossed a hill in the tract, as seen by the absence of trees in this strip of land; a pile of rocks and a cedar stake were left by the original surveyors; and oak trees have grown around barbed wire strung by the early settlers. Most of these marks of civilization are being slowly erased, and the tract is considered an excellent example of a climax oak-maple woodland.

The woods was named for Lyle Retz who, until his death, headed the Nature Conservancy committee for the preservation of this area.

W.A. Elkins, pers. comm. 1970
R. L. Hulbary, pers. comm. 1970
The Nature Conservancy, Iowa Chapter undated. The Kopp timber tract in the Turkey River Valley, unpubl.
The Nature Conservancy 1968b

White Pine Hollow, 712 acres

Dubuque County, Iowa

Owner: State Conservation Commission

This relic stand of white pine contains extensive areas of Canada yew and monkshood and other rare plants found only in a few locations in Iowa.

White Pine Hollow has been designated as a Registered Natural Landmark.

[1]Recommended as a potential Natural Landmark

Iowa State Conservation Commission undated. Iowa State Preserves System. Univ. Iowa Dept. Geol., unpubl.

Flood Plain Forests

Twelve Mile Island Natural Area, 900 acres

Clayton County, Iowa

Owner: U.S. Department of Interior, Bureau of Sport Fisheries and Wildlife

This natural area contains a silver maple-American elm association on a flat, flood plain zone, at an elevation of 605-610 ft. The area is a part of the Upper Mississippi River Wildlife and Fish Refuge.

U.S. Department of the Interior 1968

ILLINOIS NATURAL AREAS
Oak-Hickory Areas

Cap Sauers Holdings Nature Preserve, 1520 acres

Cook County, Ill., T.37 N., R.12 E., secs. 19 and 20

Owner: Cook County Forest Preserve District

Travel west of 104th Ave. and south of Route 83 to Ford Rd. and McCarthy Rd. (123rd St.).

An oak-hickory woodland lies here on the rugged, hilly terrain of moraines and other glacial land forms. Soils are derived from glacial till overlying Silurian dolomite.

There are thickets of haws and crabapples, some open meadows, and a few intermittent ponds. The area is a haven for wildlife.

This tract is part of the Palos Hills division of the Forest Preserve District and is undeveloped. It was dedicated as a Nature Preserve on 3 December 1964.

Illinois Nature Preserves Commission 1969
John Schwegman, pers. comm. 1970

Orland Park Woods

Cook County, Ill., T.36 N., R.12 E., sec. 5, SE¼

Owner: Cook County Forest Preserve District

Travel west through Orland Park to 108th Ave. and turn right into the park.

This is a near pioneer white and black oak woods, with extensive hawthorn areas and a small ravine system.

Suter and Park 1962

Palos Park

Cook County, Ill., T.37 N., R.11-12 E.

Take I-294 south to 94th St. and exit west to 104th Ave. Turn south to the Little Red School House; the woods lies about 0.5 mile to the southwest.

The Palos Park System has several areas of note; one is the Buttonbush Slough Prairie previously described. In section 8 of R.12, is a white and black oak woods, with hickory and other subdominant tree species. The woods lies on an upland underlain by glacial till.

In sec. 24 of R.11 E., is the YMCA Camp Palos which is in an oak-hickory-ash forest.

Suter, W.R., and V. Park. 1962. Some relatively undisturbed areas in the Chicago region: A microcoleopterological ordination of natural communities. Chicago Acad. Sci., unpubl.

Zander Woods (Thornton-Lansing Rd. Zander Woods Nature Preserve), 440 acres

Cook County, Ill.

Owner: Cook County Forest Preserve District

The area lies north of 183rd St. and Thorn Creek Rd., west of Calumet Expressway, and south of Thornton-Lansing Rd.

Within the area are open sandy ridges and swales and a heavy oak-hickory forest that contains sweet fern, several orchids, lupine, sassafrass, sour gum, and other unusual species.

Illinois Nature Preserves Commission 1969

Maple-Basswood Areas

Galena Woods

Jo Daviess County, Ill., T.28 N., R. 1 E., sec. 34

The tract lies 4 miles north of Galena.

This is a sugar maple-basswood forest on both sides of the river. Some Canada yew grows on the cliffs (Robert Evers, pers. comm. 1970).

Mississippi Palisades State Park,[1] 1700 acres

Carroll County, Ill., T.25 N., R.3 E., secs. 15, 16, 17, 21, 22, 27, 28, 33, 34

The area of the park represents the southernmost extension of the "driftless" or unglaciated area which covers a large part of western Wisconsin. The topography of the area is dissected with deep V-shaped valleys, caves, and sinks. The Palisades themselves are formed of Niagara dolomite of Silurian age over a bed of Maquoketa shale from the Ordovician period. In this area the Mississippi bluffs reach their maximum height, some 240 ft above the river. At the top, the soils are formed from loess and sandy loess to a depth of 33 ft.

The upland forests are primarily of the maple-basswood and oak-hickory types, with associated tree species including black, white, and red oak, paper

[1]Portions recommended as a potential Natural Landmark

birch, shagbark and bitternut hickories, and hop hornbeam. In the shrub layer, *Cornus, Rubus,* and *Ribes* are the most common genera. Some of the rarer species of herbs that are found in these forest areas are *Goodyera pubescens* and *Dodecatheon amethystinum*.

The bluffs also include some prairie openings which are being invaded by woody species. The dominant plant species on the prairie areas are big bluestem and Indian grass, with several species of legumes and composites associated with them. Slender ladies tresses are also found in many sites throughout the area. The invasion of these extensive prairie areas is evidenced by the presence of such woody species as smooth sumac and gray dogwood. An unpublished report of 1970 by R. P. Wunderlin describes the vegetation (Western Illinois University, Macomb).

> There is also evidence that certain sections of the woods were once more open or that parts of them at least were prairie or savanna.
>
> Along the western exposed edge of the bluffs a dense growth of *Juniperus virginiana* with numerous islands of hill prairie is found. The common grasses which occur in these hill prairies are *Bouteloua curtipendula, Bouteloua hirsuta, Panicum virgatum* and *Andropogon scoparius*. In some areas *Petalostemum purpureum*, *Amorpha canescens* and *Verbena stricta* were conspicuous, *Oenothera biennis, Aureolaria grandiflora* and *Helianthus strumosus* occurring in many.
>
> Along the more exposed areas of the bluff can be found several xerophytic western species such as *Opuntia rafinesquii* and *Synthynis bullii*.
>
> At the base of the slopes and corresponding valleys, a different flora is found which is typically lowland. The common forest trees found here are *Ulmus rubra, Ulmus americana, Acer saccharinum, Populus deltoides, Platanus occidentalis, Celtis occidentalis, Betula nigra, Morus rubra* and several *Salix* species. Found in the area of one of the ponds in the southern part of the park is an interesting and diversified aquatic community which includes an extensive stand of *Lythrum salicaria*.
>
> The Niagara dolomite cliffs afford an unusual and rich assemblage of ferns and flowering plants, many of which have a limited distribution within Illinois due to the specific habitat requirements of the plants and the geological history of the state. Some of the more uncommon plants which occur abundantly within the park include *Chielanthes feei, Campanula intercedens, Solidago scaphila* and *Pellaea glabella.*
>
> An area, undisturbed in part, adjoins the Mississippi and possesses a flora typical of a river floodplain. Here, *Lobelia cardinalis, Lysimachia ciliata,* and *Apios americana* are conspicuous and abundant. The tree species which occur along the river banks are typical of their situation. They are principally *Acer saccharinum* and *Betula nigra*. The river bank flora is diversified because of constant washing in of seeds and plant parts from areas up the river. Here can be found *Hibiscus militaris*. The floating vegetation in the river as well as in ponds throughout the area include *Lemma trisulca, Lemna perpusilla, Spirodela polyrhiza,* and *Wolffia columbiana.*

Plans are being made to protect areas of this state park from extensive public use. It is felt that some of the areas and rare species are too delicate to survive contamination and deterioration by public use.

Mixedwoods

Apple River Canyon State Park[1]

Jo Daviess County, Ill.

Owner: Department of Conservation

The park is located in the extreme northwestern county of Illinois and at the southern tip of the "driftless" or unglaciated area.

The average frost-free period is from 19 April to 16 October. The average January temperature is 19.6°F; the average July temperature is 74.6°F; and the yearly precipitation measures an average of 33.13 inches. (These data were taken from records at Dubuque, Iowa. Evers 1955.) These climatic conditions permit the growth of either prairie or forest, and it is largely topography which determines the local distribution and type of forest or prairie.

The lack of recent glaciation has permitted a varied topography which is quite different from the glaciated regions nearby. The park area includes steep cliffs, deep ravines, and high bluffs created by the Apple River which carved its bed through Ordovician limestones, shales, and Galena dolomites. Hartley and Iltis wrote as follows:

> The habitats and vegetation are correspondingly diverse. The uplands have an Oak-Hickory-Basswood forest, rich in herbs and other trees. On the edge of the bluffs, overlooking the valley, are rocky outcrops, and a more xeric vegetation, with small to extensive patches of prairie and, on some of the most exposed bluffs, large scattered trees of white pine. Yellow oaks *(Quercus muhlenbergii)* occur locally on the upper rims of the canyon. The very steep rocky slopes, with scattered cliffs, are densely clothed with deciduous forest, similar to that of the uplands. At the base of the slopes, this forest grades into the flood plain forest, which usually occurs only on one side of the river, with sheer cliffs on the other. Here we find the largest trees in the park, including slippery and American elms, silver and sugar maples, hackberry, walnut, and ash. The understory here, as well as in adjoining ravines, is a dense carpet of herbs, similar to those of the upland but with a number of additional species with southern affinities. On the sides of the ravines, as well as near the tops of shaded cliffs, often very extensive stands of the evergreen American yew are a striking sight. This plant is here at the very southern edge of its range. Other species with northern affinities occur on the wet vertical cliffs of Galena Dolomite along the Apple River, which give the park's landscape its character. Here, perpetual seepage, close proximity to river waters, and generally northerly exposure, produce a locally unique cool and damp, yet well-drained environment. Consequently, the most interesting, boreal or even subarctic, species in the Canyon and perhaps some of the most interesting in the State of Illinois, have been able to survive on these cliffs. On the bare face of the dolomite, or in crevices and on ledges, we find the tiny rosettes of the pale pink-flowered *Primula mistassinica,* the Dwarf Canadian Primrose. This is an essentially subarctic species, which is here highly isolated and at its most southerly station. Its closest station is far to the north, at the Wisconsin Dells. *Sullivantia renifolia*, a delicate white-flowered Saxifrage, is quite common on a number of similar cliffs and often grows with *Primula*. Since it is one of the species that requires cliff habitats, in the Midwest it is therefore essentially limited to the Driftless Area

[1]Recommended as a potential Natural Landmark

and adjoining dissected areas in the older drift of Iowa and to stations south of the terminal moraine in Missouri. Its affinities are with the Flora of the Rocky Mountains, where a number of *Sullivantia* species are found. Other species characteristic of these cliffs include the ferns *Cystopteris bulbifera* and *Cryptogramma stelleri*, as well as the following species, many of which are great rarities in Illinois: *Parnassia* sp., *Lysimachia quadriflora, Potentilla fruticosa, Pedicularis lanceolata, Lobelia kalmii, Hypericum canadense, Epilobium leptophyllum (E. lineare), Campanula uliginosa, Lycopus americanus, Mimulus ringens, Galium boreale* and *Senecio obovatus*. Many of these, at the center of their range far to the north, are typically alkaline swale or marsh plants. Here, at the southernmost edge of their range, they survive, if at all, only on the alkaline limestone or Dolomite cliffs.

A preliminary checklist of the flora in this area is in the Appendix. Thone (1922) was one of the first to appreciate such areas as this from the ecological standpoint.

Disturbance of the area includes some cutting in 1958 of the large white pines on the bluffs and slopes at the downstream end of the park.

Harty, T. G., and H. H. Iltis. 1959. Preliminary checklist of the flora of Apple River State Park, Jo Daviess County, Illinois, Univ. Wis. Dept. Botany, unpubl.

Black Partridge Woods Nature Preserve, 80 acres

Cook County, Ill., T.37 N., R.11 E., sec. 19, NW¼

Owner: Cook County Forest Preserve District

The woods is located on the north side of Bluff Road, northwest and across the Des Plaines River Valley from Lemont.

The terrain is one of hills and ravines, with a spring-fed creek which cuts through the moraine area. The hillsides are wooded with red oak, sugar maple, basswood, and black cherry on the well-drained mesic sites, and with ash, cottonwood, bur oak, and elm along the creek. White oak dominates the ridge tops.

Shrubs include pawpaw and the alternate-leaved dogwood. Skunk cabbage and marsh marigolds are abundant in the seeps; *Allium tricoccum, Asarum reflexum* and *Hepatica* spp. are found in the mesic wooded sites.

There are sculpin *(Eoltus* sp.) in the creek.

Illinois Nature Preserves Commission 1969
John Schwegman, pers. comm. 1970

Busse Forest Nature Preserve,[1] 440 acres

Cook County, Ill., T.41 N., R.11 E., secs. 17 and 20

Owner: Cook County Forest Preserve District

[1]Recommended as a potential Natural Landmark

The Preserve lies north of Higgins Rd. (Route 72) between Salt Creek and the Forest Preserve entrance drive.

The forest lies on a nearly level to slightly rolling glacial till plain underlain by Silurian Dolomite. The soils which are poorly to fairly well drained are classified in the Swygert-Bryce-Clarence-Rowe soil association developed from medium to fine-textured till.

This is an excellent example of a hardwood forest with large sugar maple, bur oak, and red elm trees as the dominant species, with green ash, black oak, American basswood, American elm, and swamp white oak common on the wet flats which are seasonally ponded.

Shrubs include *Cornus* spp., *Ribes* sp., *Viburnum acerifolium, Rhus radicans,* and *Rhamnus lanceolata.* Herbs which are abundant include the jack-in-the-pulpit and *Smilacina* sp. The rare nodding *Trillium* is also present in the preserve.

In addition to the forest composition described above, the tract includes a stand of sugar maple and an area of cattail swamp.

The area, which has an unusual abundance and diversity of wildlife, including deer, raccoon, and squirrel, was dedicated as a nature preserve on 3 December 1964.

Illinois Nature Preserves Commission 1969
John Schwegman, pers. comm. 1970

Carle Woods

Cook County, Ill., T.41 N., R.12 E., sec. 9 SW¼

Owner: Cook County Forest Preserve District

The woods can be reached on Illinois 58 near Des Plaines. The tract is located north of 58 and east of U.S. 45 and northeast of a bend in the Des Plaines River.

This is a typical, dark, red oak and sugar maple preclimax forest which lies on the flood plain of the Des Plaines River. Red oak dominates the canopy, with lesser representation of sugar maple, basswood, ash, and other trees. The shrub layer consists largely of black cherry and maple saplings. The herbs include spring beauty, wild geranium, mayapple, and wild onion.

Suter, W. R., and O. Park. 1962. Some relatively undisturbed areas in the Chicago region: A microcoleological ordination of natural communities. Chicago Acad. Sci., unpubl.

Jurgensen Woods North Nature Preserve, 120 acres

Cook County, Ill.

Owner: Cook County Forest Preserve District

The area lies south of 183rd St. east of the forest preserve driveway and west of the Calumet Expressway entrance drive.

This is a fine woodland of large trees that contains basswood, quantities of blueberry, some sassafras and sour gum, and other plants that are rare locally.

Illinois Nature Preserves Commission 1969

Lions Woods

Cook County, Ill., T.41 N., R.12 E., sec. 16, NE

Owner: Cook County Forest Preserve District

Partly disturbed.

Oak Point State Park Channel Lake

Lake County, Ill., T.46 N., R.9 E., sec. 10, SW¼

To reach the area travel Illinois 173 west through Antioch and past Channel Lake, south, to the park entrance.

This is a small pocket of oak-basswood-elm forest that has a few small areas of wetland species.

Suter, W.R., and O. Park. 1962, Chicago Acad. Sci, unpubl.

Salt Creek Nature Preserve, 245 acres

Cook County, Ill.

Owner: Cook County Forest Preserve District

The Preserve lies south of 31st St., east of Wolf Rd., and north and west of Salt Creek.

This deciduous forest contains open spaces and a diversity of habitats for wildlife. Ponds and marshy areas provide good cover for waterfowl, and a small herd of deer is maintained within the Preserve. The area was dedicated as a Nature Preserve on 30 June 1964.

Illinois Nature Preserves Commission, 1969

Sarah Fenton Hinde Preserve, 10 acres

Lake County, Ill., T.43 N., R.11 E.

Owner: Nature Conservancy, Illinois Chapter

The tract is located in the northeast corner of St. Mary's and Everett rds. (1.4 miles west of I-94 in Mettawa, Illinois).

The upland forest contains intermittent low, wet areas. Prominent tree species are sugar maple, shagbark hickory, ash, elm, basswood, black walnut, white oak, pin oak, hackberry, and aspen.

This tract was a gift to the Nature Conservancy from Mrs. Elizabeth DeLong.

John W. Humke, pers. comm. 1970

Sweet Woods

Cook County, Ill.

Owner: Cook County Forest Preserve

The woods lies north of 183rd St. and Thorn Creek (Schwab) Rd., south of Thornton-Lansing Rd., west of Calumet Expressway.

The area contains basswood and oak and a number of unusual species.

Robert A. Evers, pers. comm. 1970

Warbler Glen, 60+ acres

Lake County, Ill., T.45 N., R.12 E.

Owner: Waukegan Park District

From the north take Illinois Route 42 (Sheridan Rd. north to Greenwood Ave.) Enter at Bowen South entrance.

Tree species in the glen include oak, locust, maple, hickory, and birch. The prominent shrubs are Russian olive and privet, and wild flowers abound.

The area was once the brim shoreline of Lake Michigan. Its soils are classified as fine sandy loams with good natural drainage in an area which receives 35-37 inches of precipitation a year.

Waukegan Park District, pers. comm. 1970

Flood Plain Forests

Carpenter Woods, 9 acres

Lake County, Ill., T.44 N., R.11 E.

Owner: Nature Conservancy, Illinois Chapter

The tract is located on the western extension of Old School Road west of St. Mary's Rd., Mettawa, Ill.

This small tract on the flood plain of the Des Plaines River was donated by Mrs. Arthur Dixon to the Nature Conservancy. Admission is by arrangement.

John W. Humke, pers. comm. 1970
Nature Conservancy 1968a

Paw Paw Woods, 105 acres

Cook County, Ill., T.37 N., R.12 E., sec. 5, SW¼

Owner: Cook County Forest Preserve District

Use I-294 to the 95th St. exit, turn west to Archer Ave. and continue north about 2 blocks. The upland woods is on the right.

Paw Paw Woods includes both north-facing river bluff and flood plain woodland habitats, with some development of ravines. The soil is a rich black loam.

The dominant tree species are red oak, sugar maple, and white ash on the mesic slopes, black and white oak on the ridge tops, and bur oak on the low ground. Spicebush is a common shrub of the mesic and low areas and prickly ash *(Zanthoxylum americanum)* is found on the ridge tops.

The uncommon species in the woods are pawpaw, shingle oak, and chinquapin oak. There is an abundance of wildflowers in the area, including *Hepatica acutiloba, Solidago latifolia, Isopyrum biternatum, Asarum reflexum, Actaea alba, Geranium maculatum,* and *Thalictrum dioicum.*

Illinois Nature Preserves Commission 1969
John Schwegman, pers. comm. 1970
Suter, W.R., and O. Park 1962. Chicago Acad. Sci., unpubl.

Pottawatomie Woods

Cook County, Ill., T.42 N., R.11 E., sec. 1, SW¼

Owner: Cook County Forest Preserve System

From the Eden Expressway take U.S. Route 41 north to Dundee Rd. and then Illinois 68 west to just before the Des Plaines River at Wheeling and turn north into the woods.

This is a flood plain oak forest on the Des Plaines River. Suter and Park report that frequent flooding reduces the herbaceous layer and microhabitats for insects.

Suter, W.R., and O. Park, 1962. Chicago Acad. Sci., unpubl.

WISCONSIN NATURAL AREAS
Beech-Maple Areas

Adell Woods, 60 acres

Sheboygan County, Wis., Sherman Township, T.13 N., R.21 E., sec. 11, NESW

In Adell to the east of the railroad and to the west of State Highway 57.

A beech-maple forest with a 90% canopy was studied here in 1952 by R. T. Ward. The topography presents few irregularities and has only a slight slope to the south. Part of the area is lowland.

Table 11 lists the Importance Values of tree species as noted in the Plant Ecology Laboratory Data of the University of Wisconsin (PEL #2026).

TABLE 11. Importance value of species in Adell Woods.

Species	Importance value
Acer saccharum	107
Fagus grandifolia	123
Fraxinus americana	18
Ostrya virginiana	3
Prunus serotina	8
Quercus borealis	23
Tilia americana	14
Ulmus fulva	4

In 1952, the stand was in good condition, with only a few small areas of cutting, not enough to open the canopy. Reproduction of all size classes was abundant. The shrub layer was sparse and included the wild raspberry.

Cedarburg Beech Woods,[1] 50 acres

Ozaukee County, Wis., Newburg Quadrangle, T.11 N., R.21 E., sec. 20

Owner: University of Wisconsin-Milwaukee

On Highways 57 and 141 north from Milwaukee, travel to Saukville, then west on Highway 33 for 4 miles to Blue Goose Road, then south for 2 more miles.

The beech-maple type comprises 50 acres of the 177-acre University of Wisconsin at Milwaukee Biological Field Station, and grades into swamp hardwoods, savanna, and finally open fields. The field station is located in a moraine area, with low, gravelly, partly forested hills, kettle holes, and depressions. The soils in the woods are mainly shallow and stony and consist of 24 inches of well-drained Hocheim loam over till, with Teresa soils in the surrounding areas.

[1]Recommended as a potential Natural Landmark

The westernmost area of the woods is composed of sugar maple, white ash, and birch, with an occasional red oak and ironwood where the slope is an average 25%. Slippery elm is present but is rapidly succumbing to Dutch elm disease. Many trees in this woods were reported as being 80-90 ft tall.

The southern part of the woods has a similar composition, but has more large trees, with scattered groves of beech and more basswood. The northeast section of the woods grades into a pocket of yellow birch, tamarack, swamp hardwoods, and white cedar. Cedarburg Woods includes an occasional black cherry, hackberry, shagbark hickory, and bitternut hickory.

There has been scattered logging in the W½NWSE, and some heavier cutting near the north end. The remainder has had random cutting but has left the canopy intact and healthy. There is good tree seedling reproduction.

The woods has a ground cover of *Trillium*, mandrake, geranium, bedstraw, yellow and blue violets, *Hepatica* and bloodroot, false solomons seal, rue anemone, and wood anemone.

Studies of fauna conducted at the Biological Field Station include those of the oven bird, *Seiurus aurocapillus*, which nests in the beech-maple woods and is present there from May to September, and winter bird residents, the slate-colored junco and the black-capped chickadee.

Ecological investigations of small mammals have also been undertaken in the woods, with special consideration given to their economic relation to man and their population and distribution dynamics. Those species studied there include:

White-footed mouse	Red-backed vole
Meadow vole	Masked shrew
Meadow jumping mouse	Short-tailed shrew

Cedarburg Beech Woods has been designated a Scientific Area dedicated to research and education in the environmental sciences. The area was obtained in 1964 by the Nature Conservancy and was later donated to UWM with the provision that this and the other areas included in the Biological Field Station be preserved.

The woods are bounded by privately owned beech-maple forests that serve as buffers. The University of Wisconsin Plant Ecology Laboratory Data # 1038 and 2004 list the species composition of these buffer woods. These data are in the appendix.

Millicent Ficken, pers. comm. 1969
Germain, C. E., and W. E. Tans. 1967. Scientific Areas Preservation Council. Dept. Nat. Resources, Madison, Wis., unpubl.
Morzenti 1969
University of Wisconsin at Milwaukee 1968
Weise 1968

Colgate Woods, 15 acres

Washington County, Wis., T.9 N., R.19 E., sec. 34, NE¼

Owner: Private ownership

This is a sugar maple woods, with an 85-90% canopy. It was studied in 1952 by R. T. Ward (University of Wisconsin PEL #2024, unpubl.) who reported associated tree species of beech, basswood, hickory, hop hornbeam, black cherry, white and red oak, and some elm.

It is located on rolling terrain, with a deep ravine which crosses the tract through the middle. The leaf-litter layer was mostly of maple, oak, and basswood leaves.

Elkhart Lake Woods, 12 acres

Sheboygan County, Wis., Rhine Township, T.16 N., R.21 E., sec. 6, NW¼

Owner: Private ownership

Enter the woods 0.4 mile south of the junction of State Highway 57 and County Rd. EH.

The beech-maple stand is located in a deep depression and along steep slopes of a portion of the "Kettle Moraine." The tract, studied in 1952 by R. T. Ward (University of Wisconsin PEL #2042, unpubl.) had a 90% canopy and one extremely large beech.

Subdominant tree species included shagbark hickory, white ash, hop hornbeam, red oak, basswood, and elm.

Jerico Woods, 20 acres

Calumet County, Wis., T.17 N., R.19 E., sec. 2

This tract lies west of Charlesburg.

A dense canopy (90%) beech-maple forest lies here on level terrain at the base and to the north of a moderate rock cliff. There is very little beech on the area above the cliff.

A survey by R. T. Ward in 1952 (University of Wisconsin PEL #2015, unpubl.) showed sugar maple to have an Importance Value of 103 and beech with an Importance Value of 138. Other tree species found in much lesser quantities (all less than 15 in Importance Value) were bitternut hickory, white ash, hop hornbeam, black cherry, white oak, red oak, basswood, and slippery elm.

The soil is light brown grading into a very light brown clay at a depth of 10 inches.

There are few species of herbs and shrubs noted in the PEL data #2015. These are listed with their per cent frequency in Table 12.

Kirckhayn Woods, 10 acres

Washington County, Wis., Jackson Township, T.10 N., R.20 E., sec. 34, NE

Owner: Private ownership

Nearly level terrain with a slight rise to the south characterizes the topography of this beech-maple woods. The canopy coverage of the woods is 80-85%; the soil is a dark-brown loam grading into a light-brown clay covered with scattered beech, ironwood, and elm leaves.

The study of this area in 1952 (University of Wisconsin PEL #2021, unpubl.) showed maple to be the most important tree species, followed by hop hornbeam, beech, elm, and basswood.

TABLE 12. Percent frequency of herbs and shrubs in Jerico Woods.

Species	Per cent frequency
Anemone quinquefolia	20
Aster macrophyllus	50
Aster sp.	45
Botrychium virginianum	25
Brachyelytrum erectum	5
Carex pedunculata	15
Carex pensylvanica	40
Caulophyllum thalictroides	5
Galium concinnum	35
Galium triflorum	5
Geranium maculatum	45
Hepatica acutiloba	85
Hydrophyllum virginianum	5
Maianthemum canadensis	5
Mitella diphylla	20
Osmorhiza claytoni	20
Podophyllum peltatum	45
Polygonatum pubescens	25
Sanguinaria canadensis	15
Sanicula marilandica	5
Thalictrum dioicum	5
Trillium grandiflorum	55
Uvularia grandiflora	20
Viola cucullata	5

Marinette County Beech Forest, 40 acres

Marinette County, Wis., Thunder Mountain Quadrangle, T.34 N., R.17 E., sec. 11, NE¼NE¼

Owner: Marinette County

On Highway "C" west from Wausaukee about 19 miles, then turn north onto Goodman Parkway Rd. and continue about 5 miles (1.5 miles past Wolfe Lane). The area lies west of the road.

This area, which was covered by the Athelstane lobe of the Cary substage of the Wisconsin glacier, is of rough to undulating topography. The parent material is glacial till overlying granite and greenstones, while the soil is classified as a mildly podzolized, sandy loam.

The forest stand consists of northern mesic hardwoods dominated by beech in an area of Marinette County that is largely covered by forests of the hemlock-hardwood type. It is one of the best of the beech areas in inland Marinette County which are isolated from the main distribution of beech along the Lake Michigan shoreline.

The largest part of the forest contains sugar maple, beech, hemlock, and yellow birch, with a sparse understory of sugar maple reproduction and beech sprouts. The survey found very little hemlock reproduction present here. To the south and southwest, the area contains many aspens *(Populus grandidentata)*, some white birch, and large fire-scarred white pines. This part of the tract was partially logged about 1948 and the whole area was logged many years before.

The most prevalent shrub in the main portion of the woods was found to be leatherleaf, *Dirca palustris*. Nee and Tans in their preliminary species list for this woods note that *Epifagus virginiana* is present, and that it is the first time that this species has been recorded in Marinette County. They also list as noteworthy the presence of *Galium triflorum*, *Dryopteris spinulosa,* and *Lycopodium annotinum*. The species list is in the appendix.

The Marinette County Beech Woods is administered by the Forestry Commission of the County and is surrounded by the managed county forest. This 40 acres, however, was designated as a Scientific Area in September 1967, and no cutting will take place within its boundaries which are marked by paint at the 40-lines and by posts at the four corners.

Germain, C. E., and W. E. Tans. 1967. Sci. Areas. Preservation Council, Dept. Natural Resources, Madison, unpubl.
Nee, M., W. E. Tans, and R. Peet. 1969. Scientific Areas Council, Dept. Natural Resources. Madison, unpubl.

Mullett Creek Woods, 40 acres

Fond du Lac County, Wis., T.15 N., R.19 E., sec. 14, SE¼, sec. 23 NE¼

Owner: Private ownership

Use Highway 23 to area.

This tract contains both bottom and uplands, with the ridges covered by beech. Canopy cover in the beech-maple woods is 85%. A study here in 1950 (University of Wisconsin PEL #2028, unpubl.) gave the tree species with their Importance Values (Table 13).

TABLE 13. Importance value of tree species in Mullett Creek Woods.

Species	Importance value
Acer saccharum	59
Betula lutea	3
Carya ovata	3
Fagus grandifolia	101
Fraxinus americana	5
Ostrya virginiana	38
Prunus serotina	8
Prunus virginiana	3
Quercus alba	20
Quercus macrocarpa	4
Quercus borealis	28
Quercus velutina	15
Tilia americana	12

St. Francis Seminary Woods, 20 acres

Milwaukee County, Wis., T.6 N., R.22 E., sec. 15, NE

Take Highway 32 past the entrance to St. Francis Seminary. The woods lies just before the railroad tracks.

This is a beech-maple-basswood stand, with a canopy of 90-95%, lying on fairly level terrain with a few slight ravines. The area was studied by R. T. Ward in 1952. (University of Wisconsin PEL #2041, unpubl.) At that time, beech showed an Importance Value of 103; sugar maple, of 83, and basswood, of 54. Trees with lesser importance values were white ash, black ash, hop hornbeam, black cherry, red oak, and slippery elm. Forty-one species of herbs and shrubs were noted there in 1953.

Maple-Basswood Areas

Abraham's Woods,[1] 40 acres

Green County, Wis., T.3 N., R.9 E., sec. 31, SWSW

Owner: University of Wisconsin Arboretum Committee

Take State Highway 59 from Albany 1.75 miles, then turn right onto Town Road for 0.25 mile more. The woods are to the left.

This is a magnificent sugar maple-basswood climax woods which includes red oak, slippery elm, hickory, and hackberry. Red oak was more common in the

[1]Recommended as a potential Natural landmark

woods at the time of settlement, but does not reproduce well in dense shade, and maple is now clearly the dominant species in this stand. Soils are Knox loams, with a small area of Fox loam.

The woods is particularly rich in spring ephemerals; jewelweed and woodnettle dominate the ground layer in summer, and the rather rare Goldie's fern is listed as present here. Shrubs are scarce. A complete species list for the flowering plants and ferns of Abraham's Woods is in the Appendix.

In this area of Wisconsin, where the common woods is one of white and black oak with a heavy layer of shrubbery and summer blooming herbs, a maple woods of this type is extremely rare (Cottam G. 1961. Abraham's Woods: Its history, composition and the reasons for its conservation. Dept. Bot. Univ. Wis. unpubl.). The tree composition of the woods as taken from Harper (1963) is found in Table 14.

TABLE 14. Tree composition of Abraham's Woods (Harper 1963).

	Rel. freq.	Rel. den.	Rel. dom.	Importance value	Continuum index	Tree seedlings	
						Gap % freq.	Canopy % freq.
Acer saccharum	39.5	51.9	46.3	137.7	1377.0	5.0	66.7
Carya cordiformis	3.5	3.1	0.6	7.2	61.2		20.0
Celtis occidentalis	1.2	1.9	4.5	7.6	60.8		
Juglans cinerea	2.3	1.3	3.8	7.4	55.5		6.7
Juglans nigra	1.2	0.6	1.9	3.7	24.1		
Ostrya virginiana	8.1	7.5	2.4	18.0	153.0		
Quercus alba	4.6	3.1	1.9	9.6	33.6		
Quercus borealis	5.8	6.3	18.1	30.2	166.1		20.0
Tilia americana	13.9	10.6	5.8	30.3	227.2		
Ulmus rubra	19.8	13.8	14.6	48.2	353.6	5.0	40.0
Totals	99.9	100.1	99.9	299.9	2512.1		

Ave. basal area 123 inches^2. No. trees/acre 189. Dom./Acre 22,247 inches^2.

To the south of the area lies a pastured woods and beyond that an excellent dry prairie. The woods itself has escaped burning from prairie fires due to its location east of some steep sloped hills. Some trees bear fire scars about 60 years old.

Occasional trees have been removed from the woods, including the state record slippery elm and several large butternuts in the last logging in 1960. Dutch elm disease is killing the elms which are being replaced by maple reproduction. Mr. Abraham has retained sugaring rights in the woods.

Abraham's Woods was chosen as the first project of the Wisconsin Chapter of the Nature Conservancy. It was purchased by them as a living museum for the use of naturalists, students, and researchers.

Studies which have been done in this woods include that of Warner (1963).

Green County lies outside of and between the beech-maple, maple-basswood range as mapped by Braun (1950).

Harper 1963
Iltis, H.H. 1959. Checklist of the flowering plants and ferns of Abraham's Woods, Albany, Green County, Wisconsin. Univ. Wis. Herbarium, unpubl.
Iltis, H.H., and O. Loucks. 1965. Spring field trip into Abraham's Woods. Univ. Wisconsin Dept. Bot. and Wis. Chap. Nature Conservancy, unpubl.
Wisconsin State Board for the Preservation of Scientific Areas. 1966. Dept. Conserv., Madison, unpubl.

Black Hawk Island,[1] 200 acres

Juneau County, Wis., Wisconsin Dells Quadrangle, T.14 N., R.6 E., secs. 32, 33

Owner: University of Wisconsin

Take Highway 23 west from Wisconsin Dells to the Wisconsin River. Just across the river is County Trunk "A" (N in Juneau County). Follow it for 1.5 miles more to the Camp Upham Woods. One must reach the island by boat from there.

This is an undisturbed wooded island in the Wisconsin River which features sand bars, vertical sandstone cliffs, and seven different types of plant communities. The soils on the island are Hixton and Northfield loams, Gale silt loam, and Boone sands.

The river flows past the island from north to south and has cut a deep, narrow gorge between the mainland and the island to the north. Soft Cambrian sandstones about 500 million years old have been exposed above the cut. The geological features here provide an excellent study area for weathering, erosional cycles, and glacial influences.

The vegetation in the northern part of the island is that of a hemlock forest, with yellow birch and some white cedar on the north and east slopes. This type grades into white oak and hardwoods, with white pine understory. To the east and south is an area of maple-basswood, and to the south of it a portion of red oak-basswood. The western section of the island is composed of mixed red and white pine, with some jack pine and another section of pine-hardwoods. There are also pioneer lowland communities of soft maple, elm, and birch along the sand bars.

There are some patches of prairie on the sandbars and old river channel banks as well as on the sandstone bluffs overlooking the Wisconsin River.

> The sandstone cliffs on the northern and eastern sides of the island . . . are particularly interesting. Where they are wooded, they are often very cool and moist and offer habitats for ferns and various boreal species. On the level of the cliffs, on the very margin, . . . are . . . a number of typical bog species such as *Gaylussacia baccata,* (the huckleberry), and *Ledum groenlandicum* (the Labrador tea), which are able to

[1]Recommended as a potential Natural Landmark

grow there, high and dry above the river, because the pronounced acidity of the sandstone rock is like the high acidity of a bog. The Driftless Area Rock Goldenrod (*Solidago sciaphila*) is another interesting species growing on the edge of the cliffs. . . . On the bare rock faces there are occasionally rock crevices and fissures. Here, often close to the waters of the Wisconsin River, and generally in the open, . . . (are) . . . two of the most interesting species, the birdeye primrose (*Primula mistassinica*), which appears to be a northern (subarctic) relic left behind by ice after its melting, and the *Sullivantia renifolia*, a species essentially restricted to the unglaciated Driftless Area of Wisconsin and to similar areas in central Missouri. All of its relatives are species of cliffs, mainly of the Rocky Mountains (Hugh H. Iltis, unpubl.).

The appendix includes a complete list of the species in Upham Woods, as compiled by Donald R. Bramschreiber and Hugh H. Iltis of the University of Wisconsin Herbarium.

Black Hawk Island was purchased by Horace Upham in 1905 and was donated to the University of Wisconsin, Department of 4-H and Youth Development in 1941 as part of a 310-acre Memorial Woods, by Mrs. A. V. Keene and Mrs. C. H. Davis, the Upham's daughters. The whole tract is to remain in its natural state; provisions have been made so that no part of the land can be sold, used commercially, or made into a public park.

In 1907 the abandoned channel to the north of the island was flooded when the Wisconsin Dells dam was completed. A bridge to the island which was constructed in 1848 at Devil's Elbow, at the easternmost tip of the island, was destroyed in 1866 and there has been no replacement to date.

There are six or more trails that cross the island. It is estimated that about 600 hikers from the 4-H Upham Woods Camp, across the river and to the west, use the island each year, but no camping is permitted on the island itself.

Disturbances include some timber harvesting which took place prior to 1932 and cattle grazing also before that date. About 3 acres were plowed and planted in a garden when the Uphams owned the land.

Tans, W.E. 1969a. Scientific areas report, Black Hawk Island. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl.

Gochenaur Woods

Richland County, Wis., T.12 N., R.2 W., sec. 33, SW

On a slight 4% slope and a north exposure is found a maple-basswood stand studied by the University of Wisconsin ecology students.

Harper 1963
Zedler 1968

Heidenreich Woods

Richland County, Wis., T.12 N., R.1 W., sec. 11, SE

This maple-basswood stand has been used in studies made of this forest type by students of the University of Wisconsin. It lies on a 22% northeast-to-east slope.

Harper 1963
Zedler 1968

Juda Woods

Green County, Wis., T.1 N., R.8 E., sec. 11

This maple-basswood stand is listed here because the presence of woodland species in the Juda Prairie nearby is believed to be due to secondary adaptation to a prairie habitat from that of a woodland of similar composition to Juda Woods.

The tree composition of the woods is listed in the University of Wisconsin Plant Ecology Laboratory Data #1603 (1947, unpubl.). In addition to the dominant species, Juda Woods includes smaller amounts of hackberry, butternut, hop hornbeam, and elm.

A list of the herbs and shrubs present in the woods includes:

Adiantum pedatum
Allium tricoccum
Aralia nudicaulis
Arisaema atrorubens
Botrychium virginianum
Caulophyllum thalictroides
Claytonia virginiana
Celastrus scandens
Dentaria laciniata
Dicentra cucullaria
Erythronium albidum
Galium aparine
Geranium maculatum
Hepatica acutiloba
Hydrophyllum virginianum
Laportea canadensis
Luzula multiflora
Menispermum canadensis
Osmorhiza longistylis
Panax quinquefolium
Parthenocissus vitacea
Physocarpus opulifolius
Podophyllum peltatum
Polemonium reptans
Polygonatum communis
Polypodium virginianum
Polygonum virginianum
Ranunculus abortivus
Ranunculus septentrionalis
Ribes missouriensis
Sambucus canadensis
Sanguinaria canadensis
Smilacina racemosa
Smilax ecirrhata
Smilax herbacea
Trillium recurvatum
Viola cucullata
Viola pubescens

Lynxville Woods

Crawford County, Wis., T.8 N., R.6 W., sec. 5

This maple-basswood stand overlooks the Mississippi River on a very steep, northwest-facing 70-80° slope. Soils are variable and have developed on a parent material of sandstone and limestone.

The survey of this area in 1948 showed that sugar maple had an Importance Value of 90 and basswood, 99. Associated tree species were paper birch, shagbark hickory, white ash, butternut, hop hornbeam, bur oak, red oak, and slippery elm. Almost 90 species of herbs and shrubs are listed by the University of Wisconsin Plant Ecology Laboratory Data #1092, unpubl. Most frequently noted were false nettle *(Boehmeria cylindrica)*, Canadian wild ginger *(Asarum canadense)*, wild sarsaparilla *(Aralia nudicaulis)*, American bittersweet *(Celastrus scandens)*, and *Hepatica acutiloba*.

Maden Rock Woods, 20 acres

Pierce County, Wis., T.25 N., R.16 W., sec. 16

The site of this woods is a steep 35-45° slope of rough stony soil. The top of the hill has rock outcrops, and there are some large hackberry low on the slope, with seedlings higher up. Soil analysis showed an organic matter content of 6% and an A horizon 6 inches deep. In 1948 (University of Wisconsin PEL #1029, unpubl.) the woods composition showed sugar maple as the most important tree species with an Importance Value of 109; basswood had a value of 70. Less important species were black maple, bitternut hickory, butternut, hop hornbeam, white and red oak, and American and slippery elm.

Marshall Woods

Richland County, Wis., T.12 N., R.1 W., sec. 18, center

On a northwest exposure with 5% slope lies a maple-basswood stand studied by students of the University of Wisconsin.

Harper 1963
Zedler 1968

Pedee Woods, 25 acres

Green County, Wis., T.1 N., R.9 E., sec. 21, SW¼

Owner: Private ownership

This maple-basswood woods lies slightly to the north of Spring Grove on level terrain and Knox loam soils. The northeast portion of the tract is slightly lower than the rest and has a higher proportion of elm. Other associated species are hop hornbeam and red oak.

The area was studied in 1948–49 by the University of Wisconsin Plant Ecology Laboratory (PEL #1000, unpubl.). The herb and shrub layer was similar to that for Spring Grove (next) with the following additions to the species list:

Actaea alba
Anemonella thalictroides
Botrychium multifidum
Cypripedium pubescens
Eupatorium rugosum
Galium concinnum
Onoclea sensibilis
Parietaria pensylvanica
Polemonium reptans
Rubus allegheniensis
Sanicula gregaria
Solidago ulmifolia
Thalictrum dioicum

Harper 1963; Zedler 1968

Scott Woods

Crawford County, Wis., T.9 N., R.3 W., sec. 5, SE¼

This is a maple-basswood tract on a 20° north-facing slope. In the study made in 1949 (University of Wisconsin PEL #1091), sugar maple had an Importance Value of 132, basswood, of 46. Other tree species with their Importance Values were bitternut hickory, 12; shagbark hickory, 4; white ash, 16; butternut, 13; black walnut, 8; hop hornbeam, 5; bigtooth aspen, 4; white oak, 20; red oak, 27; and slippery elm, 12.

More than 60 species of herbs and shrubs are noted for this woods, the most common are:

Anemone quinquefolia
Arisaema atrorubens
Hydrophyllum virginianum
Osmorhiza claytoni
Osmunda cinnamomea
Sanguinaria canadensis
Thalictrum dioicum

Spring Grove

Green County, Wis., T.1 N., R.9 E., sec. 29, center

This is a maple-basswood forest studied by the University of Wisconsin Plant Ecology Laboratory (PEL #1032, unpubl.) in 1949. The tract has a north to northeast exposure and is on a 10% slope.

Associated with the dominant tree species are red and white oak, hackberry, butternut, hickory, hop hornbeam, elm, and black cherry.

Herbs and shrubs reported for this woods are:

Allium tricoccum
Anemone quinquefolia
Arisaema atrorubens
Aster shortii
Athyrum angustum
Botrychium virginianum
Carex sp.
Caulophyllum thalictroides
Celastrus scandens
Circaea latifolia
Lactuca spicata
Laportea canadensis
Orchis spectabilis
Osmorhiza claytoni
Osmorhiza longistylis
Parthenocissus vitacea
Phlox divaricata
Polygonatum commutatum
Polygonum virginianum
Polypodium virginianum

Claytonia virginiana
Cornus femina
Cryptotaenia canadensis
Dentaria laciniata
Dicentra cucullaria
Ellisia nyctelea
Erythronium albidum
Elymus villosa
Floerkea proserpinacoides
Galium aparine
Geranium maculatum
Geum canadense
Hepatica acutiloba
Hydrophyllum virginianum
Impatiens biflora
Prenanthes alba
Ranunculus septentrionalis
Sanguinaria canadensis
Sanicula marilandica
Smilacina racemosa
Smilax ecirrhata
Smilax herbacea
Trillium flexipes
Trillium recurvatum
Triosteum perfoliatum
Uvularia grandiflora
Verbena urticaefolia
Viola cucullata
Viola pubescens

Harper 1963

Verbsky Woods

Vernon County, Wis., T.13 N., R.1 E., sec. 7, NW

This tract features a much studied maple-basswood stand on a 35% northwest to northeast exposure.

Harper 1963
Zedler 1968

Waverly Woods

Pierce County, Wis., T.26 N., R.16 W., sec. 25

The woods lies on a dirt road parallel to County Road H.

This maple-basswood stand is found on flat, deep Knox silt loam. The area is crossed by two gullies formed by the runoff from nearby fields. When the area was studied (PEL #1028) in 1950, sugar maple was by far the most important tree species, with an Importance Value of 201. Other species in the tract were basswood, bitternut hickory, butternut, hop hornbeam, red oak, American and slippery elm. The woods' floor supported a heavy cover of *Laportea* and *Impatiens*.

University of Wisconsin PEL #1028, unpubl.

Wyalusing Hardwood Forest,[1] 200 acres

Grant County, Wis., Bagley Quadrangle, T.6 N., R.6 W., sec. 16

Owner: Dept. Natural Resources

[1]Recommended as a potential Natural landmark

Take Highway 15 north from Patch Grove for 5 miles, then turn west and north on County Rd. C to the Wyalusing State Park.

This natural area along the Wisconsin River contains many different types of communities, ranging from lowland silver maple-ash-elm forest to dry chinquapin oak forest on the southwest-facing bluffs above the river.

This is within the Driftless Area of Wisconsin. Topography is rough, with a heavily wooded bluff rising in some spots 420 ft above the river. The bluff has north, south, and west exposures. The soils found on Prairie du Chien dolomite, St. Peter sandstone, and Platteville-Galena dolomite were formed in deep loess and are Fayette and Seaton silt loams.

The lowland forest is along the flood plain of the river. Above it on the Prairie du Chien dolomite escarpment is the maple-basswood southern mesic type of forest common to Grant County. To the south of this east-west lying strip is one of drier mesic forest, with basswood and red oak dominant. This type is also found in scattered locales to the southeast and southwest of the tract.

South and west of the basswood-red oak association is one of white and red oak.

A St. Peter sandstone cliff supports a dry forest of chinquapin oak while directly to the south of it, along the immigrant trail, lies an area of black oak and hickory dry forest. There are also some areas of mixed hardwood in this southern section.

A small cedar glade is found in the Scientific Area in the northwest corner of it between the Prairie du Chien dolomite escarpment and a nearly pure red oak stand.

Species lists are found in the Appendix for the maple-basswood and red oak-white oak-maple associations found within Wyalusing State Park.

Tans, W. E. 1968. Scientific areas report, Wyalusing Hardwood Forest. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl.

Oak-Hickory Areas

Bell's Woods, 100 acres

Grant County, Wis., T.3 N., R.1 W., sec. 17

Owner: Private ownership

One and one half miles due west of Plattville.

This is a mature oak-hickory-elm forest in the Driftless Area of Wisconsin. It is located on a north-facing slope that runs along Rountree Branch, a stream that joins the Platte River. Hugh Iltis (pers. comm. 1970) reports as follows:

> At the west-end, the slope narrows into a nearly perpendicular east-facing bluff. The rock underlying the slope is Galena Black River Dolomite, a limestone which is

exposed in the several deep ravines and gullies that cut halfway down the wooded slope. The dolomite finally appears in small rock walls at the west-end of Bell's Woods, where a number of ferns and other species such as *Aquilegia* and *Arabis* find a suitable habitat.

There is some evidence that the woods were once much more open and that parts of them at least were savanna or prairie. Some of the larger white and black oaks have low and horizontal dead branches of large size, indicating an open environment during the youth of these trees. Such a suggestion agrees with the accepted recent history of the vegetation of the Driftless Area. The cessation of Indian fires about 100 or more years ago, as well as the general climatic trend towards a more mesophytic forest climate during the last half millenium, caused an expansion of the forest at the expense of the savannas and prairies.

On the upper parts of the steepest slope, at the western end of the woods, one finds a particularly rich assemblage of herbs. Among these are Twinleaf *(Jeffersonia diphylla)* and the Green Violet *(Hybanthus concolor)* which occurs nowhere else in Wisconsin, and which here is at its northernmost station in the world. There is, in addition, a wealth of other spring flowers, such as *Hepatica*, Spring Beauty, Dutchman's Breeches, *Trillium, Phlox,* May-apple, Blue Cohosh, Rue Anemone and many others. Measurements taken (by Margaret Schmidt Bergseng) [*sic*] on the soil pH in various parts of Bell's Woods indicate that the more level, eastern portions of the oak forest have acid soils (pH 4.5-5.0) while the very steep wooded bluff, where *Jeffersonia* and *Hybanthus* grow, is neutral to somewhat alkaline (pH 7.3).

Rare species in the woods include *Arisaema dracontium* in the low area near the stream; *Dirca palustris* near the base of the slope; *Hydrastris canadensis*, goldenseal; and *Schizachne purpurascens*. A preliminary checklist of the vascular species found in the woods is in the Appendix.

The woods have been lightly grazed in the past, and rather intensively in the last few years. "The area is one of exceptional biological interest and aesthetical appeal and efforts need to be made, perhaps by local groups, to have Bell's Woods preserved as a Natural Area." (Hugh H. Iltis pers. comm. 1970)

Bergseng, M. S., T. G. Hartley, and H. H. Iltis. 1940 and 1958. Preliminary checklist of the flora of Bell's Woods, Grant County, Wisconsin, Univ. Wisconsin Herbarium, unpubl.

Oak Woods

Jackson County, Wis., Franklin Township, T.20 N., R.6 W., sec. 1

The tract lies just off County Rd. "C."

The stand which is composed primarily of red and white oak lies on a northeast slope along the county road. When Oak Woods was surveyed in 1949 (University of Wisconsin PEL #1113, unpubl.), red oak was by far the most dominant species with an Importance Value of 219.3. White oak had a value of 75.6 and the only other species listed for the stand, black oak, had 4.2.

The most frequent herbs and shrubs noted for the area were wild sarsaparilla,

pointed-leaf tickclover *(Desmodium acuminatum)*, bush honeysuckle, wild geranium, sunflower *(Helianthus strumosus)*, and *Pteridium latiusculum*.

York Woods, 27 acres

Green County, Wis., York Township, T.4 N., R.6 E., sec. 23, NE¼

This oak-hickory woods lies on rolling land on the Galena-Black River limestone of the Ordovician Period. There is a 20% slope, with a north to northwest exposure. Soils are partly Knox and partly Dodgeville series, formed from loess. Fragments of limestone are found in the subsurface layers.

The climate of the area is intermediate between the northeast forest region and the central prairie region. At the time of settlement, the area supported a prairie-oak opening type of vegetation and pioneer oak forest, which later developed into a closed oak forest.

The species prevalent in this woods are red oak, hop hornbeam, basswood, elm, and sugar maple as well as the more common species for this area of Wisconsin, the bur oak, white oak, shagbark hickory, and black cherry. McIntosh (1957), our source of information for this, wrote: "The range of species in this woods encompasses a range of ecological adaptations being at or near the extremes of deciduous forest succession in this area, and the two . . . (dominant) species are thought of as components of two separate communities—oak-hickory and maple-basswood."

The center of the area he studied is sugar maple and basswood—both reproducing very well. Slippery elm also overlaps in the area of maple and the distribution of its reproduction is more extensive.

White oak is restricted to the periphery of the sampling area and has limited reproduction. In quadrats where white oak is the dominant species, sugar maple has the lowest Importance Values and vice versa.

Walnut does not appear in the quadrats in which red oak is dominant, nor does slippery elm where red oak is dominant. Neither white oak nor walnut appear where sugar maple is dominant.

Successional relations of the tree species are evidenced by their reproduction. White oak, walnut, and red oak are clearly not reproducing appreciably in any group of quadrats, not even where they are the leading dominants, while hop hornbeam, elm, beech, and maple are reproducing in some degree in all groups.

Understory species are probably distributed according to gradients in light intensity. Subordinate species show positive correlation, with the most prominent species present in the maple-basswood-hop hornbeam area being: *Caulophyllum thalictroides, Aralia nudicaulis, Pyrola elliptica, Botrychium virginianum, Uvularia grandifolia,* and *Trillium flexipes*. The most common species under the white oak-dominated area were: *Parietaria pensylvanica, Corylus americana, Desmodium glutinosum, Carex pensylvanica, Cornus racemosa, Geranium maculatum, Circaea latifolia,* and *Smilacina racemosa*.

The outstanding feature of this woods lies in its heterogeneity.

Hemlock-Hardwood Areas

Castle Mound Pine Forest, 20 acres

Jackson County, Wis.,

Owner: Dept. Natural Resources

This Scientific Area contains a stand of white pine, with some red and jack pine.

Wisconsin Scientific Areas Preservation Council 1968

Richard Drumm Memorial Forest, 36 acres

Manitowoc County, Wis., Gibson Township, T.21 N., R.23 E., sec. 19

Owner: Izaak Walton League

From State Highway 147, a narrow wooded lane leads to the tract.

This tract, with a splendid view of West Twin River, contains hemlock, white cedar, balsam fir, elm, and maple. It also supports a variety of shrubs, ferns, and wildflowers. There are several trails through the woods for hiking and the area is open to public hunting of deer and grouse.

The woods is managed for conservation purposes, and was donated by Mr. and Mrs. Elmer Drumm in memory of their son, Richard J. Drumm.

Conservation Education Inc. 1967

Finnerud Forest,[1] 300 acres

Oneida County, Wis., T.39 N., R.6 E., sec. 21

Owner: University of Wisconsin

On Town Road from Highway 51 south of Minocqua.

This botanical and zoological research area is maintained and administered by the University of Wisconsin Arboretum Committee for scientific and educational purposes. The stand consists of 100-year-old white and red pines, an open sphagnum bog with marsh and lake shore. It is outstanding for its magnificent stand of thriving pine trees.

Wisconsin Scientific Areas Preservation Council 1968

Flambeau Forest Scientific Area,[1] 360 acres

Sawyer County, Wis., T.37 N., R.3 W., sec. 5, SW¼SWNW and Lot 1, sec. 6, N½ Lots 6 and 7, sec. 8, N½NW¼

[1]Recommended as a potential Natural Landmark

Owner: Dept. of Natural Resources

This tract is located in the 2960-acre Flambeau River State Forest which is between the north fork of Flambeau River and the center of Section 5. From the forestry headquarters on the Flambeau County Highway "W," travel east 2.5 miles to road "M," then south 3 miles to the forest road. Turn west and continue 1.5 miles to the east boundary of the Scientific Area.

The forest consists of hemlock, yellow birch, and sugar maple, with some basswood, white ash, elm, and some very large specimens of white pine. The understory is of yellow birch and sugar maple reproduction, but little hemlock reproduction was found except along the river to the west of the woods.

The whole State Forest was purchased, thanks to pressure brought to bear by preservationists in the 1940s, for $500,000. There are deer, coyote, and grouse in the forest. Canoeing and snowmobiling occur within its boundaries and all but the 360-acre Scientific Area is managed.

One hundred sixty acres of this 360-acre tract were fenced in 1968 to keep out deer and to promote the regeneration of several species that were being browsed out of existence. There is some blister rust and porcupine damage there, and some hemlock borer damage to old and weakened trees.

Three hundred sixteen acres of the tract have been designated by the Society of American Foresters as the Big Block Natural Area. The stand age is estimated at 220 years. Within the 316 acres, 270 are classified as the hemlock-yellow birch type, while the remaining 46 acres are of sugar maple-beech-yellow birch dominance. The largest trees in the tract are basswood. Topography is listed as level moraine.

Society of American Foresters 1960

Holmboe Nature Preserve, 32 acres

Oneida County, Wis., Rhinelander Quadrangle, T.36 N., R.9 E., sec. 7, NE¼NW¼, Government Lot 4

Owner: Nature Conservancy

Follow State Highway 17 south of Rhinelander, cross the Pelican River, then continue south on the gated trail to the microwave tower.

This nature preserve is located on rough, rolling terrain underlain by acid glacial deposits. It contains a variety of northern forest types from pioneer aspen-birch to hemlock forest. This latter type seems to predominate and is found on the ridge top and slopes. White and red pine are also present as is red oak, sugar maple, and balsam fir. There is an excellent thick stand of *Taxus canadensis* at a seepage area.

A closed white cedar-black spruce-tamarack-black ash bog is found within the tract. A preliminary checklist of the plants there compiled by Nee et al. (1969) shows *Cyripedium acaule* to be present. Tans (1969 unpubl.) reports at least two species of *Corallorhiza* in the forested area.

On the drier open slopes to the south, there are 4 acres of quaking and big tooth aspen, paper birch, and red maple.

This area should prove valuable for classes and investigation for the Technical Institute at Rhinelander and for Nicolet College.

Tans, W. E. 1969. Scientific areas report, Holmboe Conifer Forest. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl.

Mt. Pisgah Hemlock Hardwoods (Wildcat Mountain Woods), 30 acres

Vernon County, Wis., LaForge Quadrangle, T.14 N., R.2 W., sec. 14, W¼NWSE, and NESW

Owner: Dept. of Natural Resources

Take Highway 33 from LaCrosse to Ontario and continue for 2 miles south to the Wildcat Mountain State Park entrance. The Scientific Area lies to the south.

Bordered to the northwest by the Kickapoo River, the Mt. Pisgah Scientific Area includes a relic stand of hemlock and yellow birch along the river cliffs and a mixed stand of northern and southern hardwoods with scattered white pines.

This is the Driftless Area of Wisconsin and presents a typical dissected terrain. The overlying Prairie du Chien dolomite has been eroded away on the elevations (such as on Mt. Pisgah which lies directly to the south of the area), and has exposed the sandstone underneath. Soils are thin and stony with rock outcrops. There are some small areas of Arenzville sandy loams along the river and some Fayette silt loam in a valley area.

The hardwood stand on the north and northeast-facing slope contains red and white oak, basswood, sugar maple, and some very large big-tooth aspen. The shrub layer is sparse, but there is a profuse growth of spring ephemerals. Rare plant species *Sullivantia renifolia* and *Adoxa moschatillina* are also found in the tract.

Mt. Pisgah hemlock-hardwoods is a game refuge. No hunting is permitted although heavy use of the woods by deer in the winter is putting pressure on the area. There are two foot trails, one along the river and one which bisects the area from Little Pisgah to the river.

To the north and east are 30-40 acres of maple and red oak. It has been suggested that these be added to the Scientific Area. Oak is heaviest near the top of the slope, while sugar maple and basswood are more prevalent toward the bottom. There is one 52 inch dbh sugar maple. Other tree species in this area are yellow birch, bitternut hickory, white ash, hop hornbeam, big-tooth aspen, and white, red, and bur oak.

Boone silt loam occurs on a 30° slope and has a specific gravity of 0.90 and 4% organic matter. A study of the soil, taken from the University of Wisconsin Plant Ecology Laboratory Data #1024, showed the following characteristics:

Horizon	Depth (in inches)	pH
A0	0.5	6.0
A1	4.0	5.4
A2	2.0	5.5

A complete list of herbs and shrubs includes 103 species and is found in the Appendix. Among these are *Cypripedium pubescens* and *Lonicera prolifera*.

Tans, W.E. 1969. Scientific areas report, Mt. Pisgah hemlock-hardwoods. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl. University of Wisconsin PEL #1024, unpubl.

Pinecliff, 18 acres

Iowa County, Wis.,

Owner: Dept. of Natural Resources

A small stand of red, jack, and white pine is preserved within the Governor Dodge State Park. The area contains the southernmost locale for jack pine in Wisconsin, and has been designated a Scientific Area by the Department of Natural Resources.

Wisconsin Scientific Areas Preservation Council 1968

Pritzl Woods, 17 acres

Manitowoc County, Wis., Gibson Township, T.21 N., R.23 E., sec. 19

Owner: Privately owned

Pritzl Woods consists of an excellent stand of old growth white pine and mixed hardwoods.

Conservation Education Inc. 1967

The Ridges Sanctuary, 700 acres

Door County, Wis., T.30 N., R.28 E., sec. 16

Owner: The Ridges Foundation

At northeast edge of Bailey's Harbor, traversed by town roads.

The Ridges Sanctuary consists of beach ridges of Lake Michigan, with spruce-fir

forest on the ridges and tamarack swamps between them in long parallel lines. It is presently classified as a wildflower sanctuary and contains nature trails and areas for botanical research.

Very unusual habitat conditions have resulted in "perhaps the greatest concentration of rare plants to be found anywhere in the Middle West." The area is especially rich in orchids, heaths, and club-mosses. Already a Registered Natural Landmark.

Department of Natural Resources, Madison, Wisconsin, pers. comm. 1970.

Straka Woods, 46 acres

Manitowoc County, Wis., Gibson Township, T.21 N., R.23 E., sec. 19

Owner: Privately owned

Straka Woods contains cedar, elm, maple, and hemlock with some beech, birch, and pine. There is a small ridge running north and south through the woods to a 5-acre swamp at the western end of the tract. Some logging has taken place in the past.

Frank Stratka, pers. comm. 1970

Tofts Point,[1] 300 acres

Door County, Wis., Sister Bay Quadrangle, T.30 N., R.28 E., secs. 15, 16 (NWNE, SENE, N½SE¼)

Owner: University of Wisconsin

From the village of Bailey's Harbor, go east on the Ridges Rd. for 1 mile, then north on the private drive. The road is gated at the property.

This area, located on a small peninsula projecting into Lake Michigan, is bordered by Moonlight Bay to the east and the Ridges Sanctuary to the west. It includes oldfields, part of a bog, and an outstanding northern mesic hardwood forest, with large hemlock and white pine throughout. The area has never been logged, and some of the red and white pines have been estimated to be more than 250 years old. There are balsam and white cedar saplings present, but no seedlings of hemlock or of cedar. The tract includes more than a mile of Lake Michigan frontage, some of which presents wave-cut dolomitic cliffs.

The bog is located in the northwest corner of the property (part of a baymouth bar lake) and contains white cedar-spruce lowlands and emergent aquatic vegetation. The southwest portion of the tract is ridge and swale topography, similar to that of the Ridges Sanctuary that adjoins it.

[1]Recommended as a potential Natural Landmark

Toft's Point was sold to the University of Wisconsin with the aid of $55,000 Matching and Loan Fund from the Nature Conservancy on the condition that it be preserved as a natural area. It is administered by the Arboretum Committee of the University of Wisconsin, and was designated a Scientific Area in 1967.

Miss Emma Toft retains life tenancy in the area, and water fowl hunting rights remain with the Toft family. Deer browsing is found along the trails which crisscross the forest region, but hunting is not permitted.

The University of Wisconsin has developed plans for extensive ecological study in this area.

Germain, C. E., and W. E. Tans. 1969. Scientific areas report, Silver Lake Bog. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl.
Nature Conservancy 1968a

Wilderness Ridge, 8 acres

Manitowoc County, Wis.

Owner: Dept. of Natural Resources

This area consists of an abandoned beach line of Lake Michigan pine forest with hemlock patches and understory. There is excellent hemlock reproduction. The area has been designated a Scientific Area by the Department of Natural Resources.

Wisconsin Scientific Areas Preservation Council 1968

Mixedwoods

Apple River Canyon

St. Croix County, Wis.

This is a deep gorge with a large diversity of flora. The area is within the amended purchase boundary of a game management project and preliminary work is being done to acquire it as a Scientific Area.

William Tans, pers. comm. 1970

Baraboo Hills Natural Area,[1] 500 acres

Sauk County, Wis.

Fifteen miles west of U.S. 12 at Sauk City.

[1]Recommended as a potential Natural Landmark

This is a large area, some 3 miles wide and 18 miles long, which includes the Devil's Lake Red Oak Forest, Parfrey's Glen, Durst Rockshelter, and Pine Hollow, all preserved and designated as Natural Areas.

> The landscape provided by the two adjacent valley systems is outstanding for the geological crossection represented (in the . . . Driftless Area), the flora and fauna, archaeological sites, and the history of Wisconsin vegetation through the past few centuries which its biota documents. Both streams rise on the high backbone of Precambrian quartzite that forms the core of the Baraboo range. The southeasterly and southwesterly stream courses cut through the deep beds of Cambrian sandstones that cover the sides of the old quartzite relief. The erosional processes in Cambrian time can be studied in detail. Locally, the highest sandstone hills are capped by harder Ordovician dolomite. Archeological investigations of the terrace under one of the overhanging cliffs, or "rockshelters," on the site shows a long period of occupancy by Wisconsin's earliest settlers.
>
> Collections and observations of the vegetation indicate a vascular flora upwards of 500 species. The exceptional richness of flora results from the great relief and habitat diversity supporting a combination of northern and southern communities, as well as mixtures of them. Small openings at the top of exposed cliffs support remnants of a former prairie. Higher on the slope the white pine forest and associated shrubs and herbs are an outlier of a community that normally occurs more than 100 miles to the north. On the steep slopes below the cliffs, the hemlock and yellow birch also represent a disjunct community from the north. A number of species including a rare moss, 2 "driftless-area" endemic flowering plants, and a sedge disjunct 200 miles north of its main range, characterize the cliff habitats and swales in the valley bottom. (Loucks 1967, unpubl.)

Pine Hollow, which is located in the eastern valley, is described separately below, with the Devil's Lake Red Oak Forest, Durst Rockshelter, and Parfrey's Glen. The following is also from Loucks:

> The western valley, locally known as Hemlock Draw, is much larger, with fewer local extremes of habitat. The list of plants in this valley is no doubt much the same (as that of the eastern valley), but most of them occur in large tracts of native communities. There are many acres of former oak opening in which prairie species abound. There are both exposed and sheltered cliff habitats, with their characteristic species on quartzite as well as sandstone. Locally there are stands of pure hemlock, hemlock-yellow birch-sugar maple-basswood, white pine-red maple, and sugar maple. Instead of simply fragments, many of these provide large natural units suitable for research or outdoor classroom use.
>
> One of the most intriguing aspects of the area is the way in which it provides a long record of its own history. These valleys are a part of the "driftless area" of Wisconsin, a refuge for many plants and animals, and possibly man, while the ice was receding in the northern part of the state. [The Archaeological excavations at the Durst Rockshelter are described separately below]. Many other unexplored cliffs and caves suitable for early occupancy are found in the two valleys.
>
> A more recent historical record is preserved in the vegetation itself. At different intervals since the retreat of the last ice, southern Wisconsin vegetation has shifted from pine, through maple and oak, to predominantly grasslands and at the time of settlement had returned to an oak-savanna maintained by fire. These changes were primarily attributable to long-term fluctuations in climate. The steep slopes, exposed hilltops, and

deep valleys of the Baraboo site harbor an exceptional diversity of local climates, providing restricted habitats in which representatives of each of these major vegetation sequences were caught and held to this day. The oldest relics are the pine and hemlock—northern hardwood communities on acid or cool sites. In exposed places, such as the upper southwest slopes, there has been only partial replacement of the northern communities by oak and prairie species. Here, large open grown oaks occur with a thin ground-cover of native grasses, apparently similar to much of southern Wisconsin when the white man first saw it. A close look at the understory vegetation, however, reveals a remarkable series of northern herbs such as trailing arbutus, wintergreen, blueberries and several orchids mixed with the grasses, left over from a time when the landscape was very different.

But now that the region is protected from fire, changes are taking place in the vegetation more rapidly than at any previous time in history. Many of the red oak and white oak communities could have grown up to sugar maple long ago if the latter were not so easily destroyed by fire. Now the sugar maple, and some hemlock, is well established as a young forest under the present old-growth oaks. The vegetation of an earlier time remains, but the vegetation of the future is also there.

It is the unusual combination of northern and southern communities, in the process of dynamic change, that makes the Baraboo site so valuable for research, teaching and casual observation of the Wisconsin landscape.

Loucks, O. 1967. The Baraboo Hills Natural Area: a project to preserve a natural landscape, fauna and flora. Univ. of Wisconsin Dept. Bot., unpubl.

Devil's Lake Red Oak Forest,[1] 122 acres

Sauk County, Wis., T.11 N., R.7 E., secs. 19, 30, T.11 N., R.6 E., sec. 24

Part of the 3000-acre Devil's Lake State Park. Travel State Highway 123 south from Baraboo to South Shore Rd., then around Devil's Lake and across the railroad tracks to the first bend in the road; the forest lies north of the road.

The original tract that was designated a Scientific Area is a nearly pure red oak forest with a red maple understory, and lies to the south of Shore Rd. Larsen (1953) reports that red oak has an Importance Value of 224.5 and that mature maple has one of only 3.2, but that there are no red oak saplings in the woods. Of the 120 saplings present, red maple accounted for 97 of them. These data clearly indicate the successional nature of the stand. Plant Ecology Laboratory data from the University of Wisconsin (PEL #1042, 1948 unpubl.) note the presence of white oak, white ash, and shagbark hickory there.

The original 50 acres is being expanded to 122 acres by the inclusion of a woods north of South Shore Road which contains large, open, grown white oak, young red maple, and hickory grading into almost pure red oak to the east. Also added are a quartzite boulder talus slope with white pine, basswood, hickory, and cedar toward the top, and an oak-hickory forest at the summit of the bluff. Along

[1]Recommended as a potential Natural Landmark

the top of the bluff, up to 150 ft from the edge, are prairie species. Management plans include regular burnings to maintain this prairie area.

Part of the 50-acre tract is being reduced somewhat to allow for an expanded campground, but the new expansion of the Scientific Area to the north will include Devil's doorway, potholes, and other geologic features.

Germain, C. E., and W. E. Tans. 1967. Scientific areas report, Devil's Lake red oak forest. Sci. Areas Preservation Council, Dept. Natural Resources, Wis., unpubl.

Durst Rockshelter,[1] 40 acres

Sauk County, Wis., Honey Creek Township, North Freedom Quadrangle, T.10 N., R.4 E., sec. 12, NE¼SE¼

Owner: Nature Conservancy

The area lies 11 miles west northwest of Prairie du Sac. From Leland follow the town road to the north 1 mile to the Gottlieb Reich farm drive and continue 0.5 mile farther.

The Sierra Club Leopold Trail cuts through this completely wooded tract which has a Cambrian sandstone ridge running from east to west through its center. The upper levels of the sandstone have proved to be more resistant to weathering than the lower levels and have consequently produced an overhang.

The archeological site, the rockshelter, faces southeast and extends for 80 ft along the bluff wall. About 50 ft provide comfortable shelter. Here, beneath it, were found deposits from 2 to 3 ft thick that contained ceramic and nonceramic artifacts. They provide evidence that several different cultural groups occupied the site in the past, that these occupations were sequential, and that they took place over a considerable period of time. The deepest preceramic layer contained Radditz side-notched points from Archaic times, probably 5500 to 6000 years old. Scrapers, small ovate knives, choppers and gravers found in this layer date from this period if not earlier. Above these were Durst stemmed type of projectile points of the Late Archaic Period, and above them were Middle and late Woodland Artifacts which include Madison Ware pottery and small triangular projectile points of the side-notched type.

The major occupations of the Durst Rockshelter site took place during the Archaic and Middle Woodland periods.

> The chipped stone artifact indices of this site clearly show that compared to the later, Woodland occupation, the Archaic peoples spent much more time in butchering (knives), skin preparation (scrapers), flint knopping (unmodified flakes and fragmentary implements) and in activities which resulted in utilized flakes. Of course, only those activities which are reflected by non-perishable artifacts left in the soil can be determined. A great deal of the past human activity at the site (e.g. work in wood and vegetable fiber, sleeping, singing, etc.) has left no record in the soil. Nevertheless, the evidence does show that the Archaic peoples made a greater use of this site as a

[1]Recommended as a potential Natural Landmark

habitation than did the Middle Woodland peoples. No doubt, the latter, under their mixed economy, performed much of the activities mentioned above at their village and camp sites (nearby) associated with their crops and used the rockshelter primarily as a seasonal camp for hunting and collecting trips. (Wittry 1959)

Some timber has been cut in the wooded area, the slopes of which support growth of young red and white oak, red maple, basswood, and ash. The southern portion contains sugar maple in the understory and beneath it, Adam and Eve orchids, showy orchid, three-bird orchid and *Goodyera*. *Lycopodium selago*, a subarctic club moss, is found on some of the north-facing slopes.

The site was first excavated in 1954-55, at which time it was owned by Louis Durst. The Nature Conservancy purchased it in 1965 from Wilbert Neuman, and it was designated a Scientific Area in February 1966.

Tans, W. E. 1969. Scientific areas report, Durst Rockshelter. Sci. Areas Preservation Council, Dept. Natural Resources, Wis., unpubl.

Parfrey's Glen,[1] 88.6 acres

Sauk County, Wis., Baraboo Quadrangle, T.11 N., R.7 E., sec. 22, SENE, sec. 23, W½NW¼

Owner: Devil's Lake State Park

From Merrimac go west 1 block on Route 113, north for 2.5 miles on Cemetery Rd., then west on Parfrey's Glen Road one-third mile to the Scientific Area.

Parfrey's Glen is part of the Devil's Lake State Park and was the first Wisconsin Scientific Area to be so designated. The tract features a deep notch cut through quartzite and conglomerate of the south range of the Baraboo Hills. The deeply recessed rocky canyon features a permanent stream and uncommon plant species such as *Aconitum noveboracense*.

There are rich associations of ferns, mosses, and liverworts beneath the pines and some oak on the steep gorge walls. Patches of *Equisetum* are found along the stream banks to the south of the area and some very old white pines are along the gorge.

The upland areas surrounding the gorge support an oak woods.

No plans have been made which might increase public use of the Glen in order to protect the delicate species which are found there.

Tans, W.E. 1966. Scientific areas report, Parfrey's Glen. Sci. Areas Preservation Council, Dept. Natural Resources, Madison, Wis., unpubl.

[1]Recommended as a potential Natural Landmark

Pine Hollow[1] (Fred R. Jones Memorial Pines), 95 acres

Sauk County, Wis., North Freedom Quadrangle, T.10 N., R.5 E., sec. 4, SE¼NW¼, NE¼SW¼

Owner: Nature Conservancy

From the town of Leland travel east on County Rd. C, then north on Pine Hollow Dr. 1.3 miles to SE corner of area.

Located in the eastern valley of the 733-acre Baraboo Hills Natural Area, this, the 45th Scientific Area of Wisconsin, contains a part of the southern branch of the Baraboo Syncline incised by an intermittent stream. The rocks which have been exposed are of sandstone, embedded with conglomerate, and fractured quartzite bluffs. The ravines form a rough "Y"-shaped pattern through the tract although most of it lies in the southern half of the area.

Across the northern 30 acres passes the Sierra Club Leopold Trail through an association of red and white oak, with some red maple. Black oak is present here near the drier bluffs. The west-facing bluff contains some prairie species. More than 500 species of vascular plants have been collected here. "The exceptional richness of flora results from the great relief and habitat and diversity supporting a combination of northern and southern communities and mixtures of them" (Loucks 1967, unpubl.)

Viburnum acerifolium is present in damp areas and *Gaylussicia baccata* and *Vaccinium angustifolium*, in the dry, sandy areas.

Hemlocks of all sizes occupy the steep ravine walls. On low valley sides and bottoms yellow birch and hard maple are found. Here there are frequent springs and seepage areas. Some large white pines occupy the tops of the nearby vertical sandstone cliffs. Here are also found many mosses, liverworts, and *Sullivantia* as well as the rare Sword Moss. "Here is an outlier of a community that normally occurs more than 100 miles to the north" (Loucks 1967, unpubl.). One very large bluff features an undercut ledge which was used possibly by prehistoric men.

Some of this area has been burned and there has been some cutting close to the road. The steep slopes preclude heavy use, but some deer browsing has been noted on the hemlock reproduction.

More than 100 species of birds are known to nest within the Baraboo Hills Natural Area, including blue-winged and Canada warblers. Other animals present here that are worthy of note are fox and badger.

Tans, W.E. 1969. Scientific areas report, Pine Hollow. Sci. Areas Preservation Council, Dept. Natural Resources, Wis., unpubl.
Loucks, O. 1967. The Baraboo Hills Natural Area: A project to preserve a natural landscape, fauna and flora. Univ. Wisconsin Dept. Bot., unpubl.

[1]Recommended as a potential Natural Landmark

Baxter's Hollow, 171 acres

Sauk County, Wis., T.11 N., R.6 E., sec. 28, SW¼

Owner: Nature Conservancy

This tract, located in the Baraboo Hills Area, is 7 miles southwest of Baraboo.

A sugar maple-red oak-basswood forest was studied here in 1947 by the Plant Ecology Laboratory of the University of Wisconsin (PEL #1049, unpubl.) Associated tree species were hickory, ash, butternut, hop hornbeam, white oak, and elm. White pine grows on the higher elevations.

Soils are Baraboo silt loams covering the Precambrian quartzite that forms the core of the Baraboo range. The terrain is rugged with steep quartzite cliffs and a deep gorge. A swift trout stream flows along the floor of the gorge.

The area is a nesting site for winter wrens, turkey vultures and hawks are common, and ruffed grouse and woodcock are also found in the area.

The Nature Conservancy 1969c

Bay City Woods

Pierce County, Wis., T.24 N., R.17 W., sec. 2

The tract lies along Highway 35, 2.5 miles east of Bay City.

A red oak-white oak woods lies on a slightly sloping Knox loam soil with a pH of 5.5. Plant Ecology Laboratory Data from 1948 show red oak to have an Importance Value of 173. Other species present in the stand are red maple, paper birch, bitternut hickory, hop hornbeam, big-tooth aspen, black cherry, white oak, basswood, and slippery elm.

University of Wisconsin PEL #1029, unpubl.

Blockhouse Brook, 20 acres

Grant County, Wis., T.3 N., R.1 W., NW¼

Owner: County

This roadside park lies along Highway 151 near Botterville.

This is a white oak-red oak-black maple stand on a soil derived from loess. (University of Wisconsin PEL #1151, unpubl.) The parent material is limestone. Soil analysis gave a pH of 5.3 and a horizon composition of the following.

Horizon	Depth (in inches)	Color
A0	0.5	black
A1	1.5	black
A2	2.0	tan-grey
B	—	tan

The tree composition of this stand included: sugar maple, bitternut hickory, shagbark hickory, butternut, big-tooth aspen, black cherry, white oak, red oak, basswood, slippery elm, and black maple. Most of the elm is now gone.

The most frequent herbs and shrubs found in this stand included:

Impatiens pallida
Geranium maculatum
Galium concinnum
Osmorhiza longistylis
Cryptotaenia canadensis
Circaea latifolia
Athyrium felix femina
Arisaema atrorubens
Botrychium virginianum
Carex pensylvanica
Cornus femina
Polygonatum pubescens
Sanicula gregaria
Viola pubescens
Geum canadense
Galium triflorum
Osmorhiza claytoni
Parthenocissus vitacea
Corylus americana
Circaea quadrisculcata
Amphicarpa bracteata
Aster shortii
Brachyelytrum erectum
Celastrus scandens
Podophyllum peltatum
Ribes cynosbati
Smilacina racemosa
Viola cucullata

All of these species were found in more than one quadrat studied.

Brothertown Woods, 15 acres

Calumet County, Wis., T.18 N., R.19 E.

The tract is located in the southeast corner of the township. It can be reached on Highway 151 along the south branch of the Manitowoc River. It lies northwest of Charlesburg.

This is a maple-elm-basswood tract on rather low land that seems to receive run-off water from surrounding fields.

Soils are Bellefontaine silt loam, with an A horizon some 9.5 inches in depth and a pH that varies between 6.8-7.0. The B horizon is 24 inches in depth and has a pH of 5.8.

Much of the basswood was stump sprouted in the woods; the species attained an Importance Value of 55 in the 1957 survey. Sugar maple had an Importance Value of 87; slippery elm, 95.

Other trees in the tract were bitternut hickory with an I. V. of 4; hawthorn, 6; white ash, 6; black cherry, 13; white oak, 9; bur oak, 5; red oak, 14; and American elm, 3.

University of Wisconsin PEL #1013, unpubl.

Cedar Grove Game Refuge, 120 acres

Sheboygan County, Wis., Sheboygan Falls Quadrangle, Holland Township, T.13 N., R.23 E., sec. 30, Parts of NWNE, NENW, SENW, SWNE

Owner: Dept. Natural Resources, Bureau of Game Management

From Cedar Grove at the junction of State Highways 32, 144, and 141, take county trunk east 1.25 miles, then north on a subdivision road across creek to area.

Lying a scant 600 ft from the shore of Lake Michigan, this abandoned beach zone is a favorite resting spot for migrating birds. More than 50,000 birds have been trapped and banded here during fall and spring migrations, and the area is well known for spectacular hawk flights. Hawks have been banded at the refuge since 1935.

Special emphasis has been placed here on the study of birds of prey, but there has also been extensive work done with passerines, pesticide monitoring, and parasite-host records. Other subjects of research include the role of weather in migration, wind drift, diurnal migration, and the navigation of hawks.

Vegetation in the refuge consists of a second growth stand of poplar, paper birch, black cherry, and ash in one area, with a growth of dogwood, willow, raspberry, and alder on the rest. There has been some removal of brush and trees in the trapping areas.

Cedar Grove Game Refuge was declared a Scientific Area in 1952 and is used by local high schools and bird watcher groups.

Tans, W.E. 1969. Scientific areas report, Cedar Grove Game Refuge. Sci. Areas Preservation Council, Dept. Natural Resources, Wis., unpubl.

Charles Pond Woods, 110 acres, including water

Oconto County, Wis., T.26 N., R.21 E., sec. 3

Owner: Dept. of Natural Resources

This forest includes 40 acres of maple, basswood, and elm.

William Tans, pers. comm. 1969

Clarno Woods, 25 acres

Green County, Wis., T.1 N., R.7 E., sec. 17, SW¼

Studies made here in 1948 and 1963 show a mesic climax maple-elm woods on a slight (3%) slope with a shallow gully in the north part of the woods. Exposure is north to northwest. Soils are Knox loams.

The 1948 survey showed that sugar maple had an Importance Value of 135. Slippery elm was next in importance with 82 and there were lesser amounts of hop hornbeam, basswood, and American elm. Since then, the Importance Value of the elms has declined, but the woods is still classified as a shade-tolerant maple-elm-basswood stand (Knight and Loucks 1969).

Most recent studies show an average of 154 trees per acre, all of which are capable of sprouting from the base. Understory vegetation is sparse, indicating dense shade. Shrubs are nearly absent in the stand and herbs are scattered. A species list for herbs and shrubs is in the Appendix and includes species which, as is common in this type of stand, flower and fruit early in the spring.

Harper 1963
University of Wisconsin PEL #1034, 1948, unpubl.

Clayton Woods

Crawford County, Wis., T.10 N., R.3 W., sec. 25, NW¼

The topography of this tract is steep. The soil parent material is Cherty limestone on the top of the hillside and sandstone below.

A red oak-maple woods has developed here on basic soils with 5% organic matter and an A horizon of some 8.5 inches. Trees in this woods are listed with their Importance Values in Table 15. The herbs and shrubs are listed with their per cent frequency in the Appendix.

TABLE 15. Importance value of tree species in Clayton Woods.

Trees	Importance value
Acer saccharum	67
Fraxinus americana	20
Juglans cinerea	13
Ostrya virginiana	14
Populus grandidentata	5
Quercus alba	18
Quercus macrocarpa	7
Quercus borealis	110
Tilia americana	26
Ulmus fulva	17

University of Wisconsin PEL #1089, unpubl.

Dundee Woods

Fond du Lac County, Wis., Osceola Township, Kewaskum Quadrangle, T.14 N., R.19 E., sec. 35, NW¼, sec. 26, SW¼

The maple-red oak-basswood forest is found on extremely irregular Kettle Moraine terrain. Soils are Miami gravelly loams, with 7% organic matter and a pH of 6.5.

Subdominant tree species are paper birch, shagbark hickory, ash, white oak, and elm. More than 60 species of herbs and shrubs are listed in the 1948 University of Wisconsin P.E.L. survey #1008 for this woods.

Europe Bay, 100 acres

Door County, Wis., T.32 N., R.29 E., sec. 28, 29

This is a beech, white birch, ash, and maple community on abandoned lake dunes.

William Tans, pers. comm. 1969

Fairy Chasm, 19 acres

Ozaukee County, Wis., T.9 N., R.22 E.

Owner: Fish Creek Park Co.

Take Route 141 to Zeddler Lane; from there continue on to Lake Shore Drive and finally to 515E, Cedar Lane.

This is a woodland ravine cut through the rough bluffs of Lake Michigan by small streams. It is shaded by climax growth of oak-beech-maple-birch and white pine. "The deep chasm creates a microclimate similar to that in Wisconsin some 10,000 years ago. The ravine habitat therefore is ideal for many northern species that were introduced at that time" (Loucks 1968, pers. comm.).

The area is in a tension band that runs from northwest to southeast through Wisconsin. This causes above average precipitation and the absence of prolonged summer drought. Frequent barometric pressure changes aerate the heavy clay soils and provide conditions suitable for the growth of many delicate plants that need the moisture of the fog and mist blown in from the lake, and the heavy, aerated, clay soils found here. One of these exotic plants is (or was) the pine drops, *Pterospora andromedea*. In the spring, the ravine features great clumps of lady slippers, arbutus, violets, *Trillium*, and *Hepatica* with bogs of marigolds, saxifrage, rue anemone, and skunk cabbage.

The site also provides an excellent habitat for songbirds and small mammals. Some of the bird species observed here are ovenbirds, which nest in the woods, green herons, seen fishing in the stream which abounds in smelt and suckers in

the spring, whip-poor-will, towhee, ruffed grouse, oriole, and several species of woodpecker.

An unpublished checklist of the plants found in Fairy Chasm has been compiled and is available from the Nature Conservancy or Dr. Alvin Throne, Professor, University of Wisconsin-Milwaukee.

After some 70 years of struggle for the preservation of this unique area, the woodlands were officially designated a Scientific Area on 10 July 1969. Negotiations were entered into with the Nature Conservancy regarding the acquisition of the land and reversion to the University of Wisconsin at Milwaukee. The area will never be completely opened to the public; its rare flora is too delicate to be exposed to heavy use, but it will remain an irreplaceable laboratory for scientists and students of nature.

Nature Conservancy 1969a
Scriba 1961

Fernwold (Schmidt's Woods) (Schmidt Memorial Game Refuge), 40 acres

Clark County, Wis., Worden Township, T.28 N., R.4 W., sec. 18, SE¼NE¼

Owner: Margaret Schmidt Bergseng, John M. Schmidt

Three miles south of Stanley. On county trunk H, north from Fairchild travel to the crossroads, then east into Clark County.

This beautiful sugar maple-red oak-elm-basswood stand lies on older glacial drift (not Wisconsin Age) of some 10-150 ft thick, underlain by Cambrian sandstone and shale. The upper 10 inches of soil are Colby loamy clay well mixed with organic material. The subsoil is a heavy clay, but the soils are generally well drained due to a gentle slope.

The woods contains, in addition to these dominant species, some yellow birch, rock elm, black maple, ironwood, and butternut, and in some of the sandier areas are large white pines. Some of the largest and oldest paper birch trees in Wisconsin are located near the property boundary. The large rock elms are at least 150 years old.

Studies have been done here by Margaret Schmidt Bergseng on the life history of *Sanguinaria canadensis* L., unpublished, and of *Trillium grandiflorum* Salisb., as well as by Schmidt (1931) on the distribution of small mammals in the woods.

The woods contains a large population of mutant *Trillium grandiflorum* which has unstable genes and produces doubles and green flowers. Records were kept as early as 1910 on doubles (from 2 to 8 in perfect numbers) of petals, sepals, stamens, and carpels. "There are especially many perfect fours, which do not remain constant from year to year, but revert to the normal number of three and six parts each" (Margaret Schmidt Bergseng, pers. comm. 1969). Collections of

these plants have been placed in the herbariums at the University of Wisconsin and at the Field Museum of Natural History in Chicago.

The name of the tract is derived from the 15 species of ferns, including *Dryopteris goldiana* and *Botrychium matricaraefolium* which are found there.

A more complete list of plant species is in the Appendix.

The small mammals studied in this woods by Franklin Schmidt included the most commonly found short-tailed shrew, the pine mouse, *Pitymys pinetorum scalopsoides*, which is unique in Wisconsin to the forests of Clark County, and the northern white-footed mouse.

Other species found here were the star-nosed mole, the northwestern pigmy shrew, the cinereous shrew, red squirrel, gray squirrel, fox squirrel, and the flying squirrel, as well as gray chipmunk, red-backed mouse, Hudsonian jumping mouse, woodland jumping mouse, house mouse, muskrat, porcupine, skunk, and badger. Bird species include the pileated woodpecker.

There is a small cabin in the woods, used infrequently by John Schmidt who serves as caretaker for the property.

Arrangements are being made with the Schmidts to designate the woods as a Wisconsin Scientific Area.

M.S. Bergseng, pers. comm. 1969
Schmidt 1931
William Tans, pers. comm. 1969

Haskell Noyes Memorial Woods[1] (Nast Woods), 70 acres

Fond du Lac County, Wis., Kewaskum Quadrangle, T.13 N., R.19 E., sec. 12, E½NW¼

Owner: Dept. Natural Resources

From the junction of Highways 28 and S in Kewaskum, follow S north and east 7 miles, then turn north on Highway GGG and continue about 2.5 miles to the parking area at the Noyes Memorial Woods on the west side of the road.

This Memorial Woods lies in an interlobate moraine formed between the Green Bay and Michigan ice sheets of the Wisconsin Glacier. It is part of the 24,000-acre Northern Unit of the Kettle Moraine State Forest and exhibits the typical kames, kettles, and ridges of this moraine. The glacial till is overlain by Casco, Rodman, Fox, and Lapeer loams and silt loams.

An analysis of a Rodman gravelly loam taken from unpublished University of Wisconsin data (PEL #1007 and 1135) showed the following:

Horizon	Depth (inches)	pH
A0	1.5	8.0
A1	2.5	8.0
A2	2.0	7.0

[1]Recommended as a potential Natural Landmark

The organic matter content was fixed at 9.0%. The heavy layer of leaf mold and litter on the forest floor is noted in the figures for the A0 horizon.

The Memorial Woods is a near climax sugar maple and red oak dominated stand, with smaller amounts of basswood and ironwood and some paper birch, American elm, bitternut hickory, black cherry, and juneberry. The understory is very rich in spring flora and ferns, and attracts many visitors from nearby colleges and high schools. A list of the shrub and herb species is found in the Appendix.

There is a small area of tamarack and swamp hardwoods on the north end of the woods, and it is surrounded to the west by abandoned fields and to the east and south by woods. There is some evidence of deer browsing in the area.

William Tans, pers. comm. 1966

Hilltop Woods

Dunn County, Wis., T.27 N., R.11 W., secs. 28-29

This is a red oak forest that is situated on the top of a hill, with a very dense understory of sugar maple. A survey by the University of Wisconsin Plant Ecology Laboratory (#1122, unpubl.) showed that associated tree species were red maple, paper birch, white ash, hop hornbeam, big-tooth aspen, white oak, and basswood.

The most frequent herbs and shrubs were: big merrybells, wild sarsaparilla, American spikenard, asters, Virginia creeper, poison ivy, ferns, and *Brachyelytrum erectum*.

Holy Hill Woods, 30 acres

Washington County, Wis., T.9 N., R.18 E., sec. 14, NW ¼

Owner: Private ownership

The woods is located northwest of the church.

A red oak-white oak-hop hornbeam-maple woods is located here on the irregular topography of the Kettle moraine. The soil is a Redman gravelly loam with a pH of 7.5 and an organic matter content of 7%. The study of this area in 1948 found some hickory, white ash, black cherry, and elm associated with the dominants. There was a rich herb and shrub layer under the trees.

University of Wisconsin PEL #1009, unpubl.

Keowns Woods, 40 acres

Washington County, Wis., T.11 N., R.20 E., sec. 29, SENE

Owner: Private ownership

This is a beech woods, with an 85% canopy on ravined topography. Associated with the beech in the 1952 survey were elm, basswood, ash, and hop hornbeam, with smaller amounts of sugar maple and paper birch.

University of Wisconsin PEL #2025, unpubl.

Kroe's Woods

Racine County, Wis.

Five miles north of the city of Racine.

This red oak-basswood stand with an 86% canopy was studied in 1956 by the University of Wisconsin Plant Ecology Laboratory (#1248, unpubl.). Included in the stand were sugar maple with an Importance Value of 4; shagbark hickory, 19; American ash, 55; white oak, 27; bur oak, 5; and black oak, 13. Basswood showed the highest Importance Value with 86, followed by red oak with a value of 83.

Lodde's Mill Bluff, 15 acres

Sauk County, Wis., T.9 N., R.6 E.

Owner: University of Wisconsin Arboretum Committee

Three miles from Sauk City on Highway 60.

This scenic tract lies north of the Wisconsin River at the site where Honey Creek flows into it.

> Cambrian sandstone forms a massive layered cliff 80 feet thick. At its base is a steep sandy talus slope. Above the sandstone are many layers of Lower Magnesian limestone (dolomite) of Ordovician Age, which form a hard cap-rock. Not only does this prevent erosion of the softer sandstone, but the percolating calcareous waters probably helped cement the sandstones. Each type of rock has its own distinctive flora.
>
> The result of topography on vegetation is . . . clearly seen. The north-facing slope has a rich basswood-aspen-birch forest at the base and a dry oak forest above the cliff; in exactly the same position and on identical substrate, the south-facing slope has instead a mesic oak forest at the base and a xeric prairie above. (Iltis 1963, unpubl.)

There are several major plant communities present at Lodde's Mill Bluff including Basswood forest, dry upland oak woods, dry prairie, oak openings with prairie plants, mesic oakwoods, and peculiar cliff vegetation.

The mesic deciduous forest of the sandy steep slope beneath the cliff is second growth, and has as associates shagbark hickory, ironwood, and a few

red oaks. There is a rich carpet of spring flowers under the trees, among them the rare showy orchis *(Orchis spectabilis)*. Summer-flowering species include several rare species of sedge. At the southeast base of the cliff are bushes of wahoo *(Euonymus atropurpurea)* and cup-plant *(Silphium perfoliatum)*, both uncommon species in Wisconsin.

On the north-facing Cambrian sandstone cliff are such unusual species as the blue monkshood *(Aconitum columbianum)*, *Sullivantia renifolia*, white camas *(Zigadenus elegans glaucus)*, and slender cliff brake *(Cryptogramma stelleri)*. A cliff goldenrod *(Solidago sciaphila)*, which is found here, is restricted in its range to the cliffs of the Driftless Area of Wisconsin. It is found nowhere else in the world.

The dry, upland red oak woods contains scattered red cedar and other prairie plants. It has a second growth of red and white oak, big-tooth aspen, and some bitternut hickory.

In the oak opening areas of the rocky level ridge top are bur oaks intermixed with trembling aspen and black oaks and an occasional paper birch. On the south slopes this area grades into dry prairie with scattered prickly ash, red cedar, poison ivy, smooth sumac, bittersweet, and arrowwood.

It appears from fire scars on older trees that frequent fires in the past have maintained this as an open area. Now, prairie species are being shaded out by thickets and scrubby woods. In this area is found the rare sessile-leaved white joe-pye weed *(Eupatorium sessilifolium)*. Disturbances include an old abandoned road and several limestone pits.

The xeric prairie is of steep topography. There are small patches of it at the east end of Mill Bluff and prairie species can be found in the juniper glade on the southwestern slope. Side-oats grama and little bluestem are dominants with switch grass, Indian grass, and showy love grass as associates.

On the calcareous cliffs of Ordovician dolomite outcrops are red cedar and paper birch; on extremely dry exposed ledges are such "desert" plants as the prickly pear cactus, grama grass, side-oats grama, and *Selaginella*. The prickly pear is also found with associated xeric species on the south and west-facing sandstone cliffs and sandy ledges.

The mesic oak forest contains bur, red, and white oak gradually grading into juniper and bur oak woods.

A complete species list for Lodde's Mill Bluff is included in the Appendix.

Lodde's Mill Bluff Scientific Area was purchased from Mr. and Mrs. Carl Litcher through the efforts of the Milwaukee Green Tree Garden Club and the Wisconsin Chapter of the Nature Conservancy. In 1963, the land was turned over in trusteeship to the University of Wisconsin under jurisdiction of the Arboretum Committee to be preserved in its natural state.

Iltis, H. H. 1963. Lodde's Mill Bluff: A Wisconsin flora treasure house. Univ. Wisconsin Herbarium and Wisconsin Chap. Nature Conservancy, unpubl.

Necedah Jack Oak Natural Area,[1] 100 acres

Juneau County, Wis., Necedah Quadrangle, T.19 N., R.3 E., sec. 34, E½SE¼S½SENE

Owner: U.S. Dept. of Interior, Fish and Wildlife Service

From Necedah travel north 2 miles on Highway 80 then west 0.8 mile more on Becker Rd. to the area which lies to the north of the road.

Soils within this section of the 40,000-acre Necedah National Wildlife Refuge are Newton, Plainfield, and Morocco sand and loamy sand. Topography is level at an elevation of 926-930 ft. These 100 acres are to be preserved mainly for the oak barrens type of community which exists here. The dominant tree species is *Quercus ellipsoidalis* (Hill's or jack oak). The relatively mature oaks, whose average age is 35 years, are associated with a considerable cover of jack pine and have an undercover of prairie grasses. The southernmost extent of the area merges with an oak-aspen association.

The southern 80 acres were designated a natural area by the Society of American Foresters in 1960. They report that the jack pine has an average height of 40 ft with an average diameter of 5 inches and that the black oak has an average height of 50 ft with an average diameter of 8 inches.

This section of the wildlife area was burned in the early 1930s, but under present preservation plans there will be no more disturbance of the present type.

The land to the east of the barrens is privately owned; that to the west is abandoned fields.

Tans, W.E. 1969. Scientific areas report, Necedah Jack Oak Natural Area. Sci. Areas Preservation Council, Dept. of Natural Resources Wis., unpubl.
Society of American Foresters 1960

Necedah Oak-Pine Forest,[1] 240 acres

Juneau County, Wis., T.19 N., R.2 E., sec. 12, Center E½

Owner: U.S. Dept. of Interior, Fish and Wildlife Service

From Necedah on Route 80 go north to county road then turn west onto Sprague-Mather Rd. to junction with Berwick Rd. Continue 0.5 mile to the south. The area is to the right.

Topography in this section of the Necedah National Wildlife Refuge is flat to slightly rolling. Soils are Newton and Morocco sands and Au Gres, a sandy soil over acid sands. There are also small areas of shallow peat.

The marshy areas are to the west; grassland openings, mostly in the eastern half, contain big and little bluestem, Indian grass, *Liatris, Lupinus,* and blueberries. A long diagonal ribbon of 6-ft sprouts and lowland brush cuts across the center from northwest to southeast. There are also scattered areas of aspen.

[1]Recommended as a potential Natural Landmark

This tract is to be managed as a jack pine-oak savanna and is to be burned as often as necessary to maintain this type. The whole area was burned in 1966; the western half was burned again in 1968.

Two-hundred-twenty-seven species of birds occur within the refuge which is a waterfowl sanctuary. Turkey is stocked there and the openings are heavily used by deer.

Germain, C.E. and W.E. Tans. 1968. Scientific areas report Necedah Oak-Pine Forest. Sci. Areas Preservation Council, Dept. Natural Resources Wis., unpubl.
Society of American Foresters 1960

Petrifying Springs County Park, 100 acres

Kenosha County, Wis., T.2 N., R.22 E., secs. 2, 11

Owner: County Park Commission

The park lies 8 miles north of downtown Kenosha.

The mature forest is found in three separate areas of the park and is principally maple and white and red oak in composition. Associated with the dominants on the rolling terrain are white ash, hop hornbeam, black cherry, and basswood.

The name of the park is derived from many calcareous seeps and former springs which have deposited calcareous material on the plants, principally the reeds and sedges. As the plant material decomposed, the outline of the plant was left, "petrified."

Kenosha County Park Commission, unpublished mimeo, 1969
University of Wisconsin PEL #1103, unpubl.

Sanders Park Hardwoods (Forest Park), 30 acres

Racine County, Wis., Mt. Pleasant Township, T.3 N., R.22 E., sec. 36

Owner: County Highway and Park Commission

The Hardwoods Preserve, part of the 80-acre Sanders Park, lies between Meachem and Wood Rds., a short distance south of the city of Racine.

When this forest, located on a sand terrace, was surveyed in 1933, the dominant species were red oak, elm, white oak, ash, and hickory. There were no large maples or basswood in the area studied. Of the young trees, elm and ash were the most abundant, followed by young basswood, hickory, white oak, red oak, and maple. Tree seedlings were most abundant for elm and ash, with hickory, basswood, and maple being next most abundant. There were no seedlings for white or red oak.

From these data it appears that the red and white oak will be replaced by the new invaders, basswood and sugar maple. Leaf mold is accumulating on the

forest floor, making conditions more favorable for these two species. Even on the lowlands, erosion is promoting better drainage and the ash may give way to maple and basswood.

Since the survey was made, some elms have died from Dutch elm disease, and the forest is now characterized by red oak and white ash with some large black walnut specimens.

There is a large variety of ferns and wild flowers found in the park; a list of them can be found in the Appendix. A complete species list of trees and shrubs can also be found there.

The land for this park was purchased in 1930 for $50,000 by the county for a natural hardwood forest preserve. It was named in 1960 for Edwin F. Sanders, a retired biology teacher from Racine. It is a favorite spot for bird watchers.

Moyle, J.B. 1933. A botanical survey of the woody plants of Forest Park, Racine County, Wisconsin. Racine County Park Bd., unpubl.

Schelling's Woods

Racine County, Wis.

The stand is located 5 miles north of the city of Racine.

A red oak-basswood stand is located here with a 92.5% canopy. In the 1956 study by the University of Wisconsin Plant Ecology Laboratory (PEL #1252, unpubl.) associated tree species were listed as sugar maple, bitternut and shagbark hickory, white ash, hop hornbeam, black cherry, white and black oak, and elm.

The Shack, 100 acres

Lafayette County, Wis., T.1 N., R.5 E., sec. 4, SW¼E¼

The University of Wisconsin Plant Ecology Laboratory has studied a white oak-American elm-basswood forest that lies here on level terrain and a silt loam texture soil with a pH of 5.8.

The study which took place in 1951 noted the trees in Table 16 and their Importance Values (PEL #1185, unpubl.).

The most frequent herbs and shrubs with more than 40% frequency were:

Athyrium angustum
Circaea latifolia
Corylus americana
Galium concinnum
Rubus allegheniensis

Silver Lake Woods, 25 acres

Washington County, Wis., T.11 N., R.19 E., sec. 27, NE¼

Owner: Private ownership

The maple-red oak-hickory-basswood forest is located on Rodman gravelly loam. A 1948 survey showed subdominant tree species to be ash, hop hornbeam, black cherry, white oak, and elm.

University of Wisconsin PEL #1010, unpubl.

TABLE 16. Importance value of tree species in The Shack Woods.

Trees	Importance value
Acer negundo	6
Carya ovata	4
Crataegus sp.	3
Fraxinus americana	29
Ostrya virginiana	24
Populus grandidentata	10
Prunus serotina	8
Quercus alba	105
Quercus macrocarpa	10
Quercus velutina	4
Tilia americana	37
Ulmus americana	49
Ulmus fulva	12

Slinger Woods, 30 acres

Washington County, Wis., T.10 N., R.19 E., sec. 18, SW¼

Owner: Private ownership

Along Highway 60.

This is a maple-oak forest with a 90% canopy located on undulating terrain with irregular shallow ravines. It was studied in 1952 by R. T. Ward (University of Wisconsin PEL #2020, unpubl.) who noted the species composition shown in Table 17.

TABLE 17. Importance value of tree species in Slinger Woods.

Species	Importance value
Acer saccharum	167
Ostrya virginiana	13
Prunus serotina	4
Quercus alba	57
Quercus borealis	53
Ulmus americana	4

South Woods, 60 acres

Fond du Lac County, Wis., T.16 N., R.14 E., sec. 29, N

Miami silt loams support a basswood-red oak woods on irregular topography. There is a low center area surrounded by a 50-20° horseshoe slope. The vegetation, as mapped in 1948, showed the Importance Values as noted in Table 18. There is a rich herb and shrub layer in the woods as evidenced by the 86 species listed in the University of Wisconsin Plant Ecology Data #1020, unpubl.

William Tans (pers. comm. 1969) reports that the land has suffered some disturbance in recent years.

TABLE 18. Importance value of tree species in South Woods.

Species	Importance value
Acer saccharum	38
Carya cordiformis	10
Fraxinus americana	6
Juglans cinerea	4
Ostrya virginiana	32
Prunus serotina	7
Quercus alba	21
Quercus borealis	68
Tilia americana	78
Ulmus americana	10
Ulmus fulva	25

Thompsons Woods, 20 acres

Kenosha County, Wis., Somers Township, T.2 N., R.22 E., sec. 13

Owner: Private ownership

This red oak-ash-basswood stand lies on flat terrain and includes some hawthorn, black cherry, and bur and white oak.

The herbs and shrubs in the woods listed by per cent frequency are in the Appendix.

University of Wisconsin PEL #1102, unpubl.

Unnamed Woods, 27 acres

Eau Claire County, Wis., Ludington Township, T.27 N., R.6 W. sec. 7, center

Owner: Private ownership

Access to the woods is by Route 27.

This is a red oak-maple-basswood stand studied in 1949 by the Plant Ecology Laboratory of the University of Wisconsin. Subdominant tree species were red maple, hickory, ash, hop hornbeam, poplar, white oak, and elm.

More than 75 herb and shrub species were noted in the understory of this woods.

University of Wisconsin PEL #1127, unpubl.

Waupun Park Maple Woods (Fond du Lac County Park), 40 acres

Fond du Lac County, Wis., Fox Lake Quadrangle, T.14 N., R.15 E., sec. 31, NW¼NE¼

Owner: County Park Commission

From Waupun take County Road MMM 1 mile north to the park which lies on both sides of the road.

This sugar maple-red oak forest is part of the 97-acre Fond du Lac County Park. The 40-acre Scientific Area lies in the east half of the park. The west half, along the Rock River, is extensively used by the public for recreation and camping. This area lies on level terrain of Miami silt loam soils and was extensively studied in 1949 and 1951 by the Plant Ecology Laboratory at the University of Wisconsin (PEL #1019, #1142, unpubl.) Data from this study are found in the Appendix.

The southeast section of the Scientific Area is a mesic forest lying on Calamus silt loam soil over brown glacial deposits at a depth of 36-50 ft. The northeast section has deeper, drier Dodge silt loam soils. The drier soils are more favorable to the growth of oaks and the woods is more open than the mesic forest area.

The mesic forest consists of a closed canopy of sugar maple, basswood, red oak, and ash, associated with some ironwood, elm, hickory, black cherry, and walnut. There is good sapling reproduction of the light-tolerant species.

Spring flowers include *Trillium*, bellwort, blue cohosh, trout lily, rue anemone, bloodroot, *Hepatica*, toothwort, spring beauty, and phlox.

There are several hiking trails which cross the Scientific Area. Disturbances include some logging in the late 1950s.

Tans, W.E. 1969. Scientific areas report, Waupun Park Maple Woods. Sci. Areas Preservation Council, Dept. Natural Resources Wis. unpubl.

Wood Ford

Lafayette County, Wis., T.2 N., R.5 E., sec. 25, SENE

The woods has been described as being one of white oak-elm-walnut-red oak on acid soil (pH 5.5). Also noted in the 1949 University of Wisconsin Plant Ecology data (PEL #1107, unpubl.) as associated tree species were sugar maple, bitternut hickory, hop hornbeam, black cherry, and black oak.

The most frequent shrubs and herbs listed were: enchanter's nightshade, sweet cicely, cleavers, lopseed, bloodroot, pretty bedstraw, and *Parthenocissus vitacea*.

Zirbes Woods

Racine County, Wis., T.4 N., R.22 E., sec. 9

Mr. Zirbes' woods, lily pond, and farm lie on Route 1 near Caledonia.

On flat terrain and nearly neutral soil is a basswood-white ash stand which contains sugar maple, bitternut hickory, black walnut, hop hornbeam, black cherry, red and white oak, and slippery and American elm.

There is a rich herbaceous layer in the woods which contains over 70 species of herbs and shrubs. There was some destruction by a hurricane in 1902.

University of Wisconsin PEL #1101. 1949. unpubl.

Flood Plain Forests

Avons Bottoms, 40 acres

Rock County, Wis., T.1 N., R.10 E., sec. 28

Owner: Private

One of the best stands of bottomland hardwoods in Wisconsin, the area is used for fishing along Sugar River and for ecological research and teaching. The tract is outstanding for its large trees which include the largest oak in Wisconsin.

Wisconsin Scientific Areas Preservation Council, 1968.

Nelson-Trevino Bottoms, 3700 acres

Buffalo County, Wis., T.22 N., R.14 W., secs. 1, 2, 3, 4, 10, 11, 12, 13, 14 T.23 N., R.14 W., secs. 33, 34, 35, 36

Owner: U.S. Dept. of Interior, Bureau Sport Fisheries and Wildlife

State Highway 35.

This river-bottom forest in the Upper Mississippi Wildlife Refuge is located just east of where the Chippewa River joins the Mississippi. About 1800 acres of the land is lowland forest of American elm, silver maple, river birch, and cottonwood, while the remaining 1900 acres is open marsh, ponds, and channels.

The area has been proposed as a scientific area. No hunting is allowed there.

William Tans, pers. comm. 1969

Tiffany Bottoms Wilderness Area, 402 acres

Buffalo County, Wis., T.24 N., R.14 W., secs. 25, 26, 35, 36

Owner: Dept. Natural Resources

This is a typical flood plain hardwood forest of silver maple, American elm, river birch, and ash, and open sedge meadow and oxbow lakes along the Chippawa River.

The area is managed as part of the 9000-acre wildlife area.

William Tans, pers. comm. 1970

Tower Hill Bottoms, 25 acres

Iowa County, Wis., Spring Green Quadrangle, T.8 N., R.4 E., sec. 20

Owner: Tower Hill State Park

It is located on the east bank of the Wisconsin River, 2 miles east of the Village Green on Highway 14, then south on Highway 23 1.5 miles to the park entrance. The Scientific Area is 0.5 mile by foot path to the north across Mill Creek.

An excellent example of a wet-mesic forest in the Wisconsin River floodplain, Tower Hill Bottoms contains silver maple, willow, green ash, cottonwood, American elm, and swamp white oak. There are also some basswood and river birch. The underlayer is somewhat sparse and consists of prickly ash, silky dogwood, and buttonbush. Vines are more prevalent and include poison ivy, wild grape, woodbine, and wild yam.

The pileated woodpecker and tufted titmouse are known to inhabit the woods.

Along the Wisconsin River, the western boundary of the Scientific Area, there is an excellent opportunity to study backwater slough and sand bar ecology.

Wisconsin State Board for the Preservation of Scientific Areas. 1966. Scientific Areas. Dept. Conservation Wis., unpubl.

MINNESOTA NATURAL AREAS
Maple-Basswood Areas

Diamond Lake Forest, 60 acres

Hennepin County, Minn., T.12 N., R.22 W., sec. 16, SESE

The forest lies approximately 20 miles northwest of Minneapolis on Route 94.

A forest dominated by maple and basswood lies here at the border of Diamond Lake in the "Big Woods" region of Minnesota. The major tree species in addition to the dominants are American and red elm, red oak, bitternut hickory, hop hornbeam, black and green ash, and silver maple. Data for the distribution of the trees by quantative composition and by basal area size class are found in Tables 19 and 20.

TABLE 19. Quantitative composition of trees, saplings and seedlings of Diamond Lake Forest (Bray 1956).

Species	Trees			Saplings		Seedlings	
	% Σ F	% D	% Dom.	% Σ F	% D	% Σ F	% D[a]
Acer saccharinum	.2	.1	.05	–	–	–	–
Acer saccharum	63.0	71.1	58.3	78.2	86.4	43.8	60.6
Amelanchier sp.	–	–	–	–	–	.7	.2
Carya cordiformis	4.1	2.8	2.6	.7	.3	36.9	15.3
Celtis occidentalis	–	–	–	.7	.2	–	–
Fraxinus nigra	.5	.3	.03	–	–	.7	.2
Fraxinus pennsylvanica	1.7	1.2	1.7	–	–	.7	.2
Ostrya virginiana	3.6	2.8	.05	8.7	4.9	–	–
Quercus borealis var. *maxima*	5.9	4.3	9.9	–	–	11.5	4.6
Tilia americana	8.2	6.2	13.7	5.1	3.7	–	–
Ulmus americana	8.2	7.5	8.3	2.9	2.5	3.8	16.9
Ulmus rubra	4.3	3.6	4.0	3.6	1.9	1.5	1.8

[a] % Σ F = percent sum of frequency. % D = percent density. % Dom. = percent dominance (basal area).

The hickory and oak have a large number of seedlings in the forest but are not growing to maturity, perhaps due to the dense shade in this closed canopy stand. Hop hornbeam does not seem to be reproducing well and according to Bray (1956) is likely to decrease in importance. The basswood, although not producing seedlings, is stump-sprouting and seems to be surviving the competition with sugar maple.

There are some small, sloughy spots in the stand and it is here that the elm was prevalent and reproducing well.

Bray, in his analysis of reproduction, noted that the sugar maple was reproducing where small gaps occurred in the canopy. Total tree, sapling, and seedling

TABLE 20. Distribution of trees by basal area size class intervals. Diamond Lake Forest (Bray 1956).

Species	11.5-50	51-100	100-150	151-200	201-300	301-400	401-600	601*+
Acer saccharinum	–	–	–	–	–	–	1	–
Acer saccharum	167	105	39	21	24	16	24	2
Carya cordiformis	1	5	4	4	2	–	–	–
Fraxinus nigra	–	1	–	1	–	–	–	–
Fraxinus pennsylvanica	1	1	–	2	2	1	–	–
Ostrya virginiana	16	–	–	–	–	–	–	–
Quercus borealis var. *maxima*	1	2	–	5	4	2	9	–
Tilia americana	2	1	3	2	10	4	11	2
Ulmus americana	19	5	1	5	6	3	1	2
Ulmus rubra	6	3	5	–	4	–	2	–

*Basal area intervals in square inches at breast height.

TABLE 21. Composition of five selected quadrats 20 m in diameter.[a] Diamond Lake Forest (Bray 1956).

Species		Numbers of individuals in quadrats				
		Q1	Q2	Q3	Q4	Q5
Acer saccharum	Trees	7	5	4	5	7
	Saplings	3	3	55	26	5
	Seedlings	31	706	–	16	–
Carya cordiformis	Trees	2	–	–	–	–
	Seedlings	63	16	16	16	188
Quercus borealis var. *maxima*	Seedlings	16	–	–	31	–
Tilia americana	Trees	–	–	–	2	–
Ulmus americana	Trees	2	1	–	–	–
	Saplings	–	–	–	–	2
	Seedlings	–	16	–	–	31
Ulmus rubra	Saplings	–	–	1	–	–
Total basal area of trees		831	289	286	1148	554

[a]Tree, sapling, and seedling data are for numbers of individuals per circular quadrat. Seedling data was converted from number per 20 m^2 to number per 314 m^2.

data appear in Table 21. Areas bare of reproduction were surrounded by gaps in which the seedlings had a high density. In these gaps, there were more seedlings for the oak and hickory, but the extensive seed production and fast growth of the maple enables it to overtop competing species and establish itself in the understory.

Minnetonka Woods, 20 acres

Hennepin County, Minn.

Owner: Private ownership

The woods lies on the east side of Lake Minnetonka, near Sunrise Point.

This fine maple-basswood stand was reported as part of the "Big Woods" by Daubenmire (1936). The dominant species are accompanied by slippery and American elm, red oak, hop hornbeam, and a small amount of hackberry.

Shrub species include *Parthenocissus vitacea, Sambucus pubens, Ribes cynosbati, Celastrus scandens, Menispermum canadense, Vitis vulpina, Zanthoxylum americanum, Rhus toxicodendron,* and *Rubus occidentalis.*

The most frequently encountered herbs were merrybells, sweet cicely, downy yellow violet, enchanter's nightshade, bloodroot, hog peanut, meadow rue, lopseed, sedges, false solomons seal, wild lily-of-the-valley, Virginia waterleaf, smooth solomons seal, pretty bedstraw, goldenrod, and rattlesnake fern.

Daubenmire (1936) reported some disturbance of the woods by grazing prior to 1900.

Miron E. Heinselman, pers. comm. 1970

Rabbit Run Woods, 55 acres

Rice County, Minn., T.11 N., R.20 W., secs. 26 and 27

Owner: Carleton College

From Northfield travel south on Route 3 to Cannon City. Turn left at the south end of Dundas.

Part of Daubenmire's (1936) "Big Woods," this maple-basswood stand is located on a steep north to west slope on loam soils. The valley slopes down to the Cannon River; soils toward the river are well drained.

The tree species in order of importance are sugar maple, basswood, and red oak. The shrub layer includes *Ribes* sp. and prominent herbs are yellow ladys slipper, *Trillium, Hepatica,* ostrich and interrupted fern.

Fauna noted in the tract include deer, fox, raccoon, gray, red and fox squirrel, jumping mouse, and fox snake.

Carleton College, pers. comm. 1970
Nature Conservancy 1968a

Oak Savanna Type

Helen Allison Savanna,[1] 86 acres

Anoka County, Minn.

[1]Recommended as a potential Natural Landmark

Owner: Nature Conservancy

From Minneapolis take Route 65 north to Coopers Corner. Turn east on Rd. 24 and continue 1 mile, then south on Rd. 26 for 3 miles more. The savanna is on the south side of the road.

An oak savanna and tall grass sand prairie are located here on the rolling topography of the Anoka sand plain glacial outwash deposits. There are several areas of sand blowouts and dunes that are covered by pioneer and sand-binding plants such as *Hudsonia* and silky prairie clover. There are also low, marshy swales present where fine sedge tussock occurs between the dunes.

Savanna vegetation is rare now in the Midwest and this example is a fine one. The trees are bur and northern pin oak and an occasional red oak.

The tract has been dedicated to Helen Allison and has been proposed for designation as a National Natural Landmark.

The Nature Conservancy, Minnesota Chapter, undated leaflet, unpubl.

Cedar Creek Natural History Area, 4000 acres

Anoka and Isanti Counties, Minn., T.34 N., R.23 W.

Owner: Administered jointly by University of Minnesota and Minnesota Academy of Science

The tract is located 30 miles north of Minneapolis.

The Cedar Creek Natural History Area is devoted to the preservation of a unique series of habitats in the Anoka Sand Plain and dedicated to scientific and educational pursuits.

There are several different habitats within the area including marsh, prairie, bur oak savanna, Hill's oak woodland, old fields, and a 5-acre "island" of mature white pine with associated beech and oak.

The Cedar Creek Bog is described in the wetlands book being issued in this series by the National Park Service. The best known work on Cedar Creek Bog is the pioneer paper on trophic dynamics of an ecosystem by Lindeman (1942), one of the landmark papers in the scientific literature of this century. Many other studies have been conducted on Cedar Creek Bog, e.g., on such aspects as radiostrontium fallout, chlorophyll content of the bark of aspen trees, and water vaporization from open water and from vegetation. Faunal studies include those of ruffed grouse, white-tailed deer, shoveler ducks, rail, green-winged teal, the mud minnow, and the thirteen-lined ground squirrel.

Lawrence et al. 1960
Marshall 1968
William H. Marshall, pers. comm. 1970

Mixedwoods

Caledonia Oaks Preserve,[1] 80 acres

Houston County, Minn.

Owner: Nature Conservancy

Travel west 0.2 mile from Freeburg on Minnesota Route 249, then north and northwest 0.6 mile to the Heimerdinger farm on the west. Walk 0.5 mile southwest then northwest up the valley.

Here, situated along a small canyon at an elevation of 800-1000 ft is a mixed woods containing oaks, hickory, basswood, butternut, elm, and maple. This is the unglaciated southeastern edge of Minnesota and presents a more dissected, rough topography. An intermittent stream flows through the tract to the south and west.

The old-growth woods, with an average tree age of 150 years, occupies the steep sides of the canyon. The most frequent species of trees are the white, red, and bur oak, shagbark hickory, basswood, and butternut. There are smaller stands of sugar maple and American elm, and a rich spring flora. The white and red oak average 80 ft in height and 30 inches in diameter while the shagbark hickory averages 75 ft and 8 inches in diameter.

The tract was acquired by the Nature Conservancy in 1956.

Society of American Foresters 1960
Nature Conservancy News 1968a
Nature Conservancy, Minnesota Chapter, undated, unpubl. leaflet

Lowry Woods, 14 acres

Hennepin County, Minn.

Owner: The Nature Conservancy

From Long Lake take Route 12 west and northwest, then Rd. 6 southwest and west for 2 miles. Turn south onto Rd. 19 and continue 1 mile more and turn east of Rd. 84 for 1 mile. The woods are to the north behind a house.

A sugar maple, red oak, basswood, and hickory woods remain here, a remnant of a much larger forest. *Hepatica acutiloba* covers the floor of the woods in the spring and deer are still found here.

The surrounding area has been developed for a housing project.

The woods was a gift to the Nature Conservancy from Mr. and Mrs. Goodrich Lowery in 1968.

Nature Conservancy, Minnesota Chapter, unpubl., undated leaflet

[1]Recommended as a potential Natural Landmark

Nerstrand Woods State Park,[1] 568 acres

Rice County, Minn.

Owner: Minnesota Dept. of Conservation

This area is listed as a maple, basswood, oak, and elm virgin forest owned by the state. Part of the park has been developed for camping, picnicking, and hiking.

Miron L. Heinselman, pers. comm. 1970

Partch Woods, 80 acres

Stearns County, Minn.

Owner: The Nature Conservancy

From St. Joseph travel northwest 0.5 mile on Route 52, then north and northwest 4 miles on Rd. 3. The woods are located west of the road.

Partch Woods, a maple-basswood stand, lies on the upland border between the prairie and forest region of Central Minnesota. Topography is level to rolling, varying about 50 ft in altitude from uplands to low-lying areas. Soils are Flak fine sand and Omega loamy fine sand.

Tree species in order of importance are basswood, sugar maple, red oak, and ironwood. Shrubs and herbs are listed in the Appendix. The spring wild flowers are characteristic of the maple-basswood forest. The woods were donated to the Nature Conservancy in 1965.

Fauna include deer, red fox, gray squirrel, chipmunk, and red-backed mouse; evidence has also been found of wood duck, pileated woodpecker, ovenbird, redstart, black-billed cuckoo, ruffed grouse, broad-winged hawk, red-tailed hawk, veery, yellow-throated vireo, scarlet tanager, rose-breasted grosbeak, indigo, bunting, blue jay, hairy and downy woodpecker, nuthatch, and Cerulean warbler.

A spring bubbles from between glacial boulders in the woods and flows into a peat meadow surrounded by tamarack. This lowland area has extensive areas of ostrich fern. Dr. Partch has written that the adjacent 40 acres of peat meadow with tamarack, alder thicket, and lowland elm-ash association will be donated to the Nature Conservancy in the future.

Nature Conservancy News 1968a
Nature Conservancy, Minnesota Chapter, undated leaflet, unpubl.
Max Partch, pers. comm. 1970

[1]Recommended as a potential Natural Landmark

Flood Plain Forests

Keiss Great Blue Heron Rookery, 55.6 acres

Stearns County, Minn., Wakefield Township, T.123 N., R. 30W., sec. 13

Owner: Nature Conservancy

The rookery lies 1.3 miles northeast of Cold Springs on Route 23.

The rookery is located on an isolated lowland wooded section of the Sauk River flood plain, and on an open flood plain meadow. Elm, ash, basswood, and hackberry grow in the peak areas, and it is here, as well as in the trees on the natural levee, that the herons nest. The levee lies between the river's flood plain and a former river terrace.

Soils are peat and silt alluvium over gray drift.

In addition to the dominant trees listed above are birch, oak, beech, and tamarack. Shrubs include elderberry and gooseberry. Jewelweed, *Trillium,* lady slipper, jack-in-the-pulpit, and nettle are prominent herbs in the woods.

Skunk, mink, raccoon, and squirrels live in the tract as well as species of skink, toad, and salamander. There are several species of birds present in the rookery in addition to the herons for which the land is preserved. These additional species include the pileated woodpecker, red-tailed hawk, and egrets.

In 1953, there were 300 Great Blue Heron nests in the rookery. Since preservation, the number has risen to 1234. Mr. David Grether of St. Cloud State College is conducting investigations on the ecology of the land and on the nesting habits of the herons. Dr. Max Partch is in the process of publishing the results of 15 years of nest and vegetation research.

David Grether, pers. comm. 1970
Nature Conservancy 1969b
Nature Conservancy, Minnesota Chapter, undated, unpubl. leaflet

St. Croix River Bottoms

Chisago and Washington counties, Minn.

Owner: Northern Power Co., Minneapolis, Minn.

Dr. Heinselman reports that this power firm owns large acreages of flood plain and riverine forest communities along the Minnesota and Wisconsin shores of the St. Croix River. These lands may contain very desirable natural areas, but no moves have been made to specifically designate such areas. The lands are now protected in some measure by the National Wild and Scenic Rivers Act, but the exact status of any suitable natural areas is unknown.

Miron L. Heinselman, pers. comm. 1970

INDIANA NATURAL AREAS

Nearly all the preservable areas known in Indiana as of 1968 were included in the book *Natural Areas in Indiana and their Preservation*. This was the report of the Indiana Natural Areas Survey of 1967–69, Dr. A. A. Lindsey, Director; the book was authored by A. A. Lindsey, Damian Schmelz, and Stanley Nichols; a version with minor corrections was reprinted in 1970 and is available at $5.50 per copy by *American Midland Naturalist,* Biology Department, University of Notre Dame, Notre Dame, Indiana 46556.

Since most Indiana natural areas and nature preserves are described in sufficient detail in this book, it seems unnecessary to recapitulate these; the areas will each be merely listed below, with the page where the description begins and minimal information. Only areas that have come to our attention between the first (1969) publication of the book and late 1970 will be described in the Indiana section of this report, following the list of published areas.

In the list below, we include priority ratings, assigned for preference ranking for possible preservation by state or local groups, for the two best ranks of the four ratings recommended in the book for such preservation. Number 1 was assigned to the 20 most outstanding Indiana areas, and No. 2 priority to the next 39 in rank of merit as potential nature preserves, of the 163 areas we recommended for preservation. Page numbers in Lindsey et al. (1970) are given. The symbol "St" indicates that areas are owned and administered by an agency of the Indiana Department of Natural Resources, and "St. Pk." that it is under the State Parks Division of that department, specifically. The one owned by a county is followed by "Co." Ownerships of the others are given in Lindsey et al. (1970). Schmelz and Lindsey (1970) published ordination results from a number of the stands listed below.

INDIANA: Abbreviated List of Forested Areas

ALLEN COUNTY
Bluecast Woods, 282 (oak-hickory)
Fox Island (1), 309 (oak-hickory)[1]

CASS COUNTY
Flood Plain Beech-Maple Stand (2), 410 (beech-maple)

DeKALB COUNTY
Kado-Lato Woods, 418 (beech-maple)

DELAWARE COUNTY
Ball State Wildlife Preserve (St.), 253 (flood plain forest)
Ginn's Woods, 312 (beech-maple)

[1]Recommended as a potential Natural Landmark

FAYETTE COUNTY
Mary Gray Bird Sanctuary, 219 (Mixedwoods)
Manlove Woods (2), 327 (beech-maple)[1]
Weaver Woods (1), 379 (beech-maple)[1]

FOUNTAIN COUNTY
Pedestal Rock Preserve (2) (St.Pk.), 334 (mixedwoods)

GRANT COUNTY
Botany Glen, 283 (mixedwoods)

HAMILTON COUNTY
W. S. Blatchley Sanctuary, 280 (mixedwoods)

HOWARD COUNTY
Shenk's Woods, 368 (mixedwoods)

HUNTINGTON COUNTY
Thornhill Nature Preserve, 373 (mixedwoods)
Wygant Woods, 386 (beech-maple) U.S.
(Read "Huntington Reservoir" for "Salamonie")

JAY COUNTY
John Cring Memorial Forest, 295 (mixedwoods)

LAGRANGE COUNTY
Browand Woods, 437 (beech-maple)
Wear Woods, 472 (beech-maple)

LaPORTE COUNTY
Barker Woods, 537 (lowland-depressional forest)
Little Calumet River Bend Woods, 536 (flood plain forest)
South LaPorte Woods (2), 509 (beech-maple)

MONTGOMERY COUNTY
Beckville Woods (1), 263 (lowland-depressional forest)[1]
Caster's Woods, 292 (ruined by timber thieves)
Lye Creek Prairie Burn, 323 (lowland-depressional forest)
Pine Hills Nature Preserve (1) (St.), 338 (flood plain, etc.)
Rush Woods, 362 (beech-maple)

MORGAN COUNTY
Blue Bluff, 141 (mixedwoods)
Bradford Nature Preserve (St.), 152 (mixedwoods)

NOBLE COUNTY
Lonidaw Nature Preserve, 423 (beech-maple)

OWEN COUNTY
Green Bluff, 178 (mixedwoods)
Hoot Woods (2), 101 (beech-maple)[1]
McCormick's Cove (St. Pk.), 114 (mixedwoods)

[1]Recommended as a potential Natural Landmark

PARKE COUNTY
Allee Memorial Woods (1), 248 (beech-maple) (Wabash College)[1]
Falls Canyon Nature Area (St.Pk.) 308 (mixedwoods)
Rocky Hollow (2) (St.Pk.), 351 (mixedwoods)
Sword Moss Gorge, 122 (lower plants)

PORTER COUNTY
Ancient Pines Nature Area (1) (St.Pk.), 521 (oak-hickory)[1]
Cowles Bog and Dunes (1), 523 (oak-hickory), already a Registered Natural Landmark
Ecology Coves, Dunes State Park (2) (St. Pk.), 530 (oak-hickory)[1]

PUTNAM COUNTY
Big Walnut Natural Area (1), 269 (several), already a Registered Natural Landmark
Fern Cliff (2), 95 (lower plants)
Vermilion Falls, 124 (lower plants)
Winona Welch Botanical Area, 132 (lower plants)

RANDOLPH COUNTY
Davis Forestry Farm (2), 298 (oak-hickory) (Purdue University)[1]

SHELBY COUNTY
Meltzer Woods (1), 329 (lowland-depressional forest)[1]

ST. JOSEPH COUNTY
Bendix Gift Park Woods (2) (Co.), 479 (beech-maple)[1]

STEUBEN COUNTY
Woodland Bog, 474 (lowland-depressional forest)

TIPPECANOE COUNTY
Ross Biological Reserve, 355 (oak-hickory) (Purdue University).

VIGO COUNTY
Hulman Park Woods, 105 (beech-maple)

WABASH COUNTY
Honeywell Woods, 320 (flood plain forest)
Ogden Woods (2), 436 (beech-maple)

WARREN COUNTY
Fall Creek Gorge (2), 482 (lower plants). Nature Conservancy.
High Bridge Botanical Area (2), 486 (lower plants)

WAYNE COUNTY
Alexander Woods, 247 (flood plain forest)
Duning Woods, 305 (oak-hickory)
Hayes Nature Preserve (2), 317 (beech-maple)
Sedgwick's Rock Preserve, 364 (mixedwoods)

[1]Recommended as a potential Natural Landmark

Beech-Maple Areas

Cameron Woods, 26 acres

Steuben County, Ind., Metz Quadrangle, Richland Township, T.36 N., R.15 E., sec. 8, NW¼N½

Owner: Walter Berlett

This is a wooded tract on rolling terrain. A small stream flows southeastward into Fish Creek, then into the St. Joseph River at Fort Wayne. The relief on the tract is from 935 to 975 ft. Soils are Bellefontaine fine sandy loam, Brookston silty clay loam, Conover loam, Griffin fine sandy loam or silt loam, Miami loam, Miami silty clay loam, and Miami silty clay loam (slope phase).

Alpha Miller Tract, 80 acres

Allen County, Ind., Cedarville Quadrangle, T.32 N., R.12 E., sec. 11, NW¼

Owner: Alpha Miller, Route 1, Huntertown, Ind.

Chapman and Griffin Roads, Perry Township.

The property lies on rolling terrain (803-881 ft) which contains deep ravines, iron springs, a kettle-hole marsh, "huge cedars" (red cedars?), and large sugaring grove. The area drains into Cedar Creek.

Mrs. T. E. Dustin (ACRES), pers. comm. 1970

Scout Ridge Nature Preserve, 15 acres

Monroe County, Ind., Benton Township, Hindustan Quadrangle, T.10 N., R.1 E., sec 3, W½ center

Owner: Morgan-Monroe State Forest

Fifteen acres near the ridge top have been designated for preservation within the State Forest. The main physiography is well-drained, east-facing and northeast-facing slope of 5-25 degrees.

The Mississippian bedrock, where weathered, has yielded abundant geodes. Fossil sea-lilies (crinoids) are commonly found and glacial boulders occur in the valleys.

W. B. Barnes measured at random some of the larger trees, finding 11 sugar maples over 20 inches dbh and 17 beech over 24 inches. The largest sugar maple was 34.0 inches dbh. Large beech measured 30.1, 31.5, 31.8, 32.0, 32.1, 34.1, 34.5 and 42.0 inches. The largest hackberry, black oak, and chinquapin oak were also 31 inches. On trips in May, September, and December 1969, he identified 30 species of trees, 12 of shrubs, and 37 of herbs including showy orchis. The

species list for plants is given in the Appendix. Pileated woodpeckers and broad-winged hawks were observed.

This 15-acre portion of the state forest is dedicated for preservation; a nature preserve sign and a self-guiding nature trail are planned.

W. B. Barnes, pers. comm. 1969

Oak-Hickory Areas

The Eunice Hamilton Bryan Memorial Nature Preserve, 29 acres

Clinton County, Ind., Frankfort Quadrangle, T.22 N., R.2 W., sec. 13, part of NE¼ of NE½

Owner: State System of Nature Preserves

About 21 miles east of Lafayette, via Route 38, to about 1 mile east of Hamilton, turn left (north) onto County Rd. 450 W. From a point on 450 W, one mile north of Route 38, this woods lies east 0.5 mile without closer vehicular access.

This property was bequeathed by Henry R. Smith, Rossville, Indiana, upon his death in 1970 to the State of Indiana, Department of Natural Resources. He directed that it be known as "The Eunice Hamilton Bryan Memorial" in memory of his wife's mother. The tract had earlier been known as Smith Woods.

The area is now isolated from the nearest county road to the west, but the bequest included a 4-rod wide and 80-rod long strip of land that can be used for an entrance road and $6000 for construction of such a road and to go toward expenses of maintaining the preserve.

This rather flat area of large old trees includes several permanent ponds which, when visited 16 April 1970, were at a high level and occupied about one-fifth of the area. The largest pond, of about one acre, displayed a large colony of mature buttonbush shrubs *(Cephalanthus occidentalis)*. On this date of this late spring, the wildflower community was assigned the following stratum rank figures: Blue Erythronium *(E. albidum)* SR 6, Dutchman's breeches, 5, *Dentaria laciniata* 4, Mayapple 4, bloodroot 4, running Euonymus 4, spring beauty 3, *Galium* sp. 3, and *Eryngium* 3.

On the low Brookston soil around the ponds, we estimated stratum ranks of trees 4 inches dbh and over as follows; pin oak 7, red maple 5, shellbark hickory 4, bur oak 4, swamp white oak 3, red oak 3, American elm 3, green ash 3, blue beech 3, beech 2, basswood 2, and hackberry 2.

The forest on the Crosby soil (sampled by 20 strips totaling 4 acres) shows white oak, 4 inches dbh and over, had an Importance Value of 24, shagbark hickory 12, white ash 11, ironwood *(Ostrya)* 9, and 21 other tree species making up the remaining 44 percent.

Spicebush is abundant on the Brookston soil.

The first vegetational reconnaissance was included in Escobar and Lindsey

1972. A very thorough vegetational study is in progress, directed by Dr. George Parker and his students in Purdue's Department of Forestry and Conservation.

Seaburg Woods, 17+ acres

Noble County, Ind., Albion Quadrangle, T. 34 N., R.9 E., sec. 27, NW½NE¼NW¼

Owner: Hazel Madison, R.R. 4, Albion, Indiana

Road 200N, south and west of Albion.

The relief is quite varied; a small creek meanders through the middle, via a deep and very beautiful ravine. The timber is dominated by very large hickories, oaks, beech, and sugar maple. The farm has been in the family since 1834. It was owned until November 1965 by Viva Seaburg; she died in that year.

Mrs. T. E. Dustin, (ACRES), pers. comm. 1970

Womer Tract, 160-180 acres

Porter County, Ind., Jackson Township, Chesterton Quadrangle, T.36 N., R.5 W., sec. 29, S½ of NW¼ and NE¼ of NW¼ and sec. 32, NE¼ of NW¼

Owner: Mr. & Mrs. John Womer, 5550 S. Dorchester Ave., Chicago, Ill. 60615

Four miles south of Chesterton, one mile east of Route 49 on Rd. 750 N.

Both tracts, lying 0.25 mile apart, are on rough land of the Valparaiso Moraine. The eastern elbow of Carlson Pond, constituting nearly one-third of this major but shallow pond, lies within the south 80, at its northwest corner and west of the Womer summer home. At the south edge of the north 80 are two tiny kettle ponds. A filled-in depression (former pond) nearly as large as Carlson Pond is entirely within the north 80, and supports buttonbush, willows, etc., on its flat, wet bottom. The upland supports a disturbed oak woods (Escobar and Lindsey 1972).

Relief ranges about 80 ft between the hill crests and the ravines; the irregular terrain makes the acreage seem more extensive than it actually is. If the neighbors would joint the Womers in making a natural area dedication, it would be possible to establish a preserve of perhaps 200-300 acres.

In the south part of the south 40, about 10 acres of a mixed species stand appears to be essentially undisturbed except for an old woods road. Farther north, a small stream runs through a wooded ravine where the alluvial bottomland supports a fine spring wildflower flora. There are two large patches of a "ground-cedar" type of club moss *(Lycopodium complanatum* var. *flabelliforme)* on high, dry ground of the north 80 where early lumbering has left open conditions of early plant succession being invaded by small trees today. Since we visited the area in winter, we cannot report on herbs in flower.

The size, diversity of physiography, drainage conditions, and living forms make this area, despite considerable past disturbance, well worthy of preservation.

Flood Plain Forests

Klingler Woods, 29 acres

Allen County, Ind., Perry Township, Garrett Quadrangle, T.32 N., R.12 E., sec. 3, SW¼ NW¼

Owner: Mrs. Ruth H. Klingler, R.R. 1, Huntertown, Ind.

Coldwater Road (U.S. 27).

Approximately half of this property is bottomland of Cedar Creek; the rest is steep topography typical of this creek valley, ranging in elevation from 805 to 842 ft.

There was a large rookery of great blue herons here formerly, but the birds moved to a big sycamore on land to the north. Beaver workings were present in 1955. On the SE corner of the tract is a plantation of white pines. A large clump of blue-eyed Mary was noted.

Mrs. T. E. Dustin, (ACRES), pers. comm. 1970

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Appendix

Beech-Maple and Maple-Basswood Regions of the Eastern Deciduous Forest

ABRAHAM'S WOODS, Green County, Wisconsin

Checklist of the Flowering Plants and Ferns
(Hugh H. Iltis 1959, unpubl.)

Trees

Acer saccharum	Sugar maple
Tilia americana	Basswood
Juglans cinerea	Butternut
Quercus borealis maxima	Red oak
Carya cordiformis	Bitternut hickory
Ulmus fulva	Slippery elm
Quercus alba	White oak
Ostrya virginiana	Hop hornbeam
Amelanchier sp.	Shadbush
Carya ovata	Shagbark hickory

Drier upland sites

Celtis occidentalis	Hackberry

Herbs and Shrubs

Actaea pachypoda	Baneberry
Adiantum pedatum	Maidenhair fern
Agrimonia pubescens	Agrimony
Allium tricoccum	Wild leek
Amphicarpa bracteata	Hog-peanut
Anemone quinquefolia	Anemone
Aplectrum hiemale	Adam and Eve; Putty-root
Aralia nudicaulis	Wild sarsaparilla
Arisaema atrorubens	Jack-in-the-pulpit
Aster sagittifolius	Wild aster
Aster shortii	Wild aster
Botrychium virginianum	Rattlesnake fern
Carex albursina	Sedge
Carex blanda	Sedge
Carex convoluta	Sedge
Carex hirtifolia	Sedge
Carex hitchcockiana (rare)	Sedge
Carex jamesii (rare)	Sedge
Carex normalis	Sedge
Carex oligocarpa (rare)	Sedge
Carex sprengelii	Sedge
Carex woodii	Sedge
Caulophyllum thalictroides	Blue cohosh
Celastrus scandens	Bittersweet
Circaea quadrisulcata	Enchanter's nightshade
Claytonia virginiana	Spring beauty
Corallorhiza maculata	Coral root
Cornus sp.	Dogwood
Cryptotaenia canadensis	Honewort
Cystopteris fragilis	Bladder-fern
Dentaria laciniata	Toothwort
Dicentra cucullaria	Dutchman's breeches
Dioscorea villosa	Wild yam
Dryopteris goldiana	Goldie's fern
Dryopteris spinulosa	Shield fern
Erythronium albidum	Dogtooth violet
Eupatorium rugosum	Snakeroot
Floerkia proserpinacoides	False mermaid
Galium aparine	Cleavers; goosegrass
Galium concinnum	Pretty bedstraw
Geranium maculatum	Wild geranium
Geum canadensis	Avens
Hepatica acutiloba	Hepatica
Hydrastis canadensis	Golden seal
Hydrophyllum virginianum	Waterleaf
Impatiens biflora	Touch-me-not
Isopyrum biternatum	False rue anemone
Laportea canadensis	Wood nettle
Lonicera sp.	Honeysuckle
Menispermum canadensis	Moonseed vine
Osmorhiza claytonii	Wild licorice
Orchis spectabilis	Showy orchid
Osmunda claytoni	Interrupted fern

Herbs and Shrubs

Panax quinquefolia	Ginseng
Parthenocissus vitacea	Virginia creeper
Phlox divaricata	Wild sweet william
Phryma leptostachya	Lopseed
Podophyllum peltatum	May-apple
Polygonum virginianum	Jump-seed
Potentilla simplex	Cinquefoil
Prenanthes alba	Lion's-foot
Prunus virginiana	Choke-cherry
Pteridium aquilinum	Bracken fern
Ranunculus abortivus	Buttercup
Ranunculus recurvatus	Buttercup
Ranunculus septentrionalis	Buttercup
Rhus radicans	Poison ivy
Ribes missouriense	Gooseberry
Sanguinaria canadensis	Bloodroot
Sanicula (gregaria?)	Black snakeroot
Scrophularia marilandica	Figwort
Smilacina racemosa	False solomons seal
Smilax eccirhata	Carrion flower
Smilax hispida	Greenbrier
Solidago flexicaulis	Goldenrod
Staphylea trifolia	Bladderbush
Trillium gleasoni	Nodding trillium
Triosteum perfoliatum	Horse gentian
Uvularia grandiflora	Bellwort
Viola sororia	Blue violet
Viola pubescens	Yellow violet
Vitis riparia	Wild grape

APPLE RIVER CANYON STATE PARK, Jo Daviess County, Illinois

Preliminary Checklist of the Flora of Apple River Canyon State Park
(Thomas G. Hartley and Hugh H. Iltis 1959, unpubl.)

Trees

Acer negundo	Box elder
Acer saccharinum	Silver maple
Acer saccharum (incl. *nigrum)*	Sugar maple
Carpinus caroliniana	Ironwood
Carya cordiformis	Bitternut
Carya ovata	Shagbark hickory
Celtis occidentalis	Hackberry
Fraxinus americana	White ash
Fraxinus nigra	Black ash
Juglans cineria	Butternut
Juglans nigra	Black walnut
Morus rubra	Red mulberry
Ostrya virginiana	Hop hornbeam
Pinus strobus	White pine

Trees

Populus grandidentata	Big-toothed aspen
Populus tremuloides	Quaking aspen
Prunus virginiana	Choke-cherry
Quercus borealis	Northern red oak
Quercus macrocarpa	Bur oak
Quercus muhlenbergii	Yellow oak
Tilia americana	Basswood
Ulmus americana	American elm
Ulmus rubra	Slippery elm

Herbs

Actaea alba	White baneberry
Actaea rubra	Red baneberry
Adiantum pedatum	Maidenhair fern
Adoxa moschatelina	Moschatel
Agropyron repens	Quack grass
Allium canadense	Wild onion
Allium tricoccum	Wild leek
Amorpha canescens	Lead plant
Andropogon gerardi	Big blue stem
Andropogon scoparius	Little blue stem
Anemone canadensis	Canadian anemone
Anemone quinquefolia	Wood anemone
Anemone virginiana	Thimble weed
Angelica atropurpurea	Alexanders
Antennaria plantaginifolia	Pussy toes
Antennaria neglecta	Pussy toes
Aquilegia canadensis	Wild columbine
Arabis canadensis	Sicklepod
Arabis missouriensis	
Arabis shortii	
Aralia nudicaulis	Wild sarsaparilla
Aralia racemosa	Spikenard
Arctium minus	Burdock
Arisaema atrorubens	Jack-in-the-pulpit
Asarum canadensis	Wild ginger
Asclepias exaltata	Wood milkweed
Asclepias verticillata	Prairie milkweed
Aster azureus	Aster
Aster ericoides	Heather aster
Aster macrophyllus	Large leaved aster
Aster novae-angliae	New England aster
Aster prenanthoides	
Aster sagittifolius	Arrowleaved aster
Aster shortii	Short's aster
Aureolaria grandiflora	Foxglove
Athyrium filix-femina	Ladies fern
Barbarea vulgaris	Yellow rocket
Blephilia hirsuta	Wood-mint
Botrychium virginianum	Grapefern
Bouteloua curtipendula	Side oats grama
Bromus kalamii	Brome grass
Caltha palustris	Marsh marigold
Campanula americana	Fall bellflower

Herbs

Campanula rotundifolia	Harebell
Camptosorus rhizophyllus	Walking fern
Carex albursina	Sedge
Carex blanda	Sedge
Carex pensylvanica	Sedge
Carex plantaginea	Sedge
Carex rosea	Sedge
Carex vulpinoides	Sedge
Caulophyllum thalictroides	Blue cohosh
Ceanothus americanus	New Jersey tea
Celastrus scandens	Bittersweet
Cerastium nutans	Mouse-ear chickweed
Chaerophyllum procumbens	
Cheilanthes feei	Slender or Fee's lip-fern
Circaea quadrisulcata	Enchanters nightshade
Cirsium altissimum	Thistle
Claytonia virginiana	Spring beauty
Convolvulus spithamaeous	Morning glory
Coreopsis palmata	Prairie Coreopsis
Cornus alternifolia	Pagoda dogwood
Cornus rugosa	Round-leaved dogwood
Corydalis sempervirens	Pale Corydalis
Corylus americana	Hazelnut
Cryptogramma stelleri	Fragile rock-brake
Cryptotaenia canadensis	Wild chervil
Cypripedium calceolus var. *pubescens*	Yellow lady slipper
Cystopteris bulbifera	Bulblet fern
Cystopteris fragilis	Fragile fern
Danthonia spicata	Poverty grass
Daucus carota	Wild carrot
Dentaria laciniata	Toothwort
Desmodium glutinosum	Tick trefoil
Dicentra canadensis	Squirrel corn
Dicentra cucullaria	Dutchman's-breeches
Diervilla Lonicera	Bush honeysuckle
Dioscorea villosa	Wild yam
Dirca palustris	Leatherwood
Dodecatheon meadia	Shooting star
Echinocystis lobata	Wild cucumber
Elymus (villosus?)	Wild rye
Elymus (virginicus?)	Wild rye
Equisetum arvense	Horsetail
Equisetum hyemale	Scouring rush
Erigeron canadensis	Horseweed
Erigeron philadelphicus	
Erigeron pulchellus	Robins plantain
Erigeron strigosus	
Erythronium albidum	White dogtooth violet
Eupatorium altissimum	
Eupatorium rugosum	White snakeroot
Euphorbia corollata	Flowering spurge
Evonymus atropurpureus	Wahoo
Festuca obtusa	Wood fescue

Herbs

Fragaria virginiana	Wild strawberry
Galium aparine	Cleavers
Galium boreale	Northern bedstraw
Galium circaezans	
Galium concinnum	Pretty bedstraw
Gentiana quinquefolia	Stiff gentian
Geranium maculatum	Wild geranium
Geum canadense	Avens
Glechoma hederacea	Creeping charlie
Hackelia americana	Stickseed
Hamamelis virginiana	Witch hazel
Helianthemum sp.	Rockrose
Helianthus sp.	Sunflower
Helenium autumnale	Sneezeweed
Hepatica acutiloba	Hepatica
Heuchera richardsonii	Alum root
Hordeum jubatum	Squirrel tail
Hydrophyllum appendiculatum	Waterleaf
Hydrophyllum virginianum	Waterleaf
Hypericum pyramidatum	St. John's-wort
Hypoxis hirsuta	Yellow-eyed grass
Hystrix patula	Bottle-brush grass
Impatiens sp.	Jewelweed
Isopyrum biternatum	False rue anemone
Jeffersonia diphylla	Twin leaf
Juncus tenuis	Rush
Juniperus virginiana	Red cedar
Laportea canadensis	Wood nettle
Lespedeza capitata	Prairie lespedeza
Lobelia inflata	Indian-tobacco
Lobelia siphilitica	Blue cardinal-flower
Lobelia spicata	"Highbelia"
Lonicera prolifera	Grape honey-suckle
Lysimachia nummularia	Pennywort
Medicago lupulina	Black medick
Melilotus officinalis	Sweet clover
Menispermum canadensis	Moon-vine
Mimulus glabratus var. *fremontii*	Yellow monkey flower
Mitella diphylla	Mitre wort
Monarda fistulosa	Wild bergamot
Myosotis aquaticum	Giant chickweed
Nasturtium officinale	Water cress
Oryzopsis racemosa ?	Mountain-rice
Osmorhiza claytoni	Sweet jarvil
Osmorhiza longistylis	Anise root
Osmunda claytoniana	Interrupted fern
Oxalis (stricta?)	Sour sorrel
Panax quinquefolia	Ginseng
Panicum sp.	Panic-grass
Parietaria pensylvanica	Pellitory
Parthenocissus quinquefolia	Virginia creeper
Pedicularis canadensis	Lousewort
Pellaea glabella	Smooth cliff-brake

Herbs

Petalostemon purpureum	Prairie clover
Phlox divaricata	Sweet william
Phlox pilosa	Prairie phlox
Physocarpus opulifolius	Nine bark
Pilea pumila	Clearweed
Podophyllum peltatum	May apple
Polemonium reptans	Jacob's ladder
Polygala senega	Seneca-snakeroot
Polygonatum canaliculatum	Solomon's seal
Polyania canadensis	Leafcup
Potentilla arguta	Prairie cinquefoil
Potentilla fruticosa	Golden-hardhack
Potentilla recta	Cinquefoil
Potentilla simplex	Old-field cinquefoil
Prenanthes alba	Lion's foot
Primula mistassinica	Dwarf Canada primrose
Prunella vulgaris	Healall
Pteridium aquilinum	Bracken fern
Pycnanthemum flexuosum	Mountain mint
Pyrola elliptica	Shin-leaf
Ranunculus abortivus	Buttercup
Ranunculus septentrionalis	Swamp buttercup
Ranunculus fascicularis	Early prairie buttercup
Ratibida pinnata	Prairie coneflower
Rhamnus lanceolata	Buckthorn
Rhus glabra	Smooth sumac
Rhus radicans	Poison ivy
Rhus typhina	Staghorn sumac
Ribes cynosbati	Gooseberry
Ribes missouriense	Gooseberry
Rubus allegheniensis, sensu lato	Blackberry
Rubus occidentalis	Black raspberry
Rudbeckia hirta	Black-eyed susan
Rudbeckia laciniata	Coneflower
Salix sp.	Willow
Sanguinaria canadensis	Bloodroot
Sanicula gregaria	Black snakeroot
Sanicula marilandica	Black snakeroot
Sanicula trifoliata	Black snakeroot
Saxifraga forbesii	Forbes saxifrage
Schizachne purpurascens	
Scrophularia marilandica	Figwort
Senecio aureus	Squaw-weed
Silphium integrifolium	Cup-plant
Silphium perfoliatum	Cup-plant
Sisyrinchium campestre	Blue-eyed grass
Smilacina racemosa	False solomons-seal
Smilax ecirrhata	Greenbrier
Smilax hispida	Bristly greenbrier
Solidago (altissima?)	Goldenrod
Solidago flexicaulis	Goldenrod
Solidago rigida	Goldenrod
Solidago sciaphila	Cliff goldenrod

Herbs

Solidago ulmifolia	Elmleaved goldenrod
Sorghastrum nutans	Indian grass
Sporobolus cryptandrus	Sand-drop-seed
Staphylea trifolia	Bladdernut
Stellaria media	Chickweed
Sullivantia renifolia	Sullivantia
Taenidia integerrima	Yellow pimpernel
Taraxacum officinale	Dandelion
Taxus canadensis	Yew
Thalictrum dioicum	Meadow rue
Tradescantia ohioensis	Spiderwort
Trillium flexipes	White trillium
Trillium recurvatum	Purple trillium
Triosteum perfoliatum	Wild coffee
Urtica procera	Nettle
Uvularia grandiflora	Bellwort
Verbascum thapsus	Mullen
Veronicastrum virginicum	Culver's root
Viburnum lentago	Sweet arrow-wood
Viburnum rafinesquianum	Downy arrow-wood
Viola missouriensis	Violet
Viola pensylvanica	Smooth yellow violet
Viola sororia	Violet
Vitis aestivalis	Grape
Vitis riparia	Grape
Woodsia obtusa	Blunt-lobed woodsia
Xanthoxylum americanum	Prickly ash
Zigadenus glaucus	White camas
Zizia aurea	Golden alexander

BELL'S WOODS, Grant County, Wisconsin

Preliminary Checklist of the Flora of Bell's Woods

(Bergseng, M.S., T. G. Hartley, and H. H. Iltis. 1958, unpubl. Herbarium, University of Wisconsin, Madison)

Trees

Quercus alba	White oak
Quercus velutina	Black oak
Tilia americana	Basswood
Ulmus americana	American elm
Carya cordiformis	Bitternut hickory
Prunus serotina	Black cherry
Acer negundo	Box elder
Acer saccharum	Sugar maple
Carpinus caroliniana	American hornbeam
Carya ovata	Shagbark hickory
Junglans cinerea	Butternut
Ostrya virginiana	American hop hornbeam
Prunus americana	Wild plum

Trees

Prunus virginiana	Choke-cherry
Pyrus ioensis	Wild crab
Quercus ellipsoidalis	Scrub oak
Quercus macrocarpa	Bur oak
Quercus rubra	Red oak
Ulmus rubra	Slippery elm

Herbs

Actaea pachypoda	Doll's-eyes
Actaea rubra	Red baneberry
Adiantum pedatum	Maidenhair fern
Agrimonia gryposepala	Agrimony
Allium tricoccum	Wild leek
Amelanchier sp.	Juneberry
Amphicarpa bracteata	Hog peanut
Anemone quinquefolia	Wood anemone
Anemone virginiana	Thimbleweed
Anemonella thalictroides	Rue anemone
Aquilegia canadensis	Wild columbine
Arabis hirsuta var. *pycnocarpa*	Rock cress
Arabis laevigata	
Aralia nudicaulis	Wild sarsaparilla
Aralia racemosa	Spikenard
Arenaria lateriflora	Grove sandwort
Arisaema atrorubens	Jack-in-the-pulpit
Arisaema dracontium	Green dragon
Asarum canadensis	Wild ginger
Athyrium thelypteroides	Silvery spleenwort
Botrychium virginianum	Rattlesnake-fern
Blephilia hirsuta	Wood-mint
Campanula americana	Tall bell flower
Camptosorus rhizophyllus	Walking fern
Carex albursina	Sedge
Carex pensylvanica	Sedge
Caulophyllum thalictroides	Blue cohosh
Circaea quadrisulcata	Enchanter's nightshade
Cirsium altissimum	Thistle
Claytonia virginiana	Spring beauty
Comandra umbellata	Bastard-toadflax
Cornus alternifolia	Pagoda-dogwood
Corylus americana	American hazelnut
Cryptogramma stelleri	Fragile rock-brake
Cryptotaenia canadensis	Wild chervil
Cystopteris bulbifera	Bulblet fern
Cystopteris fragilis	Fragile fern
Dentaria laciniata	Toothwort
Dicentra cucullaria	Dutchman's breeches
Dirca palustris	Leatherwood
Elymus sp.	Wild rye
Erigeron pulchellus	Robin's plantain
Erythronium albidum	White dog's tooth violet
Euonymus atropurpureus	Burning-bush
Eupatorium rugosum	White snakeroot

Herbs

Festuca obtusa	Wood fescue
Fragaria vesca	Woodland strawberry
Fragaria virginiana	Wild strawberry
Galium aparine	Spring cleavers
Galium concinnum	Pretty bedstraw
Galium triflorum	Sweet scented bedstraw
Geranium maculatum	Wild geranium
Geum canadense	Avens
Glechoma hederacea	Ground ivy
Habenaria viridis var. *interjecta*	Frog orchis
Hackelia virginiana	Stickseed
Hepatica acutiloba	Liverleaf
Hybanthus concolor	Green violet
Hydrastis canadensis	Golden seal
Hydrophyllum appendiculatum	Waterleaf
Hydrophyllum virginianum	John's cabbage
Hystrix patula	Bottle-brush grass
Isopyrum biternatum	False rue-anemone
Jeffersonia diphylla	Twinleaf
Laportea canadensis	Wood-nettle
Lonicera prolifera	Grape honeysuckle
Menispermum canadensis	Moonseed
Mitella diphylla	Bishop's cap
Monarda fistulosa	Wild bergamot
Monotropa uniflora	Indian pipe
Myosotis aquaticum	Giant chickweed
Orchis spectabilis	Showy orchid
Osmorhiza claytoni	Sweet jarvil
Osmorhiza longistylis	Anise-root
Parietaria pensylvanica	Pellitory
Parthenocissus quinquefolia	Virginia creeper
Phlox divaricata	Phlox
Phryma leptostachya	Lopseed
Physocarpus opulifolius	Ninebark
Pilea pumila	Rich weed
Podophyllum peltatum	May apple
Polemonium reptans	Jacob's ladder
Populus tremuloides	Trembling aspen
Pyrola elliptica	Shinleaf
Ranunculus abortivus	Buttercup
Ranunculus recurvatus	Buttercup
Ranunculus septentrionalis	Buttercup
Rhamnus lanceolata	Buckthorn
Rhus glabra	Smooth sumac
Rhus radicans	Poison ivy
Ribes missouriense	Gooseberry
Rubus allegheniensis	Blackberry
Rubus occidentalis	Black raspberry
Rubus strigosus	Red raspberry
Sambucus canadensis	Elderberry
Sanguinaria canadensis	Bloodroot
Sanicula gregaria	Black snakeroot
Sanicula trifoliata	Black snakeroot

Herbs	
Schizachne purpurascens	
Smilacina racemosa	False solomons seal
Smilax ecirrhata	
Smilax herbacea	Carrion-flower
Scrophularia marilandica	Carpenter's square
Staphylea trifolia	Bladderbush
Thalictrum dioicum	Meadowrue
Tovara virginiana	Jumpseed
Trillium flexipes	Trillium
Triosteum aurantiacum	Wild coffee
Triosteum perfoliatum	Tinder's weed
Uvularia grandiflora	Bellwort
Viburnum lentago	Sweet viburnum
Viburnum rafinesquianum	Downy arrow-wood
Viola cucullata	
Viola pensylvanica	Smooth yellow violet
Viola sororia	
Vitis riparia	Riverbank grape
Xanthoxylum americanum	Prickly ash

CEDARBURG BEECH—MAPLE WOODS, Ozaukee County, Wisconsin

Species List for Cedarburg Beech–Maple Woods (buffer zone).
(University of Wisconsin, PEL #1038, #2004. 1948, unpubl.)

Trees	**Importance value**
Acer saccharum	141
Carya ovata	6
Fagus grandifolia	90
Fraxinus americana	26
Ostrya virginiana	6
Prunus serotina	5
Tilia americana	12
Ulmus fulva	13

Herbs and Shrubs

Actaea sp.	*Circaea latifolia*
Adiantum pedatum	*Cornus alternifolia*
Allium tricoccum	*Cystopteris fragilis*
Anemone quinquefolia	*Festuca obtusa*
Aplectrum hiemale	*Fragaria virginiana*
Aralia nudicaulis	*Galium aparine*
Aralia racemosa	*Galium circaezans*
Arisaema atrorubens	*Galium concinnum*
Aster macrophyllus	*Galium lanceolatum*
Athyrium angustum	*Galium triflorum*
Botrychium virginianum	*Geranium maculatum*
Campanula americana	*Geum canadense*
Carex albursina	*Hepatica acutiloba*
Caulophyllum thalictroides	*Hepatica americana*
Celastrus scandens	*Impatiens pallida*

Herbs and Shrubs

Lappula virginiana
Lonicera canadense
Maianthemum canadensis
Oryzopsis racemosa
Osmorhiza claytoni
Osmorhiza longistylis
Panax trifolium
Parietaria pensylvanica
Parthenocissus vitacea
Phryma leptostachya
Podophyllum peltatum
Polygonatum pubescens
Prenanthes alba
Ranunculus abortivus
Ribes cynosbati
Rubus occidentalis
Sambucus pubens
Sanguinaria canadensis
Sanicula gregaria
Smilacina racemosa
Symplocarpus foetidus
Taxus canadensis
Thalictrum dioicum
Trillium cernuum
Trillium grandiflorum
Uvularia grandiflora
Viola cucullata
Viola pubescens
Vitis aestivalis

CLARNO WOODS, Green County, Wisconsin

Species Composition of Clarno Woods.
(University of Wisconsin, PEL #1034. 1948, unpubl.)

Trees	**Importance value**
Acer saccharum	135
Ostrya virginiana	37
Tilia americana	39
Ulmus americana	7
Ulmus fulva	82

Herbs and Shrubs	**% Frequency**
Adiantum pedatum	10
Allium tricoccum	15
Anemone quinquefolia	15
Arisaema atrorubens	25
Aster shortii	30
Athyrium angustum	5
Botrychium virginianum	5
Brachyelytrum erectum	15
Caulophyllum thalictroides	35
Claytonia virginica	100
Cryptotaenia canadensis	5
Dentaria laciniata	
Desmodium acuminatum	30
Dicentra cucullaria	10
Erythronium albidum	80
Eupatorium rugosum	
Galium aparine	100
Galium concinnum	10
Galium triflorum	25
Geranium maculatum	35
Geum canadense	

Herbs and Shrubs	% Frequency
Helianthus strumosus	
Hepatica acutiloba	40
Hydrastis canadensis	5
Hydrophyllum virginianum	75
Impatiens pallida	10
Isopyrum biternatum	35
Laportea canadensis	65
Lappula virginiana	
Menispermum canadensis	
Orchis spectabilis	5
Osmorhiza claytoni	25
Panax quinquefolius	5
Parthenocissus vitacea	25
Phlox divaricata	45
Phryma leptostachya	10
Podophyllum peltatum	15
Polemonium reptans	
Polygonatum commutatum	30
Polygonum virginianum	10
Ranunculus abortivus	5
Ranunculus septentrionalis	10
Ribes missouriense	
Rubus occidentalis	
Sambucus canadensis	
Sanguinaria canadensis	30
Sanicula gregaria	5
Smilacina racemosa	15
Smilax ecirrhata	5
Smilax herbacea	
Solidago latifolia	25
Thalictrum dioicum	
Trillium flexipes	15
Trillium grandiflorum	
Trillium recurvatum	40
Viola cucullata	40
Viola incognita	5
Viola pubescens	45

Frequency percentages for this and subsequent Wisconsin PEL stands are based on a quadrat size of 1/4000 acre, which is very nearly $1m^2$ (Curtis 1959).

CLAYTON WOODS, Crawford County, Wisconsin

Species List for Clayton Woods.

(University of Wisconsin PEL #1089, unpubl.)

Herbs and Shrubs	% Frequency
Actaea sp.	
Adiantum pedatum	
Allium tricoccum	5

Herbs and Shrubs	% Frequency
Ambrosia trifida	5
Amphicarpa bracteata	50
Anemone quinquefolia	15
Anemone virginiana	5
Anemonella thalictroides	40
Antennaria sp.	20
Apocynum androsaemifolium	10
Aquilegia canadensis	5
Aralia racemosa	
Arisaema atrorubens	5
Aster macrophyllus	5
Aster shortii	65
Athyrium angustifolium	
Botrychium virginianum	15
Brachyelytrum erectum	25
Carex pensylvanica	50
Ceanothus americanus	5
Celastrus scandens	30
Circaea latifolia	25
Convolvulis spithamaeus	5
Cornus alternifolia	
Cornus femina	
Cornus rugosa	
Cryptotaenia canadensis	15
Cystopteris fragilis	5
Desmodium acuminata	30
Dioscorea villosa	5
Erigeron pulchellus	
Fragaria virginiana	15
Galium aparine	
Galium circaezans	5
Galium concinnum	40
Geranium maculatum	50
Heliopsis scabra	15
Hepatica acutiloba	
Hieracium scabrum	10
Hydrophyllum virginianum	
Impatiens biflora	10
Lactuca spicata	15
Lonicera prolifera	5
Luzula acuminata	
Menispermum canadensis	
Mitella diphylla	
Orchis spectabilis	5
Osmorhiza claytoni	15
Panicum latifolium	5
Parietaria pensylvanica	10
Parthenocissus vitacea	20
Phryma leptostachya	20
Podophyllum peltatum	
Polygonatum commutatum	5
Potentilla simplex	5
Prenanthes alba	10

Herbs and Shrubs	% Frequency
Ranunculus abortivus	15
Rhus radicans	
Rhus typhina	
Ribes cynosbati	5
Rubus strigosus	10
Sanguinaria canadensis	5
Sanicula gregaria	40
Silphium perfoliatum	
Smilacina racemosa	5
Smilax ecirrhata	
Smilax herbacea	
Smilax hispida	
Solidago ulmifolia	40
Triosteum perfoliatum	
Uvularia grandiflora	20
Veronicastrum virginicum	
Viburnum acerifolium	
Viola cucullata	25
Vitis aestivalis	15
Vitis riparia	
Zanthoxylum americanum	45
Zizia aurea	

DEER LICK NATURE SANCTUARY, Cattaraugus County, New York

(Buffalo Chapter, Nature Conservancy, New York, unpubl.)

Some Shrubs
Ground juniper
Witch hazel
Hawthorn
Black-berried elder
Maple-leaved viburnum
Staghorn sumac
Meadow rose
American yew
Wild grape
Shadbush
Red-berried elder
Hobble bush
Choke cherry
Flowering raspberry

Some Herbaceous Plants
Wild ginger
Bee balm
Blue cohosh
Jewelweed
Swamp milkweed
One-sided pyrola
Fly-honeysuckle
May-apple
Common field horsetail
Spring beauty
Sweet scented bedstraw
Broom beardgrass
Red trillium
Trillium grandiflorum
Round-leafed yellow violet
Lycopodium clavatum
Lycopodium obscurum
Lycopodium complanatum

Ferns
Grape fern
Rattlesnake fern
Sensitive fern
Maidenhair fern
Bracken fern
Marginal fern
Shield fern
Hay-scented fern
Christmas fern
Rock polypody fern
Common fern

Some Birds
Yellow Warbler
Red-tailed Hawk
Bobolink
Pileated Woodpecker
Kingbird
Baltimore Oriole
Scarlet Tanager
Indigo Bunting
Goldfinch
Henslow's Sparrow
Chipping Sparrow
Field Sparrow
Hermit Thrush
Red-shouldered Hawk
Ovenbird
Black-billed Cuckoo
Yellow-billed Cuckoo
Red-winged Blackbird
Crested Flycatcher
Least Flycatcher
Black-capped Chickadee
White-breasted Nuthatch
Catbird
Brown Thrasher
Wood Thrush

FERNWOLD, Clark County, Wisconsin

Plants of Fernwold. (University of Wisconsin, PEL #1078, 1949, unpubl.)

Trees	**Importance value**
Acer rubrum	3
Acer saccharum	147
Fraxinus nigra	3
Ostrya virginiana	7
Quercus borealis	16
Tilia americana	15
Ulmus americana	84
Ulmus fulva	19
Ulmus thomasii	5

Herbs and Shrubs	**% Frequency**
Adiantum pedatum	20
Allium tricoccum	5
Amphicarpa bracteata	35
Aralia nudicaulis	10
Arisaema atrorubens	5
Asarum canadensis	15
Aster macrophyllus	10
Athyrium angustum	10
Brachyelytrum erectum	20
Carex albursina	15
Carex pensylvanica	35
Caulophyllum thalictroides	5
Circaea latifolia	30
Clematis virginiana	5
Galium concinnum	10
Galium triflorum	5
Geranium maculatum	30
Helianthus strumosus	5
Hepatica acutiloba	10
Hydrophyllum appendiculatum	5
Hydrophyllum virginianum	20
Impatiens pallida	5
Laportea canadensis	45
Mitella diphylla	10
Osmorhiza claytoni	15
Parthenocissus vitacea	60
Phlox divaricata	15
Polemonium reptans	5
Prenanthes alba	5
Ribes americanum	10
Sanguinaria canadensis	30
Sanicula gregaria	5
Smilacina racemosa	10
Solidago ulmifolia	20
Thalictrum dioicum	30
Trillium grandiflorum	5
Uvularia grandiflora	15
Viola cucullata	10
Viola pubescens	15
Zanthoxylum americanum	5

FERNWOOD, Berrien County, Michigan

(Fernwood Inc. 1966, unpubl.)

Native Trees and Shrubs

Black ash
Blue ash
Mountain ash
Prickly ash
Wafer ash
White ash
Big-tooth aspen
Quaking aspen
Japanese barberry
Basswood
American beech
Bladdernut
Butternut
Buttonbush
Catalpa
Red cedar
Choke cherry
Black cherry
Kentucky coffeetree
Cottonwood
Wild crabapple
Alternate-leaved dogwood
Flowering dogwood
Gray dogwood
Silky dogwood
American elm
Slippery elm
Sour gum
Hackberry
Hawthorn
Bitternut hickory
Shagbark hickory
Shellbark hickory
Tartarian honeysuckle
American hornbeam
Hop hornbeam
Poison ivy
Juneberry
Bristly locust
Honey locust
Black maple
Red maple
Silver maple
Sugar maple
White mulberry
Ninebark
Black oak
Chinquapin oak
Red oak
White oak
Pawpaw
Redbud
Sassafras
Spicebush
Fragrant sumac
Poison sumac
Staghorn sumac
Sycamore
Cockspur thorn
Tulip tree
Black haw viburnum
Highbush cranberry
Maple-leaf viburnum
Nanny-berry viburnum
Wild raisin viburnum
Wahoo
Black walnut
Willow
Witch hazel

Introduced Michigan natives

Apple
Gray birch
White cedar
Wild crabapple
Red osier dogwood
Hemlock
Pin oak
Red pine
White pine
Tamarack

FLINT RAVINE, Franklin County, Ohio

Preliminary List of Plants of Flint Ravine
(The Ohio State University, Herbarium, unpubl.)

Acer spp.
Aesculus glabra
Amelanchier sp.
Asimina triloba
Carpinus caroliniana
Carya ovata
Euonymus obovatus
Fagus grandifolia
Gleditsia triacanthos
Juglans nigra
Lindera benzoin
Morus rubra
Ostrya virginiana
Quercus alba

Allium tricoccum
Anternaria plantaginifolia
Arabis laevigata
Arisaema atrorubens
Asarum canadense
Asarum sp.
Caulophyllum sp.
Cardamine bulbosa
Cardamine douglassii
Carex sp.
Cimicifuga sp.
Claytonia virginica
Dentaria sp.
Dicentra canadensis
Dicentra cucullaria
Erigenia bulbosa
Erythronium albidum
Erythronium americanum
Equisetum sp.
Gaultheria procumbens
Geranium maculatum
Hepatica sp.
Hydrophyllum appendiculatum
Jeffersonia diphylla
Mitchella sp.
Phlox divaricata
Podophyllum peltatum
Polemonium reptans
Polygonatum biflorum
Polygonatum pubescens
Ranunculus abortivus
Ranunculus sceleratus
Sanguinaria canadensis
Saxifraga sp.
Senecio aureus
Senecio obovatus
Smilacina sp.
Thalictrum dioicum
Tiarella sp.
Trillium grandiflorum
Trillium sessile
Uvularia grandiflora
Uvularia perfoliata
Viola spp.

Asplenium sp.
Botrychium sp.
Cystopteris fragilis
Polystichum

Anomodon
Atrichum
Bartramia
Cirriphyllum
Dicranum
Grimmia
Hypnum
Leucobryum
Mnium
Polytrichum
Sphagnum

FOND DU LAC COUNTY PARK, Fond du Lac County, Wisconsin

The woods has an 85% canopy and a heavy herbaceous cover. The soil is well drained Miami silt loam, with 6-10 inches of a black, crumbly, loam-like texture, over clay loam underlain by about 18 inches of glacial material. Soil analysis is presented below:

Horizon	Depth (in inches)	pH
A0	0.5	—
A1	7.0	6.7
A2	2.5	—

The trees in the forest with their respective Importance Values as noted in the 1951 survey are presented below.

Species List

(University of Wisconsin, PEL #1019, 1949. and #1142. 1951 unpubl.)

Species	**Importance value**
Acer saccharum	71.6
Carya cordiformis	19.5
Fraxinus americana	20.4
Fraxinus pennsylvanica	6.2
Juglans cinerea	4.8
Ostrya virginiana	27.2
Prunus serotina	2.8
Quercus alba	3.1
Quercus borealis	74.3
Tilia americana	13.0
Ulmus americana	4.9
Ulmus fulva	50.2

Herbs and Shrubs	**% Frequency**
Actaea brachypoda	5
Adiantum pedatum	10
Agrimonia gryposepala	
Allium tricoccum	
Amphicarpa bracteata	15
Anemone quinquefolia	15
Arisaema atrorubens	40
Botrychium virginianum	30
Caulophyllum thalictroides	35
Circaea grandifolia	45
Cornus femina	5
Cryptotaenia canadensis	85
Cystopteris fragilis	
Desmodium glutinosum	5
Galium aparine	80
Galium concinnum	10
Galium triflorum	5
Geranium maculatum	65
Hepatica acutiloba	10
Hydrophyllum virginianum	15
Osmorhiza claytoni	60
Osmorhiza longistylis	5
Parthenocissus inserta	10
Phlox divaricata	10
Phryma leptostachya	25

Herbs and Shrubs	% Frequency
Podophyllum peltatum	10
Polygonatum commutatum	5
Ribes cynosbati	10
Sanguinaria canadensis	40
Sanicula gregaria	80
Smilacina racemosa	45
Smilax ecirrhata	5
Smilax herbacea	5
Thalictrum dioicum	55
Trillium grandiflorum	55
Triosteum perfoliatum	
Uvularia grandiflora	35
Viola cucullata	30
Viola pubescens	80

HASKELL NOYES MEMORIAL WOODS, Fond du Lac County, Wisconsin

Herbs and shrubs present in Haskell Noyes Memorial Woods.
(University of Wisconsin PEL #1007, unpubl.)

Species	% Frequency
Aster macrophyllus	30
Aralia nudicaulis	20
Asclepias phytolaccoides	5
Celastrus scandens	10
Desmodium acuminatum	5
Geranium maculatum	5
Cornus femina	5
Carex spp.	50
Carex albursina	5
Bromus purgans	5
Botrychium virginianum	5
Conophilis americanus	15
Galium concinnum	5
Hepatica americana	5
Lonicera prolifera	5
Osmorhiza claytoni	
Podophyllum peltatum	5
Polygonatum commutatum	10
Polygonatum pubescens	40
Ribes cynosbati	10
Smilacina racemosa	25
Trillium grandiflorum	15
Trillium recurvatum	5
Triosteum perfoliatum	5
Viburnum acerifolium	25
Apocynum androsaemifolium	Present
Arisaema atrorubens	
Aster shortii	
Aster sagittifolius	
Anemone quinquefolia	
Anemone virginiana	

Species

Allium canadensis
Allium tricoccum
Campanula rotundifolia
Circaea alpina
Dryopteris spinulosa
Erigeron pulchellus
Festuca obtusa
Fragaria virginiana
Galium boreale
Galium circaezans
Galium lanceolatum
Galium triflorum
Geum canadense
Hamamelis virginiana
Hepatica acutiloba
Hystrix patula
Impatiens biflora
Lactuca spicata
Lathyrus ochroleucus
Panicum latifolium
Parthenocissus vitacea
Phryma leptostachya
Prunella vulgaris
Pyrola elliptica
Rubus strigosus
Rudbeckia hirta
Sanicula gregaria
Smilax herbacea
Thalictrum dioicum
Uvularia grandiflora
Viburnum affine
Viola pubescens
Vitis aestivalis
Zanthoxylum americanum

HAVEN HILL, Oakland County, Michigan

Species List of Plants Found at Haven Hill
(Thompson 1953[a])

Oak-Hickory Forest
Quercus alba
Quercus velutina
Carya ovata
Acer rubrum
Ostrya virginiana
Quercus rubra
Hamamelis virginiana
Cornus florida
Amelanchier spp.
Viburnum acerifolium
Hepatica americana
Trillium grandiflorum
Claytonia virginica
Viola pubescens
Podophyllum sp.
Carex pennsylvanica
Smilacina racemosa
Aralia nudicaulis
Geranium maculatum
Aster macrophyllus
Desmodium nudiflorum
Monotropa uniflora
Monotropa hypopitys
Corallorhiza maculata

White Cedar Swamp
Thuja occidentalis
Betula lutea
Pinus strobus
Mitella nuda
Circaea alpina
Coptis groenlandica
Viola pallens
Cystopteris bulbifera
Dryopteris spp.
Mitella diphylla
Saxifraga pennsylvanica
Sambucus pubens
Ribes triste
Rubus pubescens

Swamp Forest
Fraxinus nigra
Ulmus americana
Tilia americana
Dirca palustris
Lindera benzoin
Viburnum trilobum
Evonymus obovatus
Cardamine douglassi

Swamp Forest
Cardamine bulbosa
Dentaria laciniata
Dentaria diphylla
Dicentra cucullaria
Caulophyllum thalictroides
Laportea canadensis
Osmunda cinnamomea
Osmunda regalis
Adiantum pedatum
Lycopodium lucidulum
Panax quinquefolius
Liriodendron tulipfera

Beech-Maple Forest
Fagus grandifolia
Acer saccharum
Fraxinus americana
Prunus serotina
Tilia americana
Quercus rubra
Amelanchier sp.
Dirca palustris
Lonicera canadensis
Claytonia virginiana
Viola canadensis
Hepatica acutiloba
Trillium grandiflorum
Uvularia grandiflora
Erythronium americanum
Allium tricoccum
Viola pubescens
Carex plantaginea
Panax trifolium

Tamarack Bog
Larix laricina
Rhus vernix
Betula glandulosa
Vaccinium corymbosum
Rubus pubescens
Sarracenia purpurea
Pyrola asarifolia
Lysimachia thyrsiflora
Viola pallens
Viola cucullata

Meadows
Poa pratensis
Dactylis glomerata
Agropyron repens
Melilotus alba
Monarda fistulosa
Solidago juncea

Meadows
Solidago nemoralis
Daucus carota
Chrysanthemum leucanthemum
Rudbeckia hirta
Hieracium longipilum
Erigeron annuus
Lechea villosa
Hypericum perforatum
Rubus flagellaris
Rubus allegheniensis
Juniperus virginiana
Juniperus communis var. *depressa*
Prunus serotina
Rhus typhina
Centaurea maculosa
Melilotus officinalis
Trifolium pratense
Trifolium hybridum
Medicago sativa
Potentilla argentea

Wet Meadow
Juncus spp.
Carex spp.
Eupatorium perfoliatum
Eupatorium maculatum
Impatiens capensis
Solidago graminifolia var. *nutallii*
Apocynum cannabinum

Marsh
Typha latifolia
Potentilla fruticosa
Lemna spp.
Caltha palustris
Carex spp.
Cornus stolonifera
Cornus paniculata
Salix spp.

Black Spruce Bog
Picea mariana
Chamaedaphne calyculata
Vaccinium corymbosum
Ilex verticillata
Betula papyrifera
Gaultheria procumbens
Vaccinium macrocarpon
Gaultheria hispidula
Linnaea borealis
Trientalis borealis
Drosera rotundifolia
Cypripedium acaule

Haven Hill Lake
Ceratophyllum demersum
Vallisneria americana
Myriophyllum sp.
Potamogeton natans
Nymphaea tuberosa
Nuphar variegatum
Ranunculus longirostris
Decodon verticillatus

HAZELWOOD BOTANICAL PRESERVE, Hamilton County, Ohio

The Herbaceous Species Found in the Forest Community of the Preserve
(Segelken 1929)

Adiantum pedatum
Asplenium platyneuron
Polystichum acrostichoides
Onoclea sensibilis
Botrychium virginianum
Lycopodium lucidulum
Equisetum arvense
Equisetum praealtum
Panicum dichotomum
Panicum bosci
Poa sylvestris
Brachyelytrum erectum
Carex rosea
Carex platyphylla
Arisaema triphyllum
Luzula campestris
Chamaelirium luteum
Uvularia grandiflora
Allium tricoccum
Lilium canadense
Erythronium albidum
Smilacina racemosa
Polygonatum biflorum
Medeola virginiana
Smilax hispida
Smilax glauca
Smilax herbacea
Sisyrinchium angustifolium
Epipactis pubescens
Orchis spectabilis
Corallorrhiza odontorhiza
Liparis liliifolia
Urtica dioica
Laportea canadensis
Boehmeria cylindrica
Aristolochia serpentaria
Polygonum acre
Polygonum virginianum
Silene stellata
Ranunculus recurvatus
Thalictrum dioicum
Hydrastis canadensis
Podophyllum peltatum
Oxalis stricta
Rhus toxicodendron
Celastrus scandens
Impatiens biflora
Impatiens pallida
Psedera quinquefolia
Vitis cordifolia
Vitis aestivale
Desmodium nudiflorum
Hypericum punctatum
Hypericum canadense
Viola papilionacea
Viola palmata
Viola eriocarpa
Circaea lutetiana
Aralia racemosa
Sanicula marilandica
Sanicula canadensis
Osmorhiza claytoni
Chimaphila maculata
Pyrola elliptica
Monotropa uniflora
Cuscuta gronovii
Phlox divaricata
Hydrophyllum macrophyllum
Hydrophyllum appendiculatum
Cynoglossum virginianum
Lappula virginiana
Prunella vulgaris
Hedeoma pulegioides
Scrophularia marilandica

Herbaceous Species

Veronica virginica
Epifagus virginiana
Phryma leptostachya
Galium aparine
Galium triflorum
Galium concinnum
Mitchella repens
Lobelia inflata
Eupatorium urticaefolium
Solidago caesia
Aster cordifolius
Aster lateriflorus
Heuchera americana
Mitella diphylla
Ribes gracilis
Potentilla canadensis
Geum canadense
Geum virginianum
Agrimonia mollis
Rosa humilis
Desmodium paniculatum
Desmodium grandiflorum
Amphicarpa monoica
Gnaphalium polycephalum
Actinomeris alternifolia
Bidens vulgata
Erechtites hieracifolia
Krigia amplexicaulis
Lactuca villosa
Lactuca floridana
Lactuca spicata
Prenanthes altissima
Hieracium scabrum
Hieracium paniculatum

LODDE'S MILL BLUFF, Sauk County, Wisconsin

The Botany of Lodde's Mill Bluff
(Hugh H. Iltis, 1963, unpubl. Herbarium, University of Wisconsin)

The Mesic Deciduous Forest

Tilia americana	Basswood
Betula papyrifera	Paper birch
Populus grandidentata	Bigtooth aspen
Carya ovata	Shagbark hickory
Ostrya virginiana	Ironwood
Quercus borealis	Red oak
Caulophyllum thalictroides	Blue cohosh
Trillium gleasoni	White nodding trillium
Anemone quinquefolia	Wood anemone
Aquilegia canadensis	Red-flowered columbine
Polemonium reptans	Blue-flowered jacobs ladder
Dicentra cucullaria	Dutchman's breeches
Hydrophyllum virginianum	Waterleaf
Sanguinaria canadensis	Bloodroot
Uvularia grandiflora	Yellow-flowered bellwort
Smilacina racemosa	False solomons seal
Polygonatum commutatum	True solomons seal
Geranium maculatum	Wild cranesbill
Arisaema triphylla	Jack-in-the-pulpit
Maianthemum canadense	Canada mayflower
Actaea rubra	Red baneberry
Menispermum canadensis	Moonseed
Orchis spectabilis	Showy orchid
Solidago flexicaulis	Zigzag goldenrod
Solidago ulmifolia	Elm-leaved goldenrod
Solidago gigantea	Smooth goldenrod
Aster spp.	

The Mesic Deciduous Forest

Sanicula sp.	Black snakeroot
Prenanthes alba	Coltsfoot
Galium triflorum	Three-flowered bedstraw
Carex sp.	Sedge
Staphylea trifolia	Bladdernut
Cornus rugosa	Dogwood
Cornus racemosa	Dogwood
Ribes sp.	Gooseberry
Ilex verticillata	Holly
Vitis riparia	Grape
Parthenocissus quinquefolia	Virginia creeper
Rhus radicans	Poison ivy
Euonymus atropurpurea	Wahoo
Silphium perfoliatum	Cup-plant
Pteretis pensylvanica	Ostrich fern
Botrychium virginianum	Grapefern
Adiantum pedatum	Maidenhair fern
Athyrium felix-femina	Lady fern
Cystopteris fragilis	Fragile fern

The Cambrian Sandstone Cliff Flora

Cryptogramma stelleri	Slender cliff brake
Cystopteris bulbifera	Bulb fern
Pellaea glabella	Smooth cliff brake
Camptosorus rhizophyllus	Walking fern
Polypodium virginianum	Polypody
Aconitum columbianum	Monkshood
Aquilegia canadensis	Columbine
Aralia racemosa	Spikenard
Arabis lyrata	Rock cress
Artemisia caudata	Wormwood
Campanula rotundifolia	Harebell
Heuchera sp.	Alumroot
Lonicera sp.	Honeysuckle
Maianthemum canadense	Canada mayflower
Muhlenbergia sp.	Muhly grass
Nepeta cataria	Catnip
Rudbeckia hirta	Blackeyed susan
Carex eburnea	Sedge
Chenopodium gigantospermum	Maple-leaved goosefoot
Elymus canadensis	Wild rye
Fragaria sp.	Strawberry
Galium boreale	Northern bedstraw
Hackelia virginiana	Beggars-lice
Parietaria pensylvanica	Pellitory
Solanum nigrum	Black nightshade
Solidago sciaphila	Cliff goldenrod
Sullivantia renifolia	Sullivantia
Zigadenus elegans glaucus	White camas

Dry Upland Red Oak Woods

Juniperus virginiana	Red cedar
Zigadenus elegans glaucus	White camas
Quercus borealis	Red oak
Quercus alba	White oak
Populus grandidentata	Bigtooth aspen
Carya cordiformis	Bitternut hickory

The Oak Opening (on the level ridge top)

Quercus macrocarpa	Bur oak
Populus tremuloides	Trembling aspen
Quercus velutina	Black oak
Betula papyrifera	Paper birch
Xanthoxylum americanum	Prickly ash
Rhus radicans	Poison ivy
Juniperus virginiana	Red cedar
Rhus glabra	Smooth sumac
Celastrus scandens	Bittersweet
Viburnum rafinesquianum	Arrowwood
Triosteum perfoliatum	Horse gentian
Eupatorium sessilifolium	Sessile-leaved white joe-pyeweed
Aster sp.	Aster
Solidago sp.	Goldenrod
Veronicastrum virginicum	Culvers root
Potentilla arguta	Prairie cinquefoil
Lithospermum canescens	Prairie puccoon
Euphorbia corollata	Flowering spurge
Verbascum thapsus	Mullein
Melilotus alba	White clover

Prairie

Bouteloua curtipendula	Side-oats grama
Andropogon scoparius	Little bluestem
Panicum virgatum	Switch grass
Sorghastrum nutans	Indian grass
Eragrostis spectabilis	Showy love grass
Anemone cylindrica	Prairie anemone
Anemone patens wolfgangiana	Pasque flower
Potentilla arguta	Prairie cinquefoil
Euphorbia corollata	Flowering spurge
Scutellaria leonardi	Prairie skullcap
Lithospermum canescens	Puccoon
Asclepias verticillata	Prairie milkweed
Gerardia aspera	Rough gerardia
Linum medium	Prairie flax
Gentiana quinquefolia var. *occidentalis*	Purple gentian
Amorpha canescens	Lead plant
Desmodium illinoiensis	Tick trefoil
Petalostemum purpureum	Purple prairie clover
Lespedeza capitata	Prairie clover
Aster oblongifolius	Aster
Aster azureus	Aster
Solidago nemoralis	Goldenrod
Antennaria sp.	Pussy toes
Kuhnia eupatorioides	False boneset

Calcareous Cliffs

Opuntia macrorhiza	Prickly-pear cactus
Bouteloua hirsuta	Grama grass
Bouteloua curtipendula	Side-oats grama
Selaginella rupestris	
Carex eburnea	Juniper glade sedge
Solidago sciaphila	Cliff goldenrod
Cheilanthes feei	Slender lip fern
Pellaea glabella	Smooth cliff brake
Arenaria stricta	Sandwort
Scutellaria leonardi	Prairie skullcap
Draba reptans	Whitlow grass
Sisyrinchium sp.	Blue-eyed grass
Aquilegia canadensis	Columbine

Dry Sunny South or West-Facing Sandstone Cliffs and Sandy Ledges

Monarda punctata	Horse mint
Solidago speciosa	Showy goldenrod
Opuntia macrorhiza	Prickly pear cactus
Aster azureus	Aster
Aster laevis	Aster
Chenopodium sp.	

Mesic Oak Forest

Quercus alba	White oak
Quercus borealis	Red oak
Quercus macrocarpa	Bur oak

MARINETTE COUNTY BEECH FOREST, Marinette County, Wisconsin

(Nee, M., and W. E. Tans, 1969. Scientific Areas Council, Dept. Natural Resources, Madison, Wis., unpubl.)

Beech Woods

Acer saccharum
Betula lutea
Fagus grandifolia
Tsuga canadensis

Actaea alba
Adiantum pedatum
Aralia nudicaulis
Aster macrophyllus
Athyrium felix-femina
Carex spp.
Coptis groenlandica
Corallorhiza
Dirca palustris
Dryopteris spinulosa
Epifagus virginiana
Galium triflorum
Lycopodium annotinum
Lycopodium obscurum
Maianthemum canadense
Mitchella repens
Oryzopsis asperifolia
Osmorhiza claytoni
Pyrola
Trientalis borealis
Trillium grandiflorum

Aspen Woods

Aralia nudicaulis
Cornus canadensis
Cynoglossum boreale
Pteridium aquilinum
Viburnum acerifolium
Viola pubescens
Populus grandidentata

Roadside
Achillea millefolium
Botrychium virginianum
Diervilla lonicera
Fragaria sp.
Hieracium aurantiacum
Lychnis alba
Onoclea sensibilis
Plantago rugellii
Smilacina racemosa
Taraxacum officinale

MT. PISGAH HEMLOCK HARDWOODS, Vernon County, Wisconsin

Herbs and Shrubs of Mt. Pisgah Hemlock Hardwoods.
(University of Wisconsin PEL #1024, unpubl.)

Species	% Frequency
Actaea sp.	1
Adiantum pedatum	5
Agrimonia gryposepala	1
Allium tricoccum	1
Amphicarpa bracteata	75
Anemone virginiana	1
Apocynum	5
Aralia nudicaulis	5
Aralia racemosa	5
Arisaema atrorubens	1
Asarum canadensis	1
Aster macrophyllus	35
Aster paniculatus	1
Aster sagittifolius	10
Aster shortii	1
Athyrium angustum	15
Botrychium virginianum	10
Brachyelytrum erectum	25
Campanula americana	1
Carex pensylvanica	5
Caulophyllum thalictroides	1
Celastrus scandens	5
Circaea latifolia	1
Cornus alternifolia	15
Cornus femina	65
Corylus americana	10
Cryptotaenia canadensis	1
Cypripedium pubescens	1
Cystopteris bulbifera	1
Desmodium acuminatum	55
Desmodium bracteosum	1
Desmodium nudiflorum	1
Dioscorea villosa	1

Species	% Frequency
Dryopteris spinulosa	1
Erigeron pulchellus	1
Eupatorium purpureum	5
Fragaria virginiana	1
Galium circaezans	1
Galium concinnum	65
Galium triflorum	1
Geranium maculatum	30
Hamamelis virginiana	5
Helianthus strumosus	10
Hepatica acutiloba	1
Hystrix patula	1
Lappula virginiana	1
Lonicera prolifera	1
Lysimachia quadrifolia	5
Menispermum canadense	1
Milium effusum	1
Mitella diphylla	1
Osmorhiza claytoni	5
Osmunda claytoniana	1
Panicum latifolium	5
Parthenocissus vitacea	10
Podophyllum peltatum	1
Polemonium reptans	1
Polygonum virginianum	1
Polymnia canadensis	1
Prenanthes alba	1
Pteretis nodulosa	1
Pyrus ioensis	5
Ranunculus abortivus	5
Rhus radicans	20
Rhus typhina	1
Ribes cynosbati	1
Rosa sp.	10
Rubus allegheniensis	10
Sanguinaria canadensis	15
Sanicula gregaria	15
Smilacina racemosa	15
Smilax ecirrhata	1
Smilax hispida	5
Solidago latifolia	1
Solidago ulmifolia	25
Thalictrum dioicum	5
Trillium grandiflorum	20
Uvularia grandiflora	60
Viburnum acerifolium	1
Viburnum affine	10
Vitis riparia	5
Zanthoxylum americanum	1
Carex sp.	70

HARVEY N. OTT PRESERVE, Calhoun County, Michigan

The Herbs and Shrubs of the Harvey N. Ott Preserve
(Catana 1967)

Shrubs
Cornus racemosa
Corylus americana
Rosa spp.
Viburnum rafinesquianun
Viburnum lentago
Vaccinium myrtilloides
Ribes cynosbati
Rubus occidentalis
Lindera benzoin
Rhus vernix

Herbs
Agrostis tenuis
Anemonella thalictroides
Arisaema atrorubens
Aralia nudicaulis
Aster macrophyllus
Circaea quadrisulcata
Cirsium muticum
Coptis groenlandica
Desmodium nudiflorum

Herbs
Fragaria americana
Galium circaezans
Galium triflorum
Geranium maculatum
Hepatica americana
Impatiens capensis
Laportea canadensis
Lathyrus ochroleucus
Maianthemum canadense
Menispermum canadense
Mitchella repens
Osmorhiza claytoni
Panicum oligosanthes
Phryma leptostachya
Polygonatum pubescens
Sanicula marilandica
Smilacina racemosa
Smilax herbacea
Trientalis borealis
Viola sororia

PARTCH WOODS, Stearns County, Minnesota

Forest Survey - Sec. 19

Trees
Acer negundo
Acer rubrum
Acer saccharum
Amelanchier sp.
Betula lutea
Betula papyrifera
Carpinus caroliniana
Fraxinus nigra
Fraxinus pennsylvanica
Ostrya virginiana
Populus grandidentata
Populus tremuloides
Prunus serotina
Quercus alba
Quercus macrocarpa
Quercus rubra
Tilia americana
Ulmus americana

Shrubs
Amelanchier sp.
Cornus alternifolia
Cornus racemosa
Cornus stolonifera
Diervilla lonicera
Dirca palustris
Lonicera sp.
Prunus pensylvanica
Prunus virginiana
Rhus glabra
Rhus radicans
Ribes cynosbati
Rosa sp.
Rubus pubescens
Rubus sp.
Salix sp.
Sambucus pubens
Viburnum rafinesquianum
Xanthoxylum sp.

Herbs

Actaea rubra
Adiantum pedatum
Allium tricoccum
Amphicarpa bracteata
Anemone quinquefolia
Anemone virginiana
Apocynum androsaemifolium
Aquilegia canadensis
Aralia nudicaulis
Aralia racemosa
Arenaria lateriflora
Arisaema atrorubens
Asarum canadense
Asclepias exaltata
Aster lateriflorus
Aster macrophyllus
Botrychium virginianum
Cardamine pensylvanica
Carex (bladder)
Carex (cluster)
Carex (interrupted)
Carex (nodding)
Carex pensylvanica
Caulophyllum thalictroides
Celastrus scandens
Circaea quadrisulcata
Corallorhiza trifida
Cryptotaenia canadensis
Cypripedium calceolus
Desmodium nudiflorum
Equisetum sp.
Erigeron philadelphicus
Fragaria virginiana
Galium aparine
Galium triflorum
Geranium maculatum
Geum aleppicum
Geum canadense
Geum rivale
Habenaria sp.
Helianthus sp.
Hepatica americana
Hydrophyllum sp.
Hystrix patula
Impatiens pallida
Juncus sp.
Laportea canadensis
Lilium michiganense
Lonicera dioica
Luzula sp.
Lycopus sp.
Maianthemum canadense
Onoclea sensibilis
Orchis spectabilis
Oryzopsis sp.
Osmorhiza claytoni
Osmorhiza longistylis
Osmunda claytoniana
Panax quinquefolium
Parthenocissus sp.
Pedicularis lanceolata
Phryma leptostachya
Pilea sp.
Polygonatum canaliculatum
Polygonatum pubescens
Prenanthes alba
Prunella vulgaris
Pteretis pensylvanica
Pteridium aquilinum
Pyrola sp.
Ranunculus abortivus
Ranunculus recurvatus
Rhus radicans
Rudbeckia laciniata
Sanguinaria canadensis
Sanicula
Schizachne purpurascens
Smilacina racemosa
Smilacina stellata
Smilax ecirrhata
Smilax herbacea
Solanum nigrum
Solidago canadensis
Solidago flexicaulis
Streptopus roseus
Taraxacum officinale
Thalictrum dasycarpum
Thalictrum dioicum
Trientalis borealis
Trillium cernuum
Triosteum aurantiacum
Urtica gracilis
Uvularia grandiflora
Uvularia sessilifolia
Viola conspersa
Viola cucullata
Viola pallens
Viola pensylvanica
Viola pubescens
Viola sororia
Vitis sp.
Zizia aurea

SANDER'S PARK, Racine County, Wisconsin

List of Wildflowers and Ferns of Sander's Park
(Racine County Park Commission 1967, unpubl.)

Agrimony
Baneberry, red
Baneberry, white
Beadlily, white
Beadlily, yellow
Bellwort
Black sanicle
Bloodroot
Buttercup, small-flowered
Buttercup, tall
Canada mayflower
Chicory
Cohosh, blue
Dragon arum
Dutchman's breeches
Enchanter's nightshade
Golden seal
Greek valerian
Hepatica
Hog peanut
Honewort
Horse gentian
Indian pipe
Interrupted fern
Jack-in-the-pulpit
Jewelweed
Joe-pye-weed
Lady's slipper, yellow
Lady fern
Little ebony spleenwort
Lobelia, blue
Lopseed
Maidenhair fern
Mandrake
Marsh marigold
Nightshade bittersweet
Ostrich fern
Phlox, blue
Pipsissewa
Poison ivy
Poke milkweed
Ragweed, common
Ragweed, giant
Raspberry, purple-flowering
Rattlesnake fern
Rattlesnake root
Rough bedstraw
Rue-anemone
Self-heal
Sensitive fern
Shooting star
Showy orchis
Skunk cabbage
Sneezeweed
Solomon's seal
Solomon's seal, star-flowered
Solomon's zigzag (twisted stalk?)
Spring beauty
Squawroot
Swamp buttercup
Sweet cicely
Smooth bedstraw
Snakeroot, black
Snakeroot, white
Toothwort, cutleaved
Trillium, large white
Trillium, nodding
Trillium, toad
Turtlehead
Virginia creeper
Virginia knotweed
Virginia waterleaf
Violet, blue, white, yellow
White avens
White trout-lily
Wild carrot
Wild columbine
Wild geranium
Yarrow

List of Trees, Shrubs and Vines for Sander's Park
(Moyle, J. B. 1933, Racine Park Board, unpubl.)

Acer saccharum	Sugar maple
Carya alba	White-heart hickory
Carya glabra	Pignut hickory
Carya ovata	Shagbark hickory
Celtis occidentalis var. *crassifolia*	Hackberry

Trees, Shrubs, and Vines

Carpinus caroliniana	American hornbeam
Crataegus coccinea	Hawthorn
Fraxinus americana	White ash
Fraxinus nigra	Black ash
Fraxinus pennsylvanica	Red ash
Juglans cinerea	Butternut
Juglans nigra	Black walnut
Ostrya virginiana	American hop hornbeam
Populus deltoides	Cottonwood
Prunus serotina	Wild black cherry
Prunus americana	Wild plum
Quercus alba	White oak
Quercus macrocarpa	Bur oak
Quercus rubra	Red oak
Salix nigra	Black willow
Tilia americana	Basswood
Ulmus americana	American elm
Ulmus fulva	Slippery elm
Crataegus punctata	Thorn apple
Viburnum dentatum	Arrow-wood
Pyrus coronaria	Wild crab
Smilax hispida	Green briar
Sambucus canadensis	Common elder
Rubus occidentalis	Black raspberry
Prunus virginiana	Choke cherry
Viburnum opulus var. *americanum*	Highbush cranberry
Rhus toxicodendron	Poison oak
Cornus alternifolia	Dogwood
Ribes floridum	Wild currant
Menispermum canadense	Moonseed
Rhus glabra	Smooth sumac
Lonicera dioica	Honeysuckle
Cornus paniculata	Dogwood
Viburnum lentago	Sweet viburnum
Psedera vitacea	Virginia creeper
Rubus idaeus var. *aculeatissimus*	Wild red raspberry
Corylus americana	Hazelnut
Rubus allegheniensis	Blackberry
Ribes cynosbati	Prickly gooseberry
Zanthoxylum americanum	Prickly ash
Celastrus scandens	Bittersweet
Cornus stolonifera	Red osier
Rhamnus cathartica	Buckthorn
Amelanchier canadensis	Juneberry
Crataegus roanensis	Thorn apple
Rosa blanda	Wild rose

STARK WILDERNESS CENTER, Stark County, Ohio

Checklist of Mammals, Birds, Reptiles, and Amphibians

Opossum
Masked shrew
Smoky shrew
Least shrew
Shorttail shrew
Starnose mole
Common mole
Hairytail mole
Little brown myotis
Eastern pipistrel
Big brown bat
Red bat
Raccoon
Longtail weasel
Mink
Striped skunk
Red fox
Woodchuck
Eastern chipmunk
Eastern gray squirrel
Eastern fox squirrel
Red squirrel
Southern flying squirrel
Deer mouse
White footed mouse
Southern bog lemming
Meadow vole
Pine vole
Muskrat
Norway rat
House mouse
Meadow jumping mouse
Eastern cottontail
Whitetail deer

Common Loon
Horned Grebe
Pied-billed Grebe
Great Blue Heron
Green Heron
Canada Goose
Mallard
Black Duck
Pintail
Blue-winged Teal
American Widgeon
Wood Duck
Redhead
Ring-necked Duck
Lesser Scaup Duck
Common Goldeneye
Bufflehead
Ruddy Duck
Red-breasted Merganser
Turkey Vulture
Cooper's Hawk
Red-tailed Hawk
Sparrow Hawk
Bobwhite
Ring-necked Pheasant
Virginia Rail
Common Gallinule
American Coot
Semipalmated Plover
Killdeer
American Woodcock
Spotted Sandpiper
Solitary Sandpiper
Greater Yellowlegs
Lesser Yellowlegs
Pectoral Sandpiper
Least Sandpiper
Semipalmated Sandpiper
Herring Gull
Ring-billed Gull
Yellow-throated Vireo
Common Tern
Rock Dove
Mourning Dove
Yellow-billed Cuckoo
Black-billed Cuckoo
Screech Owl
Barred Owl
Common Nighthawk
Chimney Swift
Ruby-throated Hummingbird
Belted Kingfisher
Yellow-shafted Flicker
Yellow-bellied Sapsucker
Hairy Woodpecker
Downy Woodpecker
Eastern Kingbird
Crested Flycatcher
Eastern Phoebe
Acadian Flycatcher
Traill's Flycatcher
Least Flycatcher
Eastern Wood Pewee
Horned Lark
Tree Swallow

Bank Swallow
Rough-winged Swallow
Barn Swallow
Purple Martin
Blue Jay
Common Crow
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch
Brown Creeper
House Wren
Carolina Wren
Long-billed Marsh Wren
Short-billed Marsh Wren
Catbird
Brown Thrasher
Robin
Wood Thrush
Hermit Thrush
Swainson's Thrush
Veery
Eastern Bluebird
Blue-gray Gnatcatcher
Golden-crowned Kinglet
Ruby-crowned Kinglet
Cedar Waxwing
Starling
Solitary Vireo
Red-eyed Vireo
Warbling Vireo
Black-and-white Warbler
Blue-winged Warbler
Tennessee Warbler
Nashville Warbler
Yellow Warbler
Magnolia Warbler
Cape May Warbler
Myrtle Warbler
Cerulean Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Bay-breasted Warbler
Blackpoll Warbler
Palm Warbler
Ovenbird
Northern Waterthrush
Louisiana Waterthrush
Yellowthroat
Yellow-breasted Chat
Hooded Warbler
Wilson's Warbler
Canada Warbler
American Redstart
Bobolink
Eastern Meadowlark
Red-winged Blackbird
Baltimore Oriole
Rusty Blackbird
Common Grackle
Brown-headed Cowbird
Scarlet Tanager
Cardinal
Rose-breasted Grosbeak
Indigo Bunting
Purple Finch
American Goldfinch
Rufous-sided Towhee
Savannah Sparrow
Grasshopper Sparrow
Vesper Sparrow
Slate-colored Junco
Tree Sparrow
Chipping Sparrow
Field Sparrow
White-crowned Sparrow
White-throated Sparrow
Fox Sparrow
Swamp Sparrow
Song Sparrow

Common snapping turtle
Stinkpot
Eastern box turtle
Map turtle
Midland painted turtle
Eastern spiny softshell
Five-lined skink
Northern water snake
Queen snake
Brown snake
Red-bellied snake
Garter snake
Eastern ribbon snake
Eastern hognose snake
Northern ringneck snake
Blue-racer
Northern black racer
Black rat snake
Smooth green snake
Eastern milk snake
Northern copperhead
Hellbender
Mudpuppy
Jefferson salamander
Small-mouthed salamander
Spotted salamander
E. tiger salamander

Red-spotted newt	Fowler's toad
N. dusky salamander	Northern spring peeper
Red-backed salamander	Eastern gray treefrog
Ravine salamander	Western chorus frog
Slimy salamander	Bullfrog
Four-toed salamander	Green frog
Two-lined salamander	Northern leopard frog
Long-tailed salamander	Pickerel frog
American toad	Wood frog

THOMPSONS WOODS, Kenosha County, Wisconsin

Species list for Thompsons Woods

(University of Wisconsin PEL #1102)

Species	**% Frequency**
Agrimonia gryposepala	5
Allium tricoccum	25
Anemone quinquefolia	5
Arenaria lateriflora	5
Arisaema atrorubens	10
Aster macrophyllus	20
Aster prenanthoides	5
Botrychium virginianum	25
Circaea latifolia	20
Caulophyllum thalictroides	10
Corylus americana	5
Desmodium acuminatum	5
Fragaria virginiana	5
Galium concinnum	5
Geranium maculatum	50
Geum canadense	5
Hystrix patula	5
Lonicera prolifera	20
Panicum latifolium	5
Phryma leptostachya	5
Polygonatum commutatum	5
Potentilla simplex	5
Prenanthes alba	5
Ranunculus abortivus	5
Rhus radicans	15
Rosa spp.	10
Sanguinaria canadensis	40
Sanicula gregaria	45
Smilacina racemosa	35
Smilax herbacea	5
Smilax hispida	5
Trillium grandiflorum	40
Uvularia grandiflora	15
Viburnum acerifolium	15
Viola cucullata	5
Viola pubescens	45
Vitis aestivalis	5

WEST SISTER ISLAND, Lucas County, Ohio

A List of the Herbaceous Species found on West Sister Island

(W. Alan Wertz, D. Anderson, J. L. Forsyth, and R. L. Stuckey, The Ohio State University. 1968, unpubl.)

Grasses

Agropyron repens
Elymus villosus
Elymus virginicus
Phleum pratense
Poa compressa
Sphenophilis obtusata

Sedges

Carex spp.

Rushes

Juncus dudleyi Wieg.

Composites

Achillea millefolium
Arctium sp.
Aster shortii
Cirsium arvense
Cirsium vulgare
Erigeron annuus
Erigeron philadelphicus
Lactuca canadensis
Solidago graminifolia
Sonchus oleraceus
Sonchus uliginosus
Taraxacum officinale
Tragopogon porrifolius
Tragopogon major

Other Herbs

Apocynum sibiricum
Aquilegia canadensis
Arabis pycnocarpa
Arisaema atrorubens
Asclepias syriaca
Asparagus officinalis
Bidens frondosa
Brassica nigra
Camassia scilloides
Cerastium oblongifolium
Cerastium vulgatum
Chenopodium album
Commelina communis
Convolvulus sepium
Euphorbia supina
Geum canadense
Hydrophyllum appendiculatum
Impatiens sp.
Leonurus cardiaca
Lycopus americanus
Melilotus alba
Melilotus officinalis
Nepeta cataria
Oenothera biennis
Parietaria pensylvanica
Penstemon hirsutus
Physalis heterophylla
Physalis longifolia
Phytolacca americana
Polanisia graveolens
Polygonatum canaliculatum
Polygonum persicaria
Rumex crispus
Scutellaria epilobifilia
Senecio sp.
Sicyos angulatus
Smilacina racemosa
Solanum dulcamara
Solanum nigrum
Teucrium canadensis
Thlaspi arvense
Urtica dioica
Verbascum thapsus
Verbena urticaefolia

ARTHUR B. WILLIAMS MEMORIAL WOODS, Cuyahoga County, Ohio

Species, abundance, and distribution of trees of 3.5 inches in diameter and over of the Arthur B. Williams Memorial Woods.
(Williams 1936: 338)

Species	Beech-maple-association		Beech-hemlock-oak-chestnut mictium		Transition toward swamp forest				Total	%
					In ravines		Swampy area			
	#	%	#	%	#	%	#	%		
Beech-*Fagus grandifolia* Ehrh.	1920	52.6	707	43.0	—	—	87	28.4	2714	47.2
Sugar Maple -*Acer saccharum* Marsh.	1193	32.7	124	7.5	19	13.0	79	25.6	1415	24.6
Red Maple-*Acer rubrum* L.	227	6.2	113	7.0	10	7.0	31	10.0	381	6.6
Hemlock-*Tsuga canadensis* (L.) Carr	36	1.0	242	14.9	72	49.0	—	—	350	6.1
Chestnut-*Castanea dentata* (Marsh) Borkh.	36	1.0	235	14.9	—	—	—	—	271	4.7
Tulip-*Liriodendron tulipifera* L.	110	3.0	14	0.9	6	4.0	2	0.7	132	2.3
Red Oak-*Quercus rubra* L.	8	0.2	78	4.8	5	3.4	3	1.0	94	1.6
White Ash-*Fraxinus americana* L.	25	0.7	—	—	7	4.7	29	9.5	61	1.1
American Elm-*Ulmus americana* L.	18	0.5	—	—	7	4.7	24	8.0	49	0.9
Hop Hornbeam-*Ostrya virginiana* (Mill.) K. Koch.	18	0.5	21	1.2	—	—	6	2.0	45	0.8
Basswood-*Tilia americana* L.	7	0.2	—	—	6	4.0	25	8.2	38	0.7
Shagbark Hickory-*Carya ovata* (Mill.) K. Koch.	20	0.5	4	0.2	—	—	7	2.3	31	0.6
Tupelo-*Nyssa sylvatica* Marsh	5	0.1	21	1.2	—	—	—	—	26	0.4
Cucumber-*Magnolia acuminata* L.	7	0.2	18	1.1	—	—	—	—	25	0.4
White Oak-*Quercus alba* L.	7	0.2	16	0.9	—	—	1	0.3	24	0.4
Sassafras-*Sassafras variifolium* (Salisb.) Ktze.	3	0.1	15	0.9	—	—	—	—	18	0.3
American Hornbeam-*Carpinus caroliniana* Walt.	11	0.3	1	0.0	—	—	6	2.0	18	0.3
Flowering Dogwood-*Cornus florida* L.	1	0.0	10	0.6	—	—	—	—	11	0.2

Species	Beech-maple-association		Beech-hemlock-oak-chestnut mictium		Transition toward swamp forest				Total	%
					In ravines		Swampy area			
	#	%	#	%	#	%	#	%		
Wild Black Cherry-*Prunus serotina* Ehrh.	1	0.0	5	0.2	3	2.0	—	—	9	0.2
Slippery Elm-*Ulmus fulva* Michx.	—	—	—	—	6	4.0	—	—	6	0.1
Black Ash-*Fraxinus nigra* Marsh.	—	—	—	—	—	—	6	2.0	6	0.1
Black Walnut-*Juglans nigra* L.	—	—	2	0.1	2	1.4	—	—	4	0.1
Pignut-*Carya glabra* (Mill.) Spach.	—	—	4	0.2	—	—	—	—	4	0.1
Bitternut-*Carya cordiformis* (Wang.) K. Koch.	1	0.0	—	—	2	1.4	—	—	3	0.2
Shadbush-*Amelanchier canadensis* (L.) Medic	—	—	3	0.2	—	—	—	—	3	
Butternut-*Juglans cinerea* L.	—	—	—	—	2	1.4	—	—	2	
Black Birch-*Betula lenta* L.	—	—	2	0.1	—	—	—	—	2	
Scarlet Oak-*Quercus coccinea* Muench	—	—	1	0.0	—	—	—	—	1	
Totals	3654		1638		147		306		5745	100.0

Subdominant green plants of the Arthur B. Williams Memorial Woods.
(Williams 1936:340–341)

		Beech-Maple	Beech-Hemlock
Shrubs			
Spicebush	*Benzoin aestivale* (L.) Nees	*	
Maple-leaved Viburnum	*Viburnum acerifolium* L.	*	*
Red-Berried Elder	*Sambucus racemosa* L.	*	
Highbush Blackberry	*Rubus allegheniensis* Porter	*	
Prickly Gooseberry	*Ribes cynosbati* L.	*	*
Purple-flowering Raspberry	*Rubus odoratus* L.	*	
Witch Hazel	*Hamamelis virginiana* L.	*	*
Choke Cherry	*Prunus virginiana* L.	*	
Common Elder	*Sambucus canadensis* L.	*	
Fly Honeysuckle	*Lonicera canadensis* Marsh		*
Bush Honeysuckle	*Diervilla lonicera* Mill.		*
Low Sweet Blueberry	*Vaccinium pennsylvanicum* Lam.		*
Leatherwood	*Dirca palustris* L.		*
Climbers, Twiners, and Trailers			
Northern Fox Grape	*Vitis labrusca* L.	*	
Trailing Euonymus	*Evonymus obovatus* Nutt.	*	
Virginia Creeper	*Psedera quinquefolia* (L.) Greene	*	*
Poison Ivy	*Rhus toxicodendron* L.	*	
Green Brier	*Smilax rotundifolia* L.	*	
Carrion Flower	*Smilax herbacea* L.	*	
Bittersweet	*Celastrus scandens* L.	*	
Herbs and Low Shrubby Plants			
Abundant species (somewhat in the order of their flowering)			
Hepatica	*Hepatica acutiloba* DC	*	
Spring Beauty	*Claytonia virginica* L.	*	
Yellow Adder's Tongue	*Erythronium americanum* Ker.	*	
Round-leaved Violet	*Viola rotundifolia* Michx.	*	
Halberd-leaved Violet	*Viola hastata* Michx.	*	
Wake Robin	*Trillium erectum* L.	*	
Dutchman's Breeches	*Dicentra cucullaria* (L.) Bernh.	*	
Cut-leaved Dentaria	*Dentaria laciniata* Muhl.	*	
Spring Cress	*Cardamine bulbosa* (Schreb.) BSP	*	
Squirrel Corn	*Dicentra canadensis* (Goldie) Walp.	*	
Rue Anemone	*Anemonella thalictroides* (L.) Spach.	*	
Great White Trillium	*Trillium grandiflorum* (Michx.) Salisb.	*	
Wild Ginger	*Asarum canadense L.*	*	
Sweet Cicely	*Osmorhiza claytoni* (Michx.) Clarke	*	
Toothwort	*Dentaria diphylla* Michx.	*	
Oakesia	*Oakesia sessifolia* (L.) Wats.	*	
Downy Yellow Violet	*Viola pubescens* Ait.	*	
Smooth Yellow Violet	*Viola scabriuscula* Schwein.	*	
Canada Violet	*Viola canadensis* L.	*	
Dwarf Ginseng	*Panax trifolium* L.	*	
Foam Flower	*Tiarella cordifolia* L.	*	
Solomon's Seal	*Polygonatum biflorum* (Walt.) Ell.	*	

		Beech-Maple	Beech-Hemlock
Canada Mayflower	*Maianthemum canadense* Desf.		*
Jack-in-the-Pulpit	*Arisaema triphyllum* (L.) Schott.	*	
May Apple	*Podophyllum peltatum* L.	*	
False Spikenard	*Smilicina racemosa* (L.) Desf.	*	
Pale Jewelweed	*Impatiens pallida* Nutt.	*	
Spotted Jewelweed	*Impatiens biflora* Walt.	*	
Pokeweed	*Phytolacca decandra* L.	*	
Common Species			
Blue Cohosh	*Caulophyllum thalictroides* (L.) Michx.	*	
Large-flowered Bellwort	*Uvularia grandiflora* Sm.	*	
Swamp Buttercup	*Ranunculus septentrionalis* Poir.	*	
Yellow Rocket	*Barbarea vulgaris* R.Br.	*	
Common Violet	*Viola papilionacea* Pursh.	*	
Indian Cucumber	*Medeola virginiana* L.	*	*
Wild Sarsaparilla	*Aralia nudicaulis* L.	*	
Twisted Stalk	*Streptopus amplexifolius* (L.) DC	*	
Partridgeberry	*Mitchella repens* L.		*
White Baneberry	*Actaea alba* (L.) Mill.	*	
Wild Blue Phlox	*Phlox divaricata* L.	*	
Wild Geranium	*Geranium maculatum* L.	*	
Northern Bedstraw	*Galium boreale* L.	*	
Black Snakeroot	*Cimicifuga racemosa* (l.) Nutt.	*	
Wintergreen	*Gaultheria procumbens* L.		*
Richweed	*Pilea pumila* (L.) Gray	*	
Uncommon to Rare Species			
Harbinger of Spring	*Erigenia bulbosa* (Michx.) Nutt.	*	
Bloodroot	*Sanguinaria canadensis* L.	*	
Trailing Arbutus	*Epigaea repens* L.		*
Perfoliate Bellwort	*Uvularia perfoliata* L.	*	
Early Meadow Rue	*Thalictrum dioicum*	*	
Wood Anemone	*Anemone quinquefolia* L.	*	
Wood Betony	*Pedicularis canadensis* L.	*	
Sweet White Violet	*Viola blanda* Willd.	*	
Great-spurred Violet	*Viola rostrata* Pursh.	*	
Wood Sorrel	*Oxalis corniculata* L.	*	
Bishop's Cap	*Mitella diphylla* L.	*	
Golden Seal	*Hydrastis canadensis* L.	*	
Virginia Waterleaf	*Hydrophyllum virginianum* L.	*	
Pink Lady's Slipper	*Cypripedium acaule* Ait.		*
Agrimony	*Agrimonia striata* Michx.	*	
Monkey Flower	*Mimulus ringens* L.	*	
Round-leaved Orchid	*Habenaria orbiculata* (Pursh.)	*	
Great Lobelia	*Lobelia siphilitica* L.	*	
Wild Leek	*Allium tricoccum* Ait.	*	
Ginseng	*Panax quinquefolium* L.	*	
Indian Tobacco	*Lobelia inflata* L.	*	
Cardinal Flower	*Lobelia cardinalis* L.	*	
Nodding Pogonia	*Pogonia trianthophora* (Sw.) BSP	*	
Spikenard	*Aralia racemosa* L.	*	

		Beech-Maple	Beech-Hemlock
Ferns			
Christmas Fern	*Polystichum acrostichoides* (Michx.) Schot.	*	*
Spinulose Wood Fern	*Asplenium spinulosum intermedium* D.C. Eaton	*	*
Silvery Spleenwort	*Asplenium acrostichoides* Sw.	*	
New York Fern	*Aspidium noveboracense* (L.) Sw.	*	*
Marginal Shield Fern	*Aspidium marginale* (L.) Sw.	*	*
Rattlesnake Fern	*Botrychium virginianum* (L.) Sw.	*	
Broad Beech Fern	*Phegopteris hexagonoptera* (Michx.) Fee	*	
Maidenhair Fern	*Adiantum pedatum* L.	*	*
Long Beech Fern	*Phegopteris polypodioides* Fee	*	
Sensitive Fern	*Onoclea sensibilis* L.	*	
Ternate Grape Fern	*Botrychium ternatum intermedium* D.C. Eaton	*	
Interrupted Fern	*Osmunda claytoniana* L.	*	
Narrow-leaved Spleenwort	*Asplenium angustifolium* Michx.	*	(in ravines)
Hay-scented Fern	*Dicksonia punctilobula* (Michx.) Gray	*	

Ecological Classification of Vertebrates in the Beech-Maple Association of the Arthur B. Williams Memorial Woods. (Williams 1936. 392–394)

PREDOMINANTS

Permanent predominants

Mammals
Short-tailed Shrew
Northern White-footed Mouse

Birds
Eastern Hairy Woodpecker
Northern Downy Woodpecker
Black-capped Chickadee
Tufted Titmouse
White-breasted Nuthatch

Fluctuating predominants

Mammals
Northern Gray Squirrel
Eastern Chipmunk
Pine Mouse

Birds
Eastern Robin

Seasonal predominants

Mammals
none

Birds
(nesting species)
Red-eyed Vireo
Wood Thrush
Hooded Warbler
American Redstart
Oven-bird
Eastern Wood Pewee
Scarlet Tanager

(transient species)
Eastern Hermit Thrush
Olive-backed Thrush

(winter resident species)
Red-breasted Nuthatch

Reptiles
Pilot Blacksnake

Amphibians
Green Frog
Wood Frog
Pickering's Hyla
Red Eft
Red-backed Salamander

MEMBERS

Permanent members

Mammals
Eastern Red Fox
New York Weasel
Southern Red Squirrel
Small Eastern Flying Squirrel
Domestic Dog
Domestic Cat

Birds
Eastern Ruffed Grouse
Northern Barred Owl
Northern Pileated Woodpecker
Red-bellied Woodpecker
Eastern Cardinal

Fluctuating members

Mammals
Cottontail Rabbit
Smoky Shrew

Birds
none

Seasonal members

Mammals
Virginia Opossum
Eastern Raccoon
Eastern Skunk
Southern Woodchuck
Big Brown Bat

Birds
(nesting species)
Crested Flycatcher
Acadian Flycatcher
Eastern Phoebe
Yellow-throated Vireo
Cerulean Warbler
Louisiana Water Thrush
Rose-breasted Grosbeak
Red-eyed Towhee

(transient species)
American Woodcock
Yellow-bellied Flycatcher
Winter Wren
Gray-checked Thrush
Wilson's Thrush
Eastern Golden-crowned Kinglet
Eastern Ruby-crowned Kinglet

Seasonal Members

Birds

(transient species)

Blue-headed Vireo
Black and White Warbler
Blue-winged Warbler
Nashville Warbler
Magnolia Warbler
Black-throated Blue Warbler
Blackburnian Warbler
Chestnut-sided Warbler
Blackpoll Warbler
Connecticut Warbler
Canada Warbler
Purple Finch
White-throated Sparrow
Fox Sparrow
Yellow-bellied Sapsucker

(winter resident species)
Eastern Goldfinch

Reptiles

Five-lined Skink
Ribbon Snake
Garter Snake
Red-bellied Snake
De Kay's Snake
Milk Snake

Amphibians

American Toad
Fowler's Toad
Dusky Salamander
Brown Salamander
Slimy Salamander

Incidental Members

Mammals

Fox Squirrel
Meadow Mouse
Star-nosed Mole
Hairy-tailed Mole
Red Bat
Silver-haired Bat

Birds

Turkey Vulture
Sharp-shinned Hawk
Cooper's Hawk
Eastern Red-tailed Hawk
Broad-winged Hawk
Eastern Bobwhite
Eastern Mourning Dove
Yellow-billed Cuckoo
Great Horned Owl
Eastern House Wren
Eastern Nighthawk
Chimney Swift
Ruby-throated Hummingbird
Northern Flicker
Purple Martin
Eastern Crow
Starling
Brown Creeper
Carolina Wren
Bronzed Grackle
Eastern Cowbird
Northern Blue Jay
Eastern Blue Grosbeak
Indigo Bunting
Common Redpoll
Red Crossbill
Slate-colored Junco
Eastern Whip-poor-will

Reptiles

Common Water Snake

Amphibians

Spotted Salamander
Mole Salamander

WYALUSING HARDWOOD FOREST, Grant County, Wsiconsin

List of plant species of the Wyalusing Hardwood Forest

(University of Wisconsin PEL #1088, 1949, #1056, 1947, #1054, and #1836, all unpubl.)

Sect. 17

Trees	**Importance Value**
Acer saccharum	60
Juglans cinerea	53
Ostrya virginiana	23
Quercus borealis	35
Tilia americana	107
Ulmus fulva	22

Herbs and Shrubs	**% Frequency**
Actaea rubra	
Adiantum pedatum	35
Allium tricoccum	
Anemone quinquefolia	
Aralia nudicaulis	20
Arisaema atrorubens	40
Asarum canadensis	10
Aster shortii	10
Athyrum angustum	10
Camptosorus rhizophyllus	5
Carex albursina	20
Carex pensylvanica	10
Caulophyllum thalictroides	
Celastrus scandens	
Circaea latifolia	10
Cornus alternifolia	
Cystopteris bulbifera	55
Dentaria laciniata	5
Desmodium acuminatum	15
Dicentra canadensis	
Dicentra cucullaria	
Dirca palustris	5
Dryopteris goldiana	
Erythronium albidum	
Festuca obtusa	5
Floerkea proserpinacoides	
Galium concinnum	5
Geranium maculatum	5
Geum canadense	
Hamamelis virginiana	10
Hepatica acutiloba	70
Hydrophyllum virginianum	50
Impatiens biflora	30
Isopyrum biternatum	
Laportea canadensis	5

Herbs and Shrubs	**% Frequency**
Mitella diphylla	65
Orchis spectabilis	
Osmorhiza claytoni	5
Parthenocissus vitacea	25
Polemonium pubescens	25
Prenanthes alba	5
Pteretis nodulosa	
Rhus radicans	5
Ribes cynosbati	20
Sambucus pubens	
Sanguinaria canadensis	10
Sanicula gregaria	5
Smilacina racemosa	5
Smilax herbacea	5
Solidago ulmifolia	45
Staphylea trifoliata	5
Taxus canadensis	
Thalictrum dioicum	
Trillium flexipes	
Uvularia grandiflora	5
Viburnum affine	
Viola cucullata	
Vitis aestivalis	
Carex plantaginea	15

Sect. 30

Trees	**Importance Value**
Carya cordiformis	7
Quercus alba	90
Quercus borealis	168
Tilia americana	27
Ulmus fulva	6

Sect. 19

Trees	**Importance Value**
Acer saccharum	52
Amelanchier sp.	26
Carya ovata	6
Juglans cinerea	6
Juglans nigra	6
Ostrya virginiana	5
Quercus alba	72
Quercus borealis	111
Tilia americana	8
Ulmus fulva	6

Herbs and Shrubs	**% Frequency**
Actaea brachypoda	
Adiantum pedatum	35
Amphicarpa bracteata	
Anemone quinquefolia	45
Antennaria sp.	10

Herbs and Shrubs	% Frequency
Aquilegia canadensis	
Aralia nudicaulis	20
Arisaema atrorubens	
Asarum canadensis	
Aster sagittifolius	
Botrychium virginianum	55
Brachyelytrum erectum	
Bromus purgans	
Carex albursina	
Celastrus scandens	15
Cinna latifolia	
Cornus alternifolia	
Cornus rugosa	5
Corylus americana	5
Cypripedium pubescens	
Cystopteris bulbifera	
Desmodium glutinosum	
Eupatorium rugosum	
Festuca obtusa	
Fragaria virginiana	
Galium circaezans	
Galium concinnum	50
Geranium maculatum	65
Geum canadense	20
Hepatica acutiloba	50
Hydrophyllum virginianum	
Hystrix patula	
Mitella diphylla	5
Muhlenbergia frondosa	
Orchis spectabilis	15
Osmorhiza claytoni	40
Osmorhiza longistylis	
Osmunda claytoniana	5
Panax quinquefolium	
Parthenocissus inserta	65
Phryma leptostachya	
Podophyllum peltatum	20
Potentilla simplex	
Prenanthes alba	
Pyrola elliptica	15
Ranunculus abortivus	15
Ranunculus recurvatus	10
Ribes cynosbati	15
Sanguinaria canadensis	30
Sanicula gregaria	
Sanicula marilandica	30
Smilacina racemosa	20
Smilax herbacea	5
Staphylea trifoliata	
Uvularia grandiflora	30
Viola cucullata	30
Viola pubescens	5
Zizia aurea	

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