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A NATURAL HISTORY STUDY OF THE VASCULAR
FLORA OF CEDAR BOG, CHAMPAIGN COUNTY, OHIO.

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A NATURAL HISTORY STUDY OF THE VASCULAR FLORA
OF CEDAR BOG, CHAMPAIGN COUNTY, OHIO

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University


by

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1967

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INTRODUCTION

The Cedar Bog Nature Preserve, under the supervision of the Ohio Historical Society, is located in Sections 31 and 32 in Champaign County, Ohio. For many years, it has been considered a unique area by botanists because of the number and kinds of plants found there. Yet, no one has undertaken a comprehensive study of Cedar Bog, although a preliminary study of the bog meadow portion was completed by Frederick in 1964.

The objectives of this study are to:

Determine the nature of Cedar Bog; whether it is a bog, a swamp or both--or something in between.

Investigate how and when this unique area came to be; its geologic, climatic, and vegetational history.

Understand how and why the Cedar Bog habitat has been maintained; a study of the present ecology, microclimate, and water supply.

Determine what plant associations are in the Bog today; what changes are occurring, and what associations can be expected to remain.

Observe and collect voucher specimens of the taxa in Cedar Bog today; suggesting, where possible, how these taxa came to be in the Bog.

Determine what species may now be extinct by comparing the composition of the present flora (1963-1967) with the composition of the flora based on earlier reports.

THE NATURE OF CEDAR BOG

Review of terms

Whether Cedar Bog is a bog or a swamp has been controversial for as many years as it has been known. The first name given to the area was the Dallas Arbor Vitae Bog, and it was known as Cedar Swamp Nature Preserve until the spring of 1967. At that time, the name was officially changed to Cedar Bog Nature Preserve. Previously, I have considered at least a portion of the region a bog (Frederick, 1964), but even this consideration depends upon the definitions of "bog" and "swamp." Gates' (1942) classic study of the Michigan bogs considered the term "bog" to include

a type of vegetation which controls a habitat and changes the habitat, in the course of its development, from an open area of water to a mat and then to a grounded mat and finally dry land . . . an area vegetated by a flora in which peat forming types of plants . . . are particularly abundant.

Gates (1942) included the following as characteristics of a bog: (1) water may be acid or alkaline; (2) circulation of water is slow, and thus the supply of oxygen is reduced and decay is slow; (3) water is cold under the mat but the surface of the mat may become hot; (4) plants grow slowly because of the dearth of minerals in addition to the above conditions; (5) wave action is not a factor in the development of mats.

Gates stated that the term "swamp" should be used to designate better drained areas which are not initiated by mat development.

Not all authors, of course, agree with Gates' interpretation. Deevey (1958) considered bogs as "enclaves of subarctic life," supporting "only plants that partake sparingly of nutrients, like the shrubs and perennials of Arctic barrens and cold steppes." Transeau (1903) considered bog plant associations to be composed primarily of boreal species. Swamp associations, those having plants of more southerly forms, were "considered as the normal hydrophytic vegetation of the present climatic conditions."

Waterman (1926) stated that a bog is characterized by xerophytic vegetation containing specialized forms such as pitcher plants, sundew, cranberry and sphagnum, growing in an acid substratum; whereas in a swamp, bog plants are absent and the substratum is alkaline or neutral. But Rigg (1940) described a marl bog (Iron Spring Bog in Minnesota) and concluded that sphagnum was not always an essential factor in the development of bogs. He pointed out that species of mosses, other than sphagnum, and sedges often play an important role in peat formation and bog development. Rigg reiterated Transeau's view that the species of bog communities of temperate regions are largely boreal and relicts of former climatic conditions.

Dansereau and Segades-Vianna (1952) published the definition of a bog adopted by the committee on nomenclature of the Ecological Society of America:

that stage in the physiographic succession of an area during which its surface is entirely of living sphagnum, immediately under which is a fibrous brown peat composed mainly or entirely of partially disintegrated sphagnum, the habitat exercising a distinctly selective influence on its flora.

Despite somewhat contradictory details of what constitutes a bog, there are points of agreement, and the over-all concepts are not so widely divergent. All authors agree that peat must be present if an area is to be denoted a "bog." Peat is present in the bog meadow areas and the arbor vitae stands of Cedar Swamp. Black muck soils, derived from peat, exist in the swamp forest. In addition, small patches of sphagnum remain as well as many species of Juncus and Carex. All these plants, even today, influence peat formation. Dachnowski (1912) described peat found to a depth of five feet in the arbor vitae stands and two feet deep in another area--probably the area I have designated as the bog meadow zone. Dachnowski also mentioned five townships in Champaign County in addition to Mad River and Urbana townships, where firm peat varied in depth from a few inches to a foot.

Most writers have considered the presence of relict boreal plant species a prerequisite for the designation "bog." Such plants are in Cedar Bog today. Species generally considered boreal are noted in the annotated plant list. The relatively cool water in Cedar Bog influences the maintenance of a cooler microclimate in the area (see "Microclimate," below).

In addition, Gates (1942) with reference to Thuja stated:

The Thuja association is the climax association in boggy areas in the region. Without change of climate, as long as the boggy area persists without accident, Thuja should remain as the vegetative cover.

Thuja occidentalis is found in Cedar Bog both in pure stands and as scattered individuals throughout the bog meadow areas. Arbor

vitae must have been present for thousands of years, probably since the retreat of the Wisconsin glacier. Dachnowski (1912) encountered well preserved logs and branches at three feet below the surface. Whether or not these represent the destruction of an arbor vitae covered area by bog invasion as described by Dansereau and Segadas-Vianna (1952) is pure conjecture. Because many large logs are still seen there, it can be assumed that arbor vitae did grow in areas that are today marl and bog meadow. Some existing arbor vitae stands were once marl areas because marl is usually mixed with the peat substratum. This same situation is described by Muenscher (1946) at Bergen Swamp near Rochester, New York. Three areas of Bergen Swamp are listed by Muenscher as bogs.

Probably these buried arbor vitae logs and the marly peat found within the present Thuja stands indicate: first, the enlargement of the bog area (regression), and second, progressive succession with a tendency toward drier conditions as Dansereau and Segadas-Vianna (1952) have described.

That bogs begin as mats formed over a water surface is accepted by most authors. Even though all evidence of a lake in the Cedar Bog area has disappeared long ago, it seems probable that such a lake did exist. Almost all areas of the bog meadow zone are quaking. Quaking mats are formed over open water. Therefore, I assume that at least these areas of Cedar Bog were once open water. Glacial lakes are known to have covered large areas in Champaign County. Dugan's prairie was once a large lake just north-east of Urbana (Antrim, 1872). Its boundaries on the

west, north, and east are still visible and are outlined by Dugan, Jackson Hill, Stone Quarry, and Ludlow roads.

Today small lakes or marshy ponds exist along both sides of Mad River in Champaign County. Other small lakes have been filled or drained in the past 25 to 50 years within the memory of people living in the county today. Possibly much of the present Mad River Valley was a series of lakes, and Cedar Bog may have been one of these glacial lakes.

Considering all these similarities as well as the relatively cool microclimate one cannot avoid the conclusion that Cedar Bog was--and is--a bog as that term is generally understood. Nevertheless, some areas can correctly be designated as swamp.

Comparison of Cedar Bog with bogs of Northern Lower Michigan

Another method of gaining an insight into the nature of Cedar Bog is by comparing it with other Thuja bogs. The cedar bogs of the Douglas Lake area have been studied thoroughly over a period of many years by Gates and his students (Gates, 1926 and 1942; Gates and Ehler, 1924; Goe et al., 1924; Sigler and Woollett, 1926; Coburn et al., 1933; Dutro and Cohoe, 1938) and more recently by Bevis (1960).

In June and in early September, 1966, I visited the Douglas Lake region to study the bogs described in Gates' publications. Portions of Reese's Bog most closely resemble the arbor vitae areas and Cedar Bog in general aspect and over-all descriptions (Fig. 1). Reese's Bog extends across the north end of Burt Lake and was formed

Fig. 1. Forest floor of the arbor vitae associations.

A. Cedar Bog, Ohio

B. Reese's Bog, Michigan

A.



B.



by the encroachment of vegetation onto the lake (Gates, 1942). He considered this bog to have reached maturity long ago. Carp Creek flows through the Thuja association. Seepage areas and stream-lets, present in 1942, still exist today. Similar seepage areas are also common in Cedar Bog.

When I visited Reese's Bog on June 18, 1966, with only one exception, all areas were more firm, perhaps drier and less "boggy" than similar areas in Cedar Bog at the same time of year. Although this Michigan bog is probably five or six thousand years younger than Cedar Bog (Spurr and Zumberge, 1956 and Goldthwait, personal communication), the arbor vitae association seems to have reached a later stage of maturity than that in Cedar Bog. Thuja is larger and taller. The sparse foliage allows more light to reach the soil surface than in comparable areas of Cedar Bog.

One small part of Hebron Bog located at the south central edge of Hebron township, Cheboygan County, Michigan, has larger, older arbor vitae than those in Reese's Bog. The lower branches of the Thuja are gone and the tree foliage is so dense, there are practically no herbaceous plants, except a few scattered plants of small ferns, orchids, Maianthemum, and Trientalis. The substratum is nearly solid peat, not really a bog at all, with many old logs in various stages of decomposition. The appearance is best described by the word "cathedral." In Cedar Bog a small area approximately 20 X 20 feet had exactly the same cathedral-like internal aspect. It was located just west of the convergence of Cedar Run and the West Branch. But because tornadic winds

destroyed the large arbor vitae some years ago, the entangled branches make the area almost impenetrable today.

The marl meadow and bog meadow associations in Cedar Bog have no counterpart in Reese's Bog or Hebron Bog, but do resemble, in over-all aspect, the grounded mat on the eastern edge of Mud Lake Bog in Inverness township, Cheboygan County, Michigan (Fig. 2). Both Mud Lake Bog and the marl and bog meadows of Cedar Bog have a diversity of sedges: Carex, Eleocharis, Cladium, Scirpus, and Rhynchospora. In addition, Juncus, Utricularia, Typha, Bromus, Calamagrostis, and Phragmites are found in both.

Perhaps one significant item in relating Cedar Bog to the bogs of Northern Lower Michigan is the number of plant species common to both areas. Of the species listed by Gates (1942) as characteristic of the Thuja associations in the Michigan bogs, approximately 43% are found in the Cedar Bog arbor vitae associations. Of the 52 herbaceous species I observed in June, 1966, in Reese's Bog, 32 or 61% are found in Cedar Swamp.

Approximately 52% of the characteristic emergent aquatic and bog plant species listed by Gates (1942) are also present in the marl and bog meadows of Cedar Bog. Regardless of whether they are characteristic of bogs, if one considers only those species growing in the marl and bog meadow regions of Cedar Bog, 128 species or 65% are common to both Cedar Bog and the bogs of Northern Lower Michigan.

Considering the total number of plant species collected in Cedar Bog, 66 of the 87 plant families are also found in the

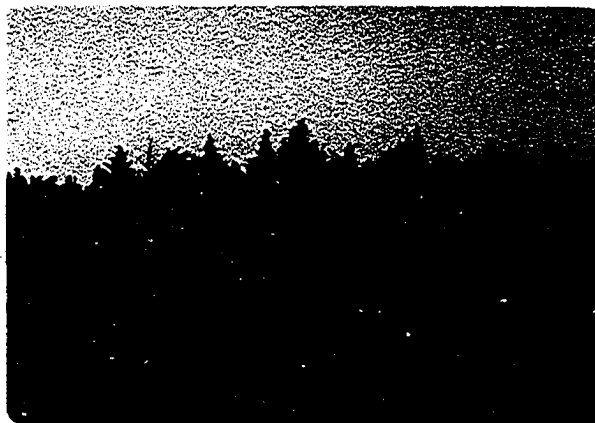
Fig. 2. Bogs.

- A. Cedar Bog, Ohio. Bog meadow along Cedar Run.
- B. Mud Lake Bog, Michigan. Mat in foreground.

A.



B.



Michigan bogs. Of the 493 species in these 66 plant families, 266, or 53.8%, are species growing in the Douglas Lake region (Gates, 1942, and Gates and Ehler, 1924).

Despite the many similarities, there are also interesting contrasts. For example, areas in the arbor vitae tracts of Cedar Bog have great numbers of violets of 10 different species. But only a few plants of two species were seen in just one place in the Michigan bogs. Many arbor vitae stands in Cedar Bog have an almost complete herbaceous layer of bulblet fern (Cystopteris bulbifera), but only a few plants of this species were seen in Reese's Bog.

In the Thuja associations of Michigan, there are many representatives of the Ericaceae, but only huckleberry (Gaylussacia baccata) is found in Cedar Bog. Possibly others once grew in the bog. Cranberry (Vaccinium macrocarpon) has been collected in County Line Bog (lying on either side of the Champaign and Logan County boundary) and Kenard Bog, both a few miles to the north of Cedar Bog. If, as seems likely, all these bogs once were part of one large bog along Mad River, it is possible that these ericaceous plants, and perhaps others, were present in Cedar Bog at one time. Apparently they were extinct by the time of Kellerman's collections in the 1890's.

The successional patterns in Cedar Bog and the Michigan bogs are obviously different. There are no spruce, balsam, or large poplars in Cedar Bog; no tuliptrees in Reese's Bog (Fig. 3).

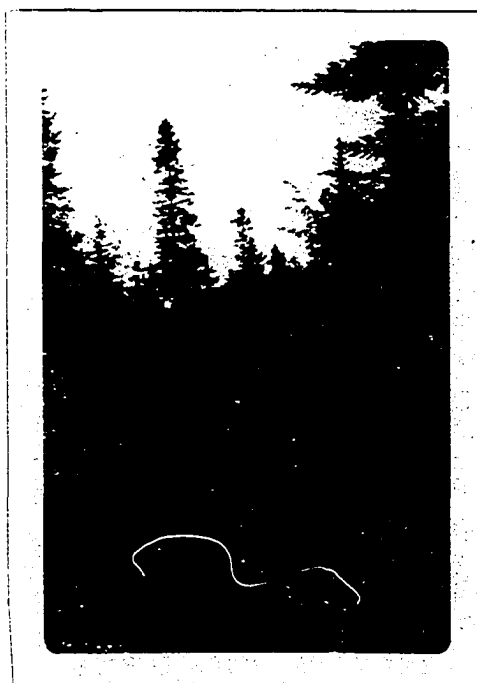
Fig. 3. Cedar Bogs.

- A. Cedar Bog, Ohio. Arbor vitae and cinquefoil
along Cedar Run.**
- B. Reese's Bog, Michigan. Spruce and arbor vitae
along Carp Creek.**

A.



B.



The nature of Cedar Bog--summary

Despite differences between Cedar Bog and the bogs of Northern Lower Michigan, parts of Cedar Bog Nature Preserve should be considered a bog, for the following reasons:

- (1) Peat is present in the bog meadow and arbor vitae associations.
- (2) Thuja occidentalis, which Gates (1942) listed as the climax species in boggy areas, is present in various stages of growth.
- (3) In certain portions, both the internal and external aspects resemble the bogs of Northern Lower Michigan.
- (4) As will be discussed, Cedar Swamp has a much cooler microclimate than the surrounding areas.
- (5) Over 65% of the plants found in the bog and marl meadow associations and 43% of those in the arbor vitae associations in Cedar Bog are found in Michigan bogs discussed by Gates (1942) and can be designated as bog plants.
- (6) The origin and formation of Cedar Bog was probably similar to the origin and formation of the bogs of Northern Lower Michigan.

HISTORY OF CEDAR BOG

Geologic and climatic

Glacial history is of primary importance in the origin and unique character of Cedar Bog and its resultant plant history. Glaciation resulted in unique water supply, topography, and microclimate.

During the Tertiary Period, the dominant feature of the area which Cedar Bog now occupies was the Teays River. Ver Steeg (1946) considered the Teays to be a mature river at least 800 miles long draining the New-Kanawha system, one-half to two-thirds of Ohio, and a large part of Indiana, Illinois, and northern Kentucky. According to Ver Steeg, the Teays was one of the largest rivers of Tertiary times, probably a mile wide in the area of Clark and Champaign Counties, in Ohio.

The Teays remained the master river of the area until at least a million years ago; until the southward advance of the first great Pleistocene ice sheet (Bates and Sweet, 1964). During the ensuing 870,000 years, four periods of glaciation occurred. Ice sheets first covered, then receded from the area, and the deep bedrock valley was filled with glacial debris. Approximately 25,000 years ago, the last of these great glaciers entered Ohio and, by 23,000 years ago, had moved into this part of the state, bulldozing and burying large spruce trees in front of it (Goldthwait, 1959). The size of buried spruce logs indicates that they

were part of a boreal open forest, or taiga. Assuming climatic conditions at that time in central Ohio were similar to those prevailing in boreal forests today, Goldthwait stated it is "fair to surmise that, as the ice approached, July temperatures . . . were about 20° cooler than today." He also estimated that the ice was about 3,000 feet thick in areas of Columbus and Dayton. Probably the present Mad River Valley was covered by somewhat thinner ice because the bedrock high east of Bellefontaine (Logan County) caused the glacier to divide, forming two ice lobes, the Scioto lobe in Central Ohio and the Miami lobe in Western Ohio (Forsyth, 1961). According to Goldthwait (1959 and personal communication), 19,500 years ago the Miami lobe was ploughing logs into the terminal moraines in Warren and Hamilton Counties. The Scioto lobe of the Wisconsin glacier moved at a different speed and did not reach its southernmost extension until about 18,000 years ago. Approximately 19,000 years ago, Champaign County was completely covered with ice, first by the Miami lobe moving from west to east across the county and later by the Scioto lobe moving from east to west. As this part of the ice sheet melted, the Kenard outwash plain was formed. A re-advancement of the Miami lobe followed, forming the Springfield Moraine which overlaid parts of the till deposited by the Scioto glacial lobe.

Goldthwait stated (personal communication) that the final retreat of the Miami lobe and the initiation of the Mad River Valley Train began a little more than 18,000 years ago, and the

outwash plain was completed 15,000 years ago. But all these deposits cover gravel and glacial till which is about 50,000 years old.

The Mad River Valley Train thus became Ohio's largest outwash valley. Portions of this valley coincide with the course of the deep stream bed of the old Teays river bed, now buried under almost 500 feet of glacial outwash. Cedar Bog lies over the old Teays river bed, perhaps one of the many depressions left in the Mad River Valley Train, or possibly one large depression, many miles long, running north to south along Mad River.

During the centuries following glaciation, the climate in the Mad River Valley apparently became gradually warmer until the Xerothermic period, approximately 3400 years ago (see "Vegetational History").

Following the Xerothermic period, the climate became cooler and more moist (Ogden, 1966). Presumably such a climate exists in Champaign County today. During 115 years of recorded data, although an extremely short time to consider real climatic changes, from 1852 to 1876, the average annual temperature in Urbana was 50.86°F; average total precipitation, 39.75 inches (M. G. Williams, 1878). For the period 1896 to 1921, the average annual temperature was 50.9°F; annual precipitation, 39.61 inches (Alexander, 1923). These were considered the "normals" for Urbana until 1962.

These temperatures are in contrast to the normals calculated by the United States Weather Bureau based on records for 1931 through 1960. During that period, the average annual temperature

was 51.5°F; average total precipitation, 37.74 inches (Climatological Data, Ohio. Ann. Sum., 1962). The latter are considered the normals for Urbana today. Although the "normal" annual temperatures today are only about 0.5°F higher, "normal" annual precipitation is 2 inches less than 115 years ago.

Vegetational history

One can assemble a history of the vegetation in Champaign County, beginning with the data of Goldthwait (1958 and 1959), N. N. Williams (1957), Kapp and Gooding (1964), and Ogden (1966). Just prior to the Wisconsin glaciation, perhaps 27,000 years ago, the area must have resembled the forest regions of north central Ontario today (Goldthwait, 1958, and Ogden, 1966). The dominant trees were probably black spruce (Picea mariana), white spruce (P. glauca), hemlock (Tsuga canadensis), and possibly balsam fir (Abies balsamea).

Immediately following glaciation, the first vegetation was most probably sedges and grasses, replaced rapidly by spruce, fir, balsam, and poplar (Ogden, 1966). In Medway Bog in Clark County, N. N. Williams (1957) found that northern coniferous forests were the dominant vegetation for a long period, but were gradually displaced by trees of the Lake Forest or hemlock-hardwood formations. These, in turn, were replaced by deciduous forest communities, particularly oak-hickory. Finally, this area became predominantly grassland, indicating warmer, dryer conditions of the Xerothermic period. Prairie species probably became established in the area during this warm period.

Ogden's (1966) pollen studies in Silver Lake, about 20 miles north of Cedar Bog, indicate that about 9800 years ago, the boreal forest was, in general, replaced by oaks. Grassland vegetation later replaced the oaks during the Xerothermic period which he dated at 3600 ± 212 years ago.

Although these same changes apparently occurred in Champaign County, Cedar Bog remained cooler and wetter than the adjoining area during this warm period because many relict boreal species remain. No doubt, Cedar Bog was then at the water table level, as it is today, with a constant supply of cool ground water maintaining a reasonably cool microclimate. Relict boreal plants must have existed in Cedar Bog since post-glacial times for there is no history of the displacement of boreal vegetation southward since the last glaciation.

Wet Prairies of Mad River Valley covered a vastly larger area than they do today, extending from Kingscreek to Springfield as late as the early 1800's (Dobbins, 1937). These wet "prairies" were probably comparable to the present bog meadow areas in Cedar Bog with arbor vitae growing in or at the edges of the "prairies" as they do today. Atwater (1838) described Ohio when it was first settled as "a great grassy country . . . along our rivers and in our prairies and barrens." He described, too, how in December, 1814, good peat was found "from near to Springfield, Clark County, almost all the way to Dayton." Atwater also told of peat in a "wet prairie" east of Urbana. Yet he made no mention of either the present Cedar Bog region or of the County Line Bog. Perhaps

even as late as 1814, these areas were lake-like or at least so wet that investigation of them was not possible.

Atwater (1838) believed that many of the wet prairies were once "thick forests of white cedar" (*arbor vitae*) because of old logs "in different stages of decay" four feet below the surface.

Roberts (in Antrim, 1872) described the disappearance of one lake and its surrounding bog. Rushcreek Lake was connected to a swamp, as he called it, about 6 or 7 miles long and 3/4 mile wide. Roberts reported "I can . . . attest that all around the margin of the lake, as also in the bed of Rushcreek, so far as the swamp extends, a person attempting to wade would sink beneath the mire as quick as in the water, . . . The whole area has evidently once been a lake connecting Mad River and Rushcreek, the former running South, and the latter North." The lake, itself, ". . . is much smaller now . . . and scarce one hundredth part as large as it originally was. The swamp connected with it is much more firm now than forty years ago The tallest corn is now grown in some places where cattle would not then dare venture." Because of Cedar Bog's history, logically, a similar description probably could have been written of that region during the 1800's.

In Antrim's book (1872), several pioneers recalled their youth during the early settlement in and around Urbana. The plants that they mentioned are the same as those found today: beech, white oak, bur oak, hickory, honey locust, chestnut, ash, ironwood, dogwood, hawthorn, maple, poplar, walnut, as well as wild grape, hazelnut, plum, and rose-of-sharon. This colorful description was

given of the stream margins:

The old settlers say that the margins of the streams, near which the first settlements were generally made, were thickly covered with a low, matted growth of long grass, while nearer to the water was a rank growth of long grass, interlaced with morning-glory and wild pea vines, among which funeral willows and clustering alders stood like sentinels on the outpost of civilization.

Although many lakes, swamps, and wet prairies long since gone were described, no one mentioned the Cedar Bog area. Both the bog area and the arbor vitae must have been present, for Thuja trees in the Bog today are that old or older. Again, perhaps the area was too wet and too dangerous to investigate. Or, because it was not suitable for farming, it was simply ignored.

The greatest changes in the Bog and adjoining areas occurred in the 20th century. The area of the bog habitat was drastically reduced. Probably the one significant operation reducing the bog area was the dredging and deepening of Mad River, first completed in 1912. But dredging had to be repeated in 1915 following the 1913 flood (Middleton, 1917). Much of the wet prairie in northern Clark County, south of Cedar Bog, was drained by diverting the mouth of Cedar Run a mile to the north. Evans (1944) cited the following newspaper item but does not indicate the paper from which it was taken:

Urbana, July 13 (1929). The death knell of the famous Cedar swamps and the 2,000 acres of other swamp land along Mad River near the junction of both Clark and Champaign Counties was sounded Thursday when the county commissioners, surveyors and land owners of both met and determined to abandon a mile of Cedar Creek, running the mouth into Mad River north of the county line bridge. With the dredging of this river will follow a further invasion of the swamps, which are eventually to be eliminated throughout the valley.

The bridge will allow extra water of Cedar Creek to flow under it with a 30-foot lowering of the bed by the proposed dredging, engineers stated. The group of officials are shown in the picture standing on an island in a beautiful bend of Cedar Creek that will be abandoned. This creek is the only one in Ohio with waters cold and clear enough for the raising of brook trout, though some of these were caught in Mad River this spring after they had gone down stream.

Since 1929, continued and expanded ditching and dredging has reduced the Cedar Bog habitat to about 98 acres. Today, perhaps the richest farm land in Champaign County has replaced most of the former wet prairie of the Mad River Valley.

STABILITY OF THE CEDAR BOG HABITAT

Microclimatic influences

I believe a microclimate similar to the northern Michigan bogs must exist in Cedar Bog and must have existed from the retreat of glaciation to the present, otherwise the Cedar Bog habitat would not have survived. Temperature studies of air, water, and soil over the past three years provide evidence that such a microclimate does exist.

During a previous study (Frederick, 1964), maximum and minimum air temperatures 12 inches above the soil surface were recorded for the marl meadow about a quarter of a mile north of Woodburn Road, from February through September, 1964. During the same period, maximum and minimum readings were recorded from a thermometer under the water in Cedar Run. The last three months of 1964 and all of 1965, temperature data, including air temperatures approximately 12 inches above the soil and water temperatures in Cedar Run, were recorded just south of Woodburn Road.

On December 31, 1965, a weather station, similar to the U. S. Weather Bureau shelters, was erected in the bog meadow south of Woodburn Road. Science Associates, Inc. maximum-minimum thermometers, model #110, were placed at five feet above the soil surface in the shelter and at 12 inches above the soil on the outside of the shelter. A model #140 Science Associates soil

thermometer was placed six inches under the soil surface beneath the shelter. The soil thermometer was not a maximum-minimum type, but the temperature was recorded at least once each week (Fig. 4).

A similar set of thermometers was placed in an arbor vitae stand west of Cedar Run, and a set in the swamp forest area south of Woodburn Road (Fig. 4). However, maximum-minimum thermometers for readings at five feet at these two stations were not available until the middle of March, 1966. Thermometers in the arbor vitae and the swamp forest were not sheltered but were placed on trees so that sun would not strike the sensor.

On January 1, 1966, a model #117 Science Associates maximum-minimum thermometer was placed with the sensor below the surface of the water in Cedar Run, approximately 400 feet south of Woodburn Road. Unfortunately, in extremely cold weather the thermometer reset hands occasionally "froze," and it was impossible to reset them.

During the study period, temperature data were taken at least once a week at all stations. Fifty-four readings were recorded in 1966. Official readings taken from the Urbana Weather Station's monthly summary (Climatological Data, Ohio) were used in the same manner: i.e., the only temperatures used were maximums and minimums for periods exactly coinciding with periods between readings at the Bog.

Table I presents data for soil temperature. However, similar data are not recorded by the weather bureau reporting stations, with the exception of the Coshocton Agricultural Experiment Station. To get a general idea of how soil temperatures in

Fig. 4. Temperature Data Stations.

- A. Station in swamp forest, Q E - 9.**
- B. Weather station, in bog meadow, Q D - 9.**
- C. Station in Cedar Run, Q E - 9.**



A.



B.



C.

TABLE I

Comparison of soil temperatures at 6" depth in Cedar Bog and at the Coshocton Agricultural Experiment Station for 1966.
Degrees F.

	Coshocton Agric.Expt. Station ^a	Cedar Bog Bog Meadow	Cedar Bog Arbor Vitae Stand ^b	Cedar Bog Swamp Forest
Annual average monthly maximum temperatures	64.1	53.7	51.8	53.8
Annual average monthly minimum temperatures	48.2	46.8	43.6	47.1
Average maximum temperatures for 6 warmest months	75.8	64.1	61.0	63.0
Average minimum temperatures for 6 warmest months	59.3	57.3	53.0	56.1
Average maximum temperatures for 6 coolest months	52.5	43.3	41.0	44.9
Average minimum temperatures for 6 coolest months	37.2	36.3	32.2	38.2
Highest temper- ature recorded	82.0	69.0	66.0	66.5
Lowest temper- ature recorded	34.0	33.0	28.0	34.0

^aCoshocton data, Clim. Data, Ohio, 1966.

^bFor 11 months. No January readings.

Cedar Bog compared with those at Coshocton, the highest and the lowest temperatures recorded each month for each area were compared. Average maximums and minimums for the year were calculated from these extremes. The data thus presented may not be exactly comparable, but I think it does indicate that soil temperatures in Cedar Bog are significantly lower during the warm summer months than soils in general.

Table II shows a comparison of the mean soil temperatures within Cedar Bog as calculated from the 54 readings made throughout 1966. The soil temperature never went below 32° in the bog meadow and swamp forest areas. In contrast, during seven weeks in 1966, the soil in the arbor vitae tract was at or below freezing, even though no readings were made in January. During the six warmest months, however, soil temperatures in the bog meadow averaged 3.1° higher and in the swamp forest, 2.2° higher than those in the arbor vitae region. One probable factor in maintaining a boreal habitat is the effect on soil temperature resulting from the presence of arbor vitae in the area.

Because water is near the surface, the water temperature undoubtedly influences winter soil temperatures, particularly minimum readings in the bog meadow and swamp forest regions. These data are given in Table III.

However, changes in minimum soil temperatures lagged behind changes in water temperature by about one week. The minimum water temperature and the lowest temperature at the time of reading were each recorded on January 29, 1966; the lowest soil temperature readings in the bog meadow and swamp forest were recorded on

February 5, 1966. These data are expected because during winter months, the ground water temperature has a greater influence on soil temperature than insolation.

TABLE II

Average soil temperatures in Cedar Bog for 1966, at three stations. Degrees F.

	Bog Meadow	Arbor Vitae	Swamp Forest
Average temperature for 1966	49.7	47.3	50.3
Average temperature for 6 warmest months	59.7	56.6	58.8
Average temperature for 6 coldest months	39.3	36.0	41.3

TABLE III

Average maximum, minimum, and present water temperatures in Cedar Run, 1966. Degrees F.

	Maximum	Minimum	Present Reading*
Average of all readings, 1966	57.0	43.1	48.9
Average temperature for 6 warmest months	65.1	49.3	54.7
Average temperature for 6 coldest months	49.1	37.7	44.5
Highest temperature recorded	73.0 (7/16 and 7/23)		64.0 (6/4 and 8/7)
Lowest temperature recorded		26.0 (1/29)	

* Studies completed in 1964 (Frederick, 1964) established that the maximum and minimum temperatures occurred for only short periods of time and that the readings recorded at the time of observation probably indicated a more typical temperature for Cedar Run than do the maximum and minimum readings.

Table IV shows the average monthly temperatures of the water in Cedar Run. These averages point up the constant, relatively stable water temperature.

TABLE IV
Average monthly temperature of water in Cedar Run, 1966.
Degrees F.

	Avg. Monthly Max. Temp.	Avg. Monthly Min. Temp.	Avg. Monthly Temp. at Time of Reading
Jan.	43.6	35.5	38.6
Feb.	43.0	34.3	39.0
Mar.	52.8	38.8	44.3
Apr.	55.6	41.0	49.4
May	64.5	43.8	51.0
June	67.0	49.5	57.0
July	71.7	54.0	58.0
Aug.	70.8	53.6	63.3
Sept.	65.4	51.6	54.6
Oct.	54.9	44.3	47.5
Nov.	50.8	39.3	45.3
Dec.	48.7	35.7	40.6

The reverse is true of summer soil and water temperatures; a lag of two weeks or more occurs. The highest soil temperatures in the bog meadow and the swamp forest were recorded on July 2, 1966, but the highest water temperature was recorded on July 16

and again on July 23. This, too, would be expected, for higher soil temperatures as a result of insolation would affect the temperature of ground water.

Annual average air temperatures and average maximum and minimum temperatures for 1966 are given in Table V. Maximum-minimum thermometers were not placed at the five-foot level in the arbor vitae stand and the swamp forest until mid-March. Therefore, the annual average temperature, the average temperatures for the six coldest months, and the lowest temperature for these categories has not been calculated. However, comparative data for the first three months of 1967 are included at the bottom of the table.

In bar graphs in Figures 5A and 5B certain facts stand out. (The length of the bar and the position of the left end of the bar have no significance.) Higher maximum temperatures occur in the bog meadow at the five-foot level than at the Urbana weather station but minimum temperatures are colder than those at the weather station. With few exceptions, this has been true for each weekly period throughout the year. Averaging just the differences between the temperature at Cedar Bog and that at the Urbana weather station, the bog meadow temperatures at the five-foot height averaged 3.1° warmer and 3.3° cooler for 1966.

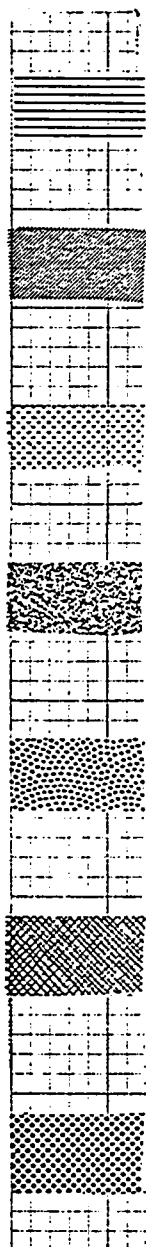
The extremes at the 12-inch level in the bog meadow are even greater, for the minimums are lower than both weather stations every month except August, and the maximums are higher than both stations eight months of the year.

TABLE V

Annual average air temperatures--Urbana Weather Station and three stations in Cedar Bog, 1966 and 1967. Degrees F.

	Urbana Weather Station Max., 5 feet*	Bog Meadow Weather Station Max. 5 feet	Bog Meadow Weather Station Max. 12 inches	Arbor Vitae Station Max. 5 feet	Arbor Vitae Station Max. 12 inches	Swamp Forest Station Max. 5 feet	Swamp Forest Station Max. 12 inches	Urbana Weather Station Min. 5 feet*	Bog Meadow Weather Station Min. 5 feet	Bog Meadow Weather Station Min. 12 inches	Arbor Vitae Station Min. 5 feet	Arbor Vitae Station Min. 12 inches	Swamp Forest Station Min. 5 feet	Swamp Forest Station Min. 12 inches
Average temper- ature 1966	68.3	70.8	70.9		65.4		64.7	28.6	25.6	22.6		30.3		27.1
Average temper- ature for 6 warmest months	81.5	83.5	83.5	78.9	77.1	79.1	73.5	41.8	39.2	36.7	42.3	44.7	42.2	42.0
Average temper- ature for 6 coldest months	54.1	57.5	57.7		43.3		52.8	14.0	12.0	8.0		15.4		11.2
Highest temperature	99	96	96	91	87	89	86							
Lowest temperature								-10	-12	-14		-6		-13
Monthly Avg. Jan. 1967	53.8	58.0	56.5	54.7	53.2	57.3	53.3	8.8	8.0	3.0	12.0	14.5	9.7	8.7
Monthly Avg. Feb. 1967	47.5	50.5	48.8	48.8	48.3	50.8	47.8	1.5	-0.75	-4.3	3.8	4.0	1.5	-0.5
Monthly Avg. Mar. 1967	62.5	70.7	70.2	65.3	61.0	67.0	66.0	12.4	11.8	7.5	16.8	19.6	13.8	12.0

* Clim. Data, Ohio 1966 and 1967.



The Urbana, Ohio, Weather Station, 5 foot level.

Weather station, bog meadow, Cedar Swamp,
5 foot level.

Weather station, bog meadow, Cedar Swamp,
12 inch level.

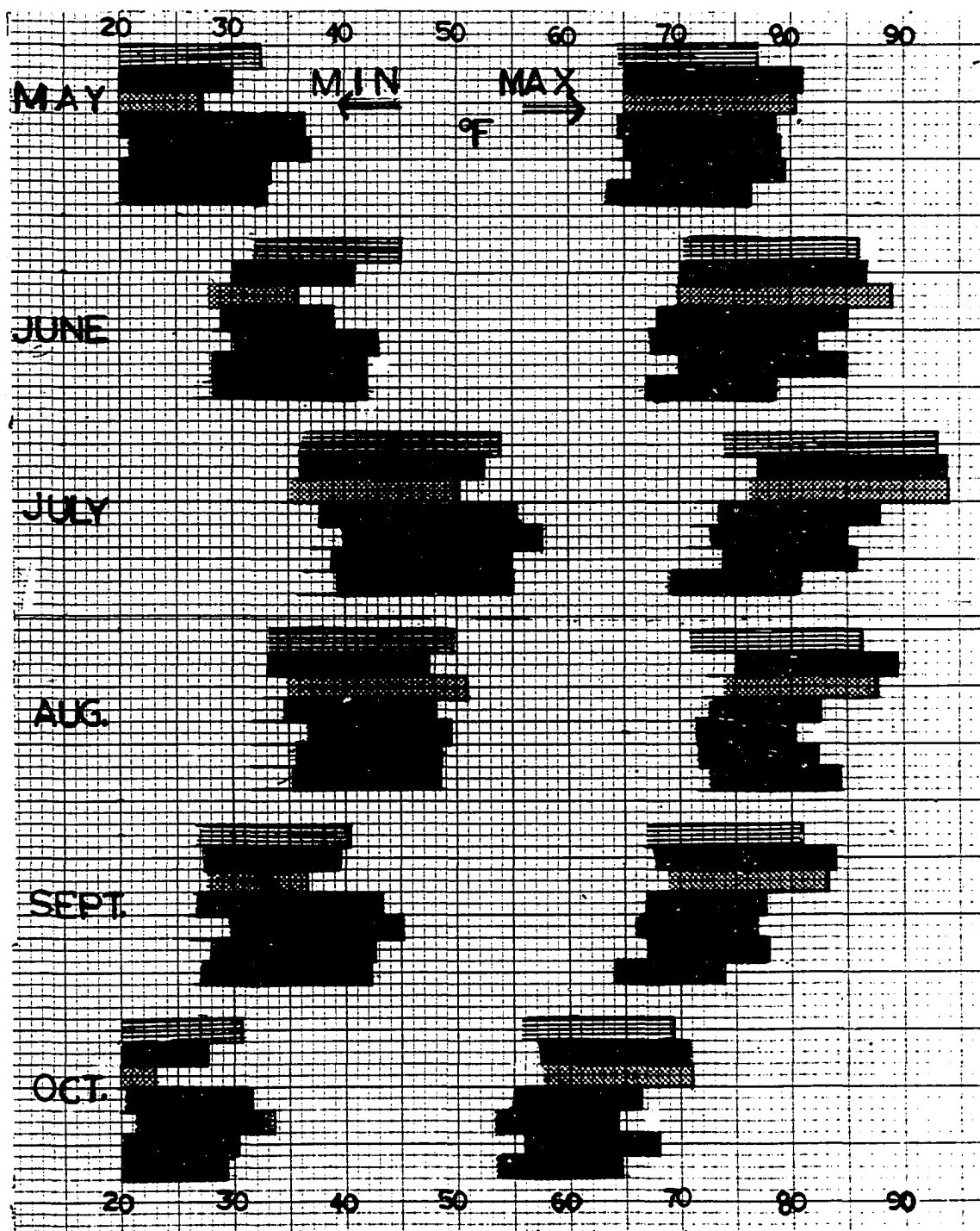
Arbor vitae stand, Cedar Swamp, 5 foot level.
(Data for 9 months).

Arbor vitae stand, Cedar Swamp, 12 inch level.

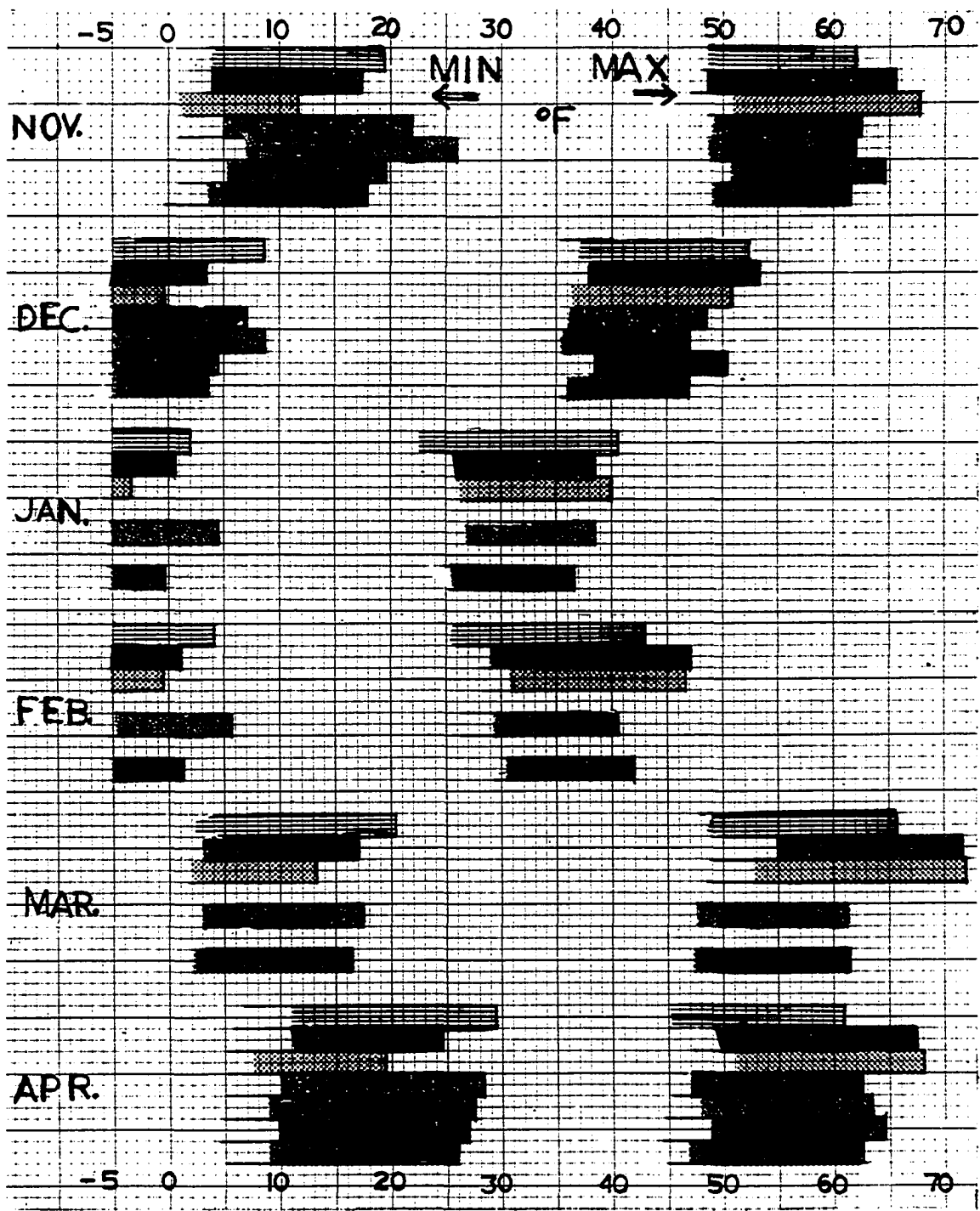
Swamp forest, Cedar Swamp, 5 foot level.
(Data for 9 months).

Swamp forest, Cedar Swamp, 12 inch level.

Figure 5. Comparison of 1966 monthly average maximum and minimum temperatures at the Urbana, Ohio, Weather Station and in three areas of Cedar Swamp, Champaign County, Ohio. (Legend above)
Length of bar and position of the left end of the bar have no
A. Six warmest months. significance.
B. Six coldest months.



A.



B.

The arbor vitae areas have less extreme, more constant temperatures than any other area of the Bog. Temperatures are always lower both at 5 feet and 12 inches than at either the bog meadow or Urbana weather stations, during the summer months. Temperatures at 12 inches are lower than those at 5 feet. But more important, during the winter months minimum temperatures are higher, and in the summer maximum temperatures are lower in the arbor vitae association than those in the bog meadow.

Temperatures in the swamp forest show greater variation than those in the arbor vitae but are less extreme than those in the bog meadow. In general, temperatures are cooler than at either the Urbana weather station or the station in Cedar Bog and also cooler at the 12-inch level than at 5 feet.

Some annual comparisons can be made of temperatures in different areas of Cedar Bog by averaging the degrees departure of temperatures in Cedar Bog and those at the Urbana weather station. In 1964, temperatures were recorded at 12 inches above the soil in the marl meadow association. Compared to official weather bureau temperatures taken at Urbana, the maximum temperatures in the marl meadow averaged 3.5°F higher and minimum temperatures, 5.4° lower.

During 1965 temperatures were recorded at 12 inches above the soil in the bog meadow very near the east bank of Cedar Run. This region is the low, exposed bog meadow region, but because it is near Cedar Run which never freezes, the temperature is probably moderated by the water. In this area of the bog meadow, the

maximum temperatures were 3.48°F higher; the minimum temperatures, 6.74° lower than those at the Urbana weather station.

In 1966, the temperatures averaged 3.5°F higher and the minimums 7.0° cooler at the weather station in Cedar Bog 12 inches above the soil. The weather station in the Bog stands in an exposed area (no arbor vitae or high shrubs within 30 feet) about 5 higher than the surface of Cedar Run. It is coldest in the exposed bog meadow area where Cedar Run does not influence the air temperature.

Paradoxically, in the same area the soil was not frozen at a depth of 6 inches; seepage areas continued to run throughout the winter although a hard crust of ice sometimes froze at the surface; Cedar Run never froze except for an occasional, very small thin sheet of ice close to the bank. During very cold weather Cedar Run appeared to "steam" because of the great differences in air and water temperatures. Even when air temperatures are 5.4° to 7.0°F cooler, plant roots are not frozen, and water is present at all times of the year.

Perhaps the most dramatic evidence for a cold microclimate in Cedar Bog concerns the absolute temperature extremes and the length of the frost-free period. During the winter of 1964-65, a low of -25° was recorded in the marl meadow, although the Urbana weather station reported -10°F as the lowest temperature for that period. A -26°F on January 16, 1873 (Alexander, 1923), is the coldest temperature ever officially recorded in Champaign County. In 1964 the highest temperature recorded in Cedar Bog was 101°

between August 2 to 9 and fell to 31°F the following week. The extremes at the Urbana weather station for the same period were 95°F and 38°F .

Assuming that the minimum temperature recorded in Cedar Bog during any one period occurred on the same day as the minimum for that same period at the Urbana weather station, the yearly frost-free period is quite revealing. This is summarized in Table VI.

TABLE VI
Frost-free periods, Urbana Weather Station and Cedar Swamp for three years. Degree F.

	Last Frost in Spring		First Frost in Fall		No. Frost- free Days
1964					
Urbana Weather Station	4/11	29°	9/13	32°	155
Cedar Swamp, 12" level	5/30	28°	8/15	31°	76
1965					
Urbana Weather Station	4/19	31°	10/4	32°	168
Cedar Swamp, 12" level	5/28	31°	8/3	30°	66
1966					
Urbana Weather Station	5/10	25°	10/2	30°	138
Cedar Swamp, 5' level	6/2	32°	9/16	31°	105
Cedar Swamp, 12" level	6/11	32°	9/16	27°	96

In 1964 the frost-free period in the marl meadow area was 66 days shorter than at the Urbana weather station; in 1965, 102 days shorter; and in 1966, 33 days shorter at the 5-foot level and

42 days shorter at the 12-inch level. With regard to 1966, the state climatologist noted that on May 9, "overnight lows were in the twenties in all cooperative temperature recording stations except Ashtabula. Mean surface temperatures on the 10th were 15° to 22° below normal." Record low temperatures were observed throughout the state, with stations recording the lowest ever recorded in May (Climatological Data, May, 1966). In addition, September was unseasonably cool; on September 16 frost was reported in some areas of Ohio (Clim. Data, Ohio, Sept., 1966).

From these reports, data from 1964 and 1965 are probably more typical for Cedar Bog. Or, the frost-free period in Cedar Bog is approximately 2 1/2 months shorter than in the surrounding country side. Only July has been frost-free all three years.

In 1965 the first freezing temperature occurred on August 3, but freezing temperatures were recorded on three other occasions before freezing temperatures were recorded at the Urbana station. A low of 27°F occurred on August 29; 25° on September 25; and 28° on September 26.

In 1966 for only three weeks between January 1 and June 12 were the minimum temperatures above the freezing mark at the 5-foot level at Cedar Bog, and for only two weeks during that period at the 12-inch level. From September 16 on, the minimum temperature was below freezing each week at the 12-inch level and above freezing only one week at the 5-foot level. Cedar Bog is in a depression with low hills on at least two sides and low air temperatures result from movement of cold air downhill to the Bog site.

There can be no question that the microclimate is much more severe in Cedar Bog than in the adjoining areas. Surely this microclimate has been an important factor in the survival of a boreal bog in this part of Ohio.

Water supply and source

One other important factor in the survival and maintenance of the Cedar Bog habitat is the constant, relatively cool supply of water.

During 1964 the maximum water temperature in Cedar Run was 78°F and the minimum 38°F , with an average maximum temperature of 58.2°F and an average minimum of 38.7°F . The extremes are probably maintained for a short period of time (Frederick, 1964); thus, the present temperature at each reading represents the most usual temperature--that maintained for the greatest length of time. The mean temperature of all the present readings for 1964 was 49.7°F . However, no regular weekly readings were made during January, February, and March, 1964, although maximum and minimum were recorded during the entire period.

In 1965 the average maximum temperature of the water was 65.6°F ; the average minimum, 39.5° ; and the average present temperature, 48.2°F .

During 1966 the average maximum temperature was 57.0°F ; the average minimum 41.1°F ; and the average of present readings of water temperature in Cedar Run, 48.9°F . Extremes were 26°F during the week of January 22 to 29 and 73°F on July 16, 23, and August 29. One other below-freezing temperature, 31°F , was recorded

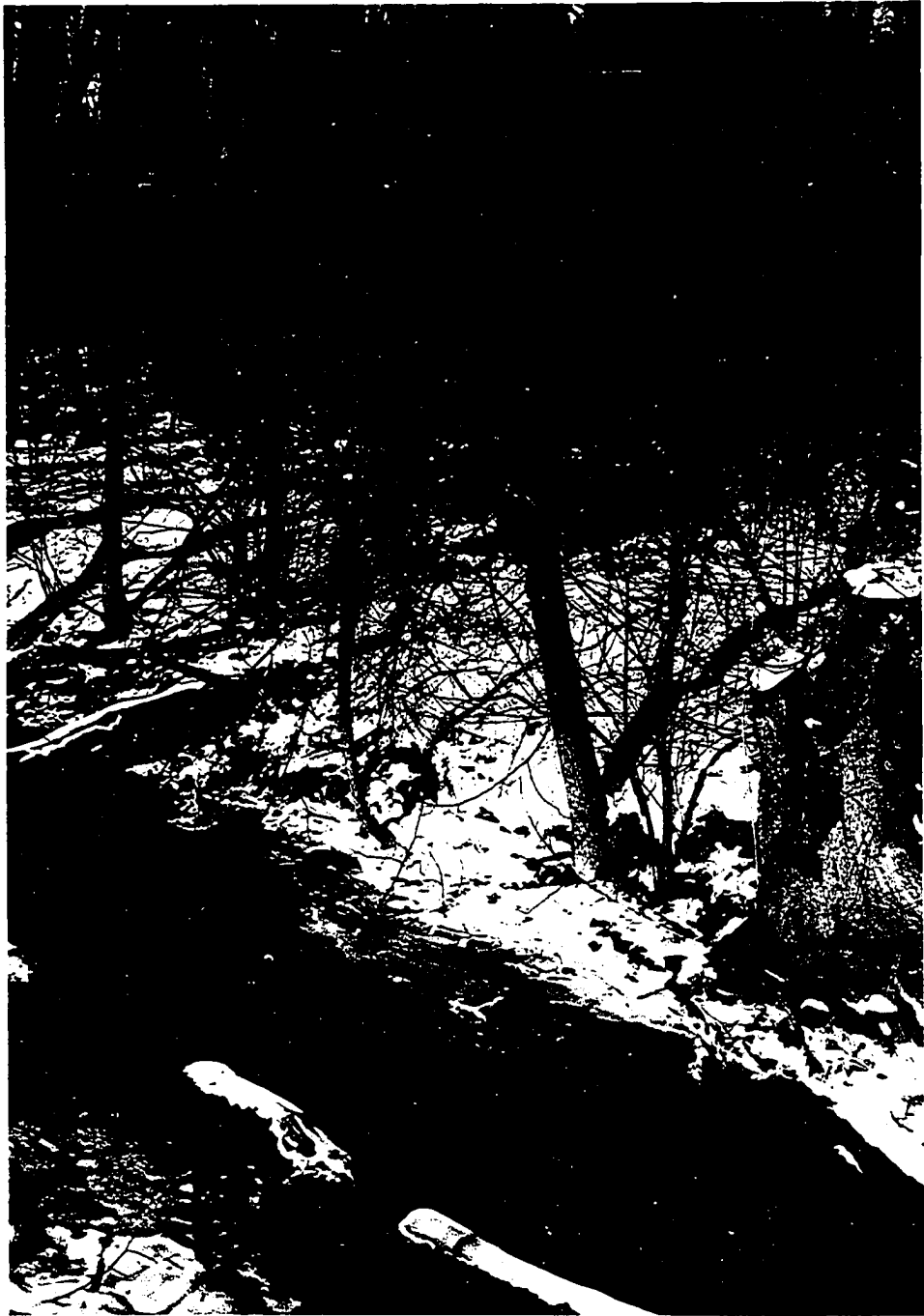
February 5, but at no time did the water freeze (Fig. 6). In fact, the stream did not freeze even when 22°F was recorded in 1964, during the period when no weekly readings were taken, and once in 1965. Large quantities of calcium carbonate and other salts (Frederick, 1964) and the constant motion of the water are responsible for no freezing.

Mad River and its tributaries have been noted as a constant water source from pioneer times. Morgan (in Antrim, 1873) said of Mad River, Kingscreek, and Mac-O-Chee Creek, "all these are permanent, never-failing streams of pure, clear water. They have never been known to go dry in summer, and always furnish an ample supply of water for milling purposes throughout the year." Howe (1889) described the Mad River at Springfield in 1846 as "unequalled for fine mill seats, its current very rapid and the water never so low in the driest season as to interfere with the mills now upon it."

Today the Mad River Valley in Champaign and Clark Counties is noted for the abundant water available to cities and industry. In discussing the water resources of Clark County, Cross (in Norris et al., 1952) cited the high, sustained stream flow even during droughts as the outstanding characteristic of the Mad River. He also established that this even flow is sustained because a larger percentage of the total runoff is from ground-water, rather than direct runoff water.

Goldthwait (Norris et al., 1952) pointed out that the best places for large ground-water development in valley-train deposits

Fig. 6. West Branch during winter,
February, 1967. Note water cress growing in
stream.



are adjacent to streams because water from the stream infiltrates and recharges such areas. Of course, the streams must also be "recharged," or have a continuing supply of water. This supply is no doubt the result of the peculiar glacial deposits in the area. Glacial till deposits as ground and end moraines cover a large area east of the Mad River Valley train. Till is only slightly permeable, the ground-water runoff, therefore, is very slow but constant (Goldthwait, personal communication and Norris et al., 1952). This, then, accounts for the relatively high rate of flow of Mad River and its tributaries during periods of drought, as well as for the reasonably constant flow during rainy periods.

These same factors account for a constant water level in Cedar Bog because apparently Mad River and Cedar Bog have the same water sources. Supporting evidence is seen in the water analyses of the two areas (Norris et al., 1952, and Frederick, 1964). Both the kinds and amounts of minerals and the pH determinations are strikingly similar. Perhaps the water of Mad River also infiltrates the Bog. In addition, the slow water seepage from the till deposits east of Cedar Bog is a definite factor in maintaining the water level.

Because the water level in Cedar Bog does not vary more than a few inches even when the water table is lowered three or four feet near Urbana, perhaps some clay lenses may exist which result in slow water movement both into and out of Cedar Bog itself. This constant supply of relatively cool ground water is, and doubtless has been throughout the centuries since glacial

times, an important factor in the formation and survival of the bog habitat in Cedar Bog.

In summary, Cedar Bog originated as a result of its geologic history, particularly glaciation, and has survived because of the constant, cool water supply and the existing cool microclimate. The future of the Bog is, therefore, dependent upon the maintenance of the water supply. If the assumptions made above are correct, two or three events could occur to destroy the habitat: (1) additional surface drainage into the Bog would change the character of the water as well as the movement of water in the area and thus destroy the present habitat; (2) disturbance of the clay lenses, if they exist, would hasten drainage of the area.

Of course, it is possible that the Champaign County water table might be lowered so drastically that seepage from the extensive till deposits could not maintain the present level. Also, the enormous ground water storage reservoir of the Mad River Valley could be depleted. But if that happened, not only Cedar Bog, but also the Mad River would be drained.

Although new factories have been developed both north and south of Cedar Bog, and a new municipal well has been dug for Urbana, the water in the Bog has not lowered appreciably. But, admittedly, five years is a short period of observation with reference to the level of the water table. Nonetheless, probably only a very drastic change in the whole water situation in the Mad River Valley could destroy Cedar Bog in the immediate future.

PLANT ASSOCIATIONS IN CEDAR BOG

Introduction

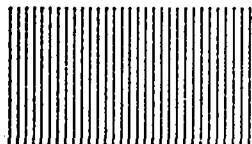
It is important to define some terms and establish names before discussing the various plant associations and segregates in Cedar Bog. The quadrat system used in this paper is the same as that established previously (Frederick, 1964) and is indicated on the vegetation maps (Fig. 7 and 8). The symbols are also equivalent to those used in 1964: i.e., Q D - 8 is to be read quadrat D, number 8, indicating the first quadrat north of Woodburn Road on the east side of Cedar Bog.

Cedar Run is the eastern stream designated on topographic maps and the Champaign County map. The western branch has not been given an official name, but throughout this paper, I have designated it as West Branch. The term "western extension" has been used to indicate the swamp forest and hardwood forest associations west of the stream, covering quadrats G through J, nos. 10, 11, and 12.

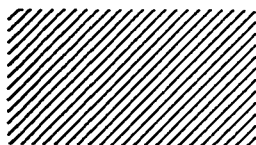
The terms referring to groups of vegetation, association and segregate have been used in various ways; therefore, it seems pertinent to define them as they are used in this paper. The term "association" is used to indicate the larger category of vegetational types. "Association" refers throughout to a specific type of vegetation, influenced by water level, origin, etc., as



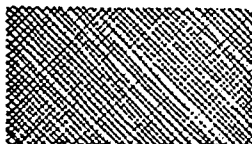
Swamp forest; elm, sycamore, silver
and red maple.



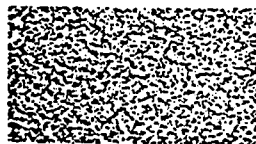
Shrubs; spicebush, alder, blackberry
and dogwood.



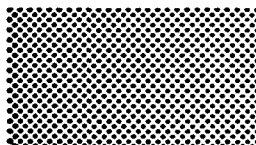
Young silver maple stand.



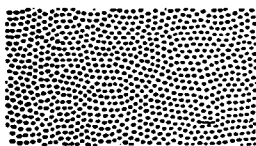
Sugar maple, beech, oak and hickory.



Arborvitae stand.

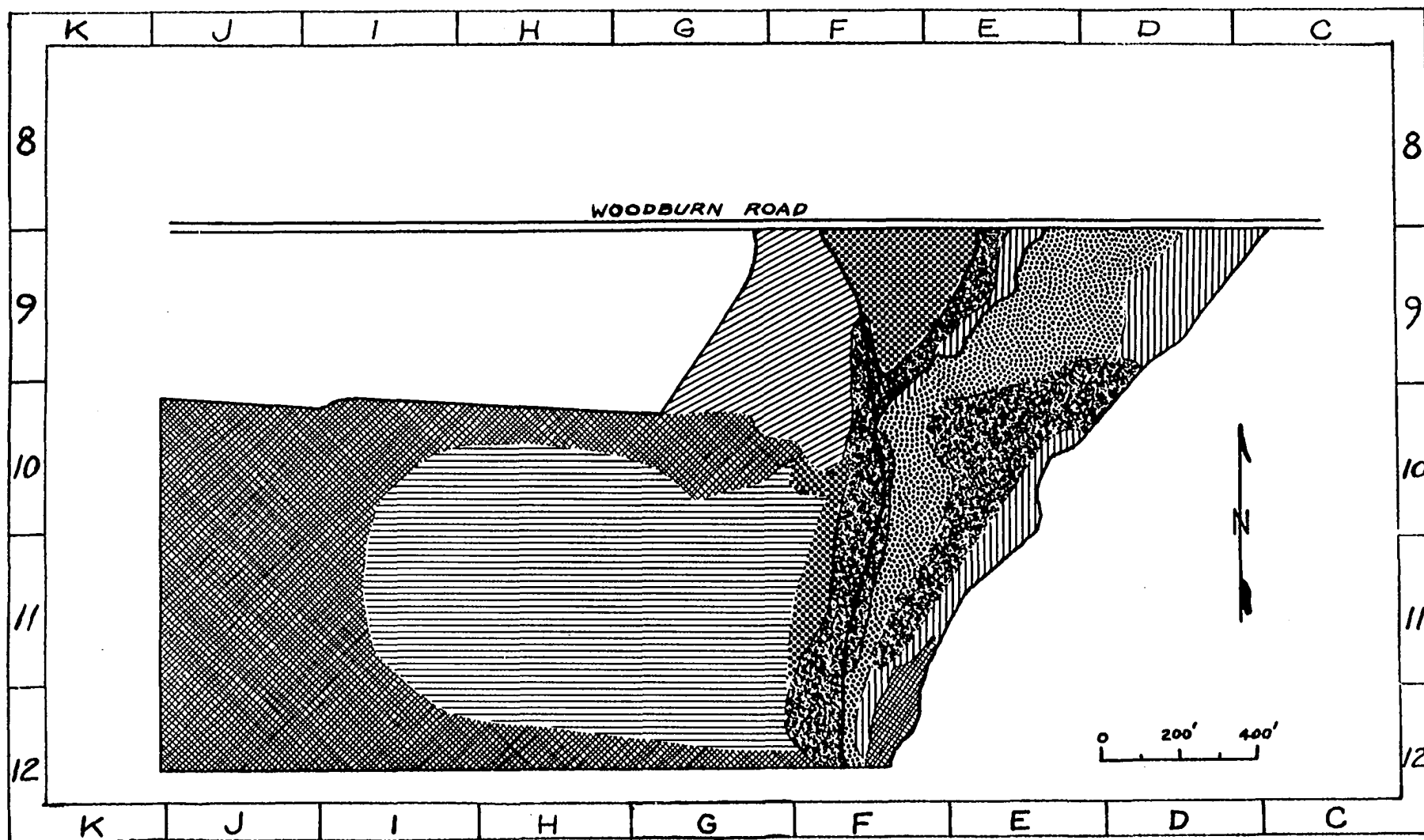


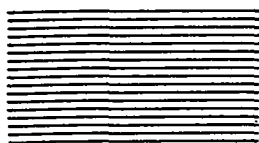
Tuliptree



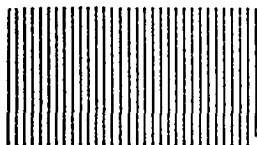
Bog meadow

Fig. 7. Vegetation map. Region south of Woodburn Road.

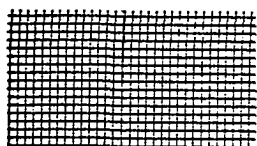




Swamp forest; elm, sycamore, silver
and red maple.



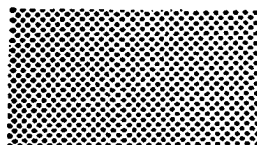
Shrubs; spicebush, alder, blackberry
and dogwood.



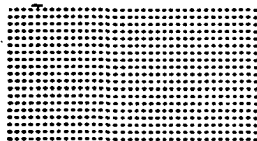
Swamp forest; elm, ash and ironwood.



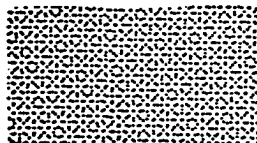
Arborvitae stand.



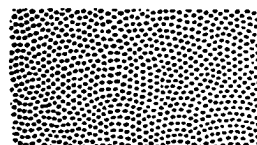
Tuliptree.



Marl meadow.

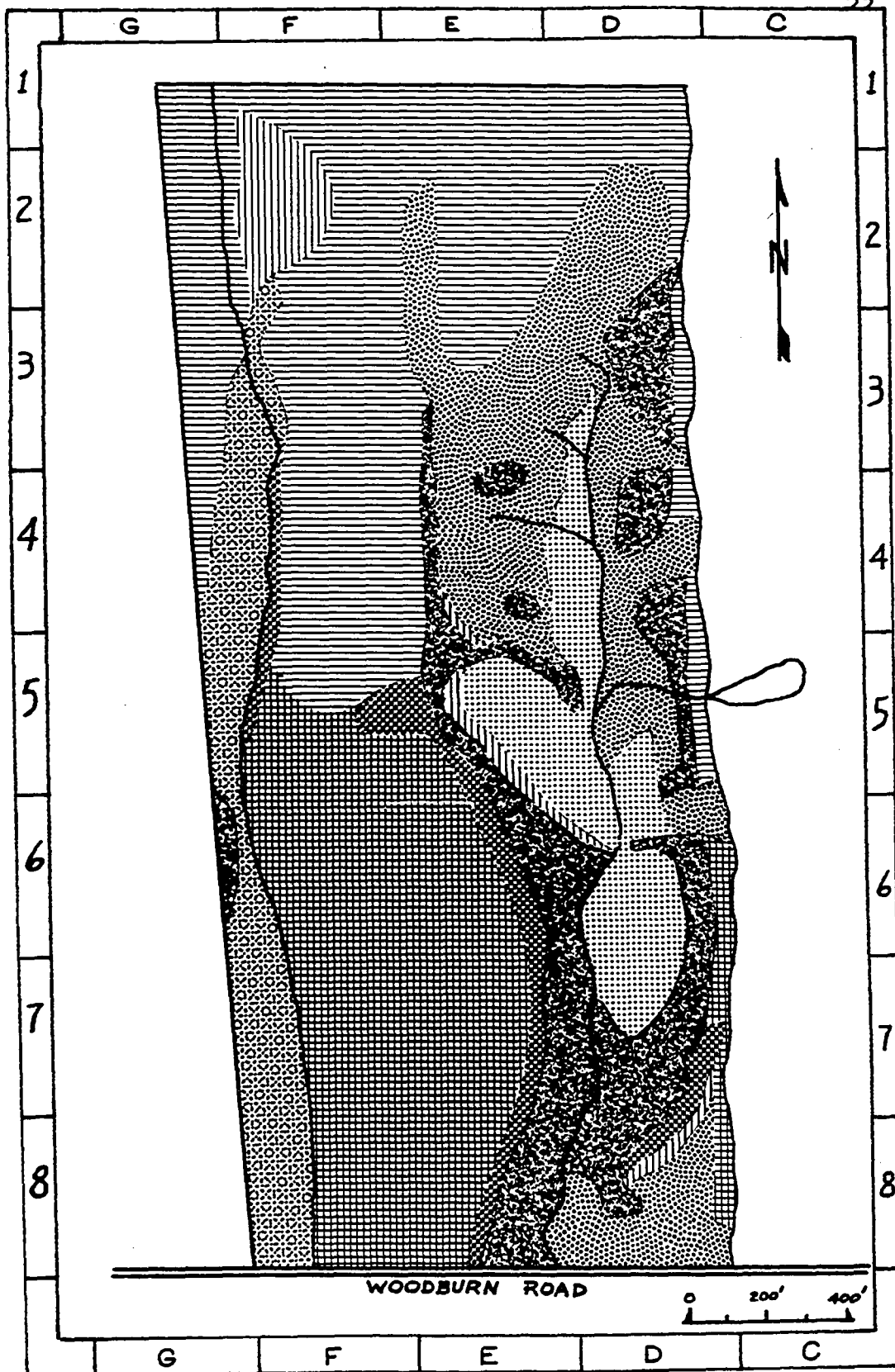


Oak and maple.



Bog meadow

Fig. 8. Vegetation map. Region north of Woodburn Road.



well as by the kinds of plants found there. For example, the "arbor vitae association" is that group of plants associated with Thuja occidentalis, most, considered boreal in origin. "Swamp forest association" indicates that group of plants growing in poorly drained, swampy areas in which are found plants generally associated with flood plains. However, there are distinct variations within areas of the swamp forest, and these areas are called "segregates" denoting particular vegetational types within the general swamp forest association.

The bog meadow and marl meadow associations have been treated previously (Frederick, 1964). Each refers to a specific community of plants controlled by the level of the water; i.e., marl meadow occurs where water and marl are at the surface; whereas in the bog meadow, water is below the surface, and a greater variety of plants growing on raised mounds or hummocks throughout the area.

Measurements of trees are given as inches DBH (diameter at breast height) and, unless stated otherwise, were measured approximately 4 1/2 feet above the soil surface.

The plant associations in Cedar Bog do not have distinct margins. There is actually no straight-line separation between vegetational types in the Bog. There are ecotones and small, differing vegetational groups in every association. For example, sycamore (Platanus occidentalis) is a dominant tree in only one plant association. Yet, sycamores, sometimes very large ones, are in almost every plant association. Spice bush (Lindera benzoin)

is found as a shrub under-story in most plant associations but is mentioned as an aspect dominant in only the shrub zone.

The Bog Meadow and Marl Meadow associations

The bog meadow and the marl meadow associations were treated previously (Frederick, 1964), and only brief additions are necessary here. I have emphasized that the marl areas are dominated by grasses and sedges, particularly Eleocharis and Juncus. Most species are northern species; i.e., species generally found much farther north today. Two factors probably influence plant survival. First, although air temperatures at the 12-inch level in both the bog meadow and the marl meadow regions show the greatest extremes, soil temperatures are relatively stable and cool at the root level. Second, the wet, cool, marly environment is not easily invaded by other species, therefore, the northern species have survived because of little or no "competition."

However, a dramatic change took place in the bog meadow just north of Woodburn Road, Q D - 8, in 1966. Until that time, this area had been used as pasture by Mrs. Lottie McDaniels, who owns most of this tract. In the fall of 1965, the fence on the east side was removed and the pasture plus a small segment of the bog meadow was plowed (Fig. 17, Q C and D - 6, 7, and 8).

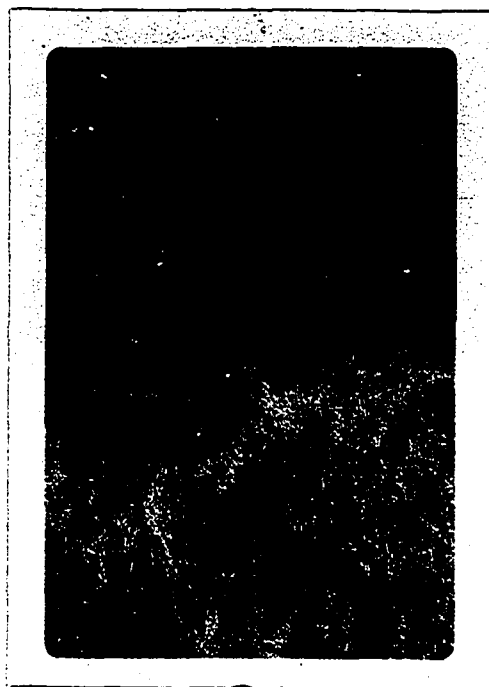
During the following summer, the remaining bog meadow zone was undisturbed. Many plants which had not flowered previously did so in 1966. (Fig. 9). Grasses, sedges, and herbaceous plants grew to two or three feet high, whereas, they had been kept at

Fig. 9. Contrast, Bog Meadow.

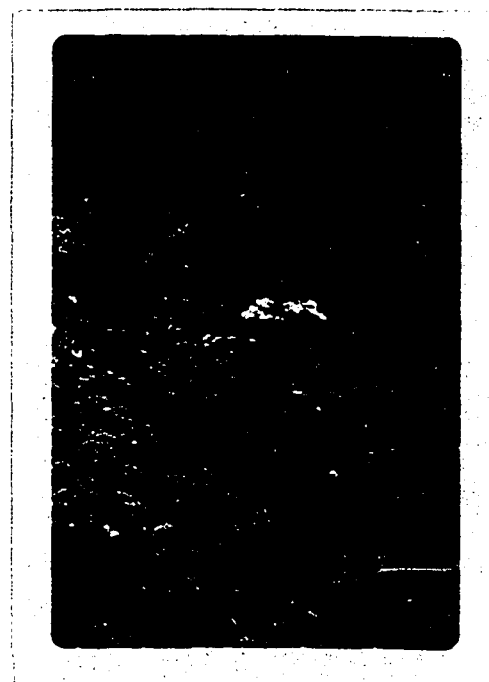
A. Used as pasture land, 1964.

B. Undisturbed for one year, 1966.

A.



B.



approximately one foot during the years of pasturing. If this zone remains undisturbed in the future, it should provide even greater opportunities for study.

South of Woodburn Road (Fig. 10), the bog meadow occupies most of quadrat E - 9 as well as parts of quadrats E - 10, 11, and 12, and D - 9. Except for some arbor vitae in Q F - 10 and 11, the bog meadow covers the area east of Cedar Run to the south end of the state-owned property. Frederick (1964) reported that grasses, composites, and shrubby cinquefoil dominate the association. The sedge-formed peat has been broken through in many places leaving "sink holes," deep holes filled with dystrophic water. In addition, there are seepage areas and although marl covers these areas, the plant association of the marl regions is not present. Usually, only one small sedge, Rynchospora capillacea, and one moss, a species of Fissidens, grow in these patches of marl.

At the present time, many small arbor vitae are beginning to grow on the hummocks in the bog meadow. In the future, these bog meadow tracts may become well-developed arbor vitae forest areas, as more peat is formed, and the surface level becomes higher and better drained. A lowering of the water table would bring about the same result.

Shrub communities

Shrubs usually form an intermediate community between the arbor vitae and deciduous forest associations, and the bog and marl meadow associations. One shrub community, associated with the swamp forest segregate occurs on the far east side of the state-owned

Fig. 10. Bog Meadow, Q E and F - 9.
Note small arbor vitae trees.



property (Q D and C - 9 and Q E - 10 and 11). It is now in a successional stage. It probably began as a coarse shrub community followed by establishment of American elm. The elms are almost gone now and a few silver maples are present. But mostly, this is an area of brambles and coarse annuals, and, therefore is designated as a shrub tract.

North of Woodburn Road and east of Cedar Run (Q C and D - 7 and 8), the shrub community associated with the swamp forest consists of poison sumac (Rhus vernix), prairie rose (Rosa setigera), dogwood (Cornus species), prickly ash (Xanthoxylum americanum), black locust (Robinia pseudo-acacia), and hop tree (Ptelea trifoliata). Although the last three species named are generally small trees, they are only slightly taller than the speckled alder and poison sumac and are considered as members of the shrub community in this region.

The shrub community at the north end of the swamp forest in quadrats F - 1 and 2 is a veritable jungle of berry briars. This berry patch may be the reason the path along West Branch is always well trod during the summer months. Raspberry plants grow all along this path but seldom bear abundant fruit, probably because the shade is quite dense.

The most common shrubs associated with the arbor vitae association are Alnus rugosa, Cornus alternifolia, Rhamnus alnifolia and several species of Salix in addition to spice bush, cinquefoil, ninebark, and swamp birch. In quadrats D and E - 5 and 6, the most frequent shrubs are willows, birch, and Rhamnus

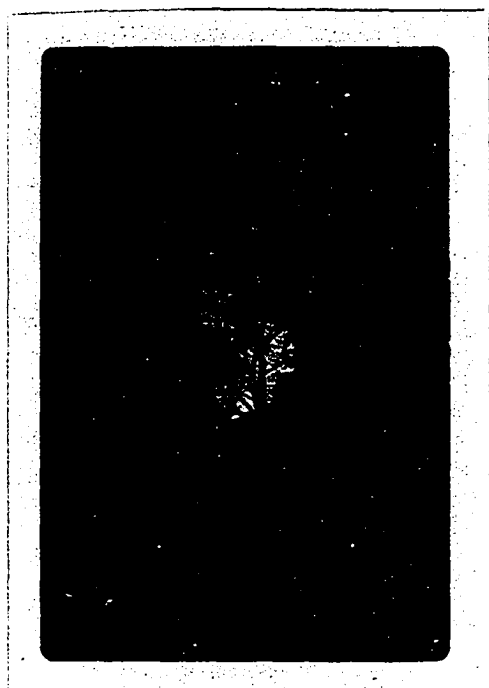
alnifolia. A large colony of blackberry, Rubus allegheniensis, occurs in Q E - 5; but both blackberries and raspberries are scattered throughout the shrub communities and beyond the arbor vitae into the adjoining swamp forest.

One other shrub, Gaylussacia baccata, the black huckleberry, grows under the arbor vitae along the association boundaries and is found in isolated arbor vitae clumps in the bog and marl meadows--especially where arbor vitae foliage is sparse and sunlight reaches the ground. Huckleberry grows on the elevated root areas at the base of Thuja trees. Poison sumac is common on the margins of almost every arbor vitae stand (Fig. 11). Spice bush (Lindera benzoin), elderberry (Sambucus canadensis), and species of Cornus occur along the margins of the arbor vitae association. These shrubs are also found in most of the forest associations in Cedar Bog. Cinquefoil and dwarf birch are abundant throughout the bog meadow as well as associated with the arbor vitae margins.

A unique, stable shrub community lies south of Woodburn Road on the west bank of Cedar Run. Swamp rose (Rosa palustris), poison sumac, ninebark (Physocarpus opulifolius), in addition to Alnus rugosa, Cornus alternifolia, and several species of Salix grow in this community. There is a dense herbaceous layer, mostly grasses, which almost conceals the many seepage areas and treacherous sink holes.

What happens to these various shrub communities apparently depends upon their location. The portions which are quite wet, containing speckled alder, swamp birch, Rhamnus, and cinquefoil,

Fig. 11. Poison sumac on the margins of the
arbor vitae association.



will doubtless remain the same, precluding a drastic change in the water level. This is to be expected because these northern species have been noted in Cedar Bog since botanists first visited the area.

The briar patch at the north end will likely be over-topped by trees and be eliminated. Those on the east margin of Cedar Bog will be replaced first by swamp forest dominated by silver maple. But oak and beech may follow because this area is on a rise above the arbor vitae and bog meadow and thus better drained. Oak and beech now grow at the south end, in quadrat F - 12.

The arbor vitae association

The arbor vitae stands north of Woodburn Road have previously been described (Frederick, 1964). However, the stands south of Woodburn Road do represent somewhat different stages of development. In quadrats E - 10 and 11, the arbor vitae are smaller than those west of Cedar Run. In one area, Q E - 10, the trees, although young, constitute a solid stand and create a dense shade in which few other plants grow. The ground is covered with arbor vitae foliage; sometimes, lichens are found on the trunks of the trees, but little else.

The arbor vitae in Q E - 11 are younger still and often interspersed with deciduous shrubs or small patches of bog meadow plants. Dwarf birch (Betula pumila), alder (Alnus rugosa), cinquefoil (Potentilla fruticosa), and species of dogwood (Cornus) commonly form small thickets between the arbor vitae. Eventually, the arbor vitae probably will over-top the deciduous shrubs, and this area, too, will become a pure stand of arbor vitae.

West of Cedar Run and south of Woodburn Road to the convergence of Cedar Run and West Branch, Q E - 9, the arbor vitae appear to vary in age from quite old to very young. In this tract, the trees are less dense, many herbaceous plants grow in the shade of the arbor vitae: swamp thistle (Cirsium muticum), wing-stem (Actinomeris alternifolius), bulblet fern (Cystopteris bulbifera), horsetail (Equisetum arvense), and grass-of-parnassus (Parnassia glauca). In Q E - 9 the large trees vary in size from 14" DBH to 20" DBH.

At the edge of the arbor vitae on the west bank of Cedar Run, ninebark (Physocarpus opulifolius) leans out over the stream. There is evidence that large arbor vitae were cut in this area. Several stumps remain, and one, although partially decayed, still measures approximately 15" in diameter (Fig. 12, C).

Some of the more unusual plants found here are the orchid, Habenaria clavellata, partridge berry (Mitchella repens), and sundew (Drosera rotundifolia). Although sundew is not rare in Cedar Bog, one colony, six to eight inches across, is growing on the base of an arbor vitae beside a seepage area. Even in dense shade, it flowers abundantly. On the raised area over the roots of an arbor vitae in Q E - 9, some genera (Clintonia, Gautheria, and Hexastylis) have been planted by over-zealous naturalists, probably with the mistaken view that because these plants are normally found in this habitat, they should be planted and preserved in Cedar Bog (Carl Horst, personal communication).

Thuja also occurs along the west bank of Cedar Run about 200 feet south of Woodburn Road and southward to the end of the

state-owned property, Q F - 9, 10, 11, and 12. In general, the trees in this tract are so very close together that it is often difficult to walk through the stand. It is in this region that the cathedral-like stand of arbor vitae was toppled by strong winds. In the tangled thicket which resulted, some arbor vitae are still living, though badly bent, but in many places, blackberry, ninebark, dogwood, and even giant blue-stem grass have grown among the downed trees. In fact, all of this arbor vitae stand has been damaged by high winds, but the worst damage is in the northeast section of quadrat F - 10 and in the southeast part of Q F - 11 and eastern Q F - 12.

Just northwest of the convergence of the two branches of Cedar Run (near the boundary of Q F - 9 and 10) is the only place where I observed Liparis loeselii. Small alders and few ferns--mostly Dryopteris and Thelypteris--are in the same area.

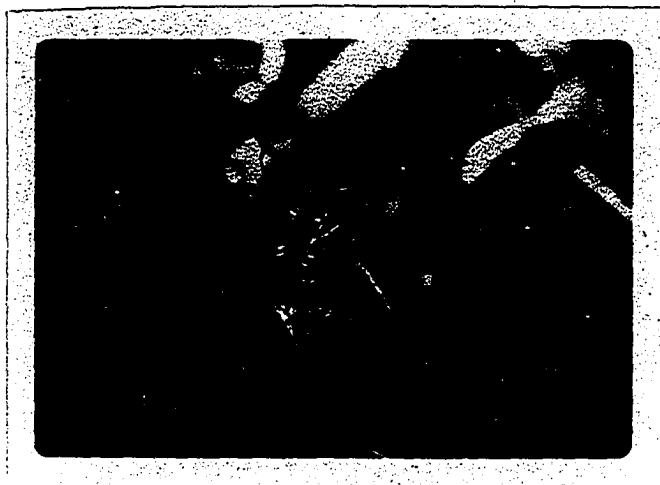
South of the convergence of the streams (Q F - 10, south half, and Q F - 11 and 12) are some stands which have no herbaceous plants, only fallen arbor vitae foliage. This is particularly true on the banks of Cedar Run. But in other areas, especially those a short distance west of the Run, are Taxus canadensis, Lycopodium lucidulum, Rubus pubescens, Mitchella repens, and species of Ranunculus (Fig. 12A). The drier areas next to Cedar Run probably result from down-cutting by the stream following the dredging of Cedar Run to the south.

One interesting difference between the arbor vitae tracts in this area and those to the north is that only one plant of

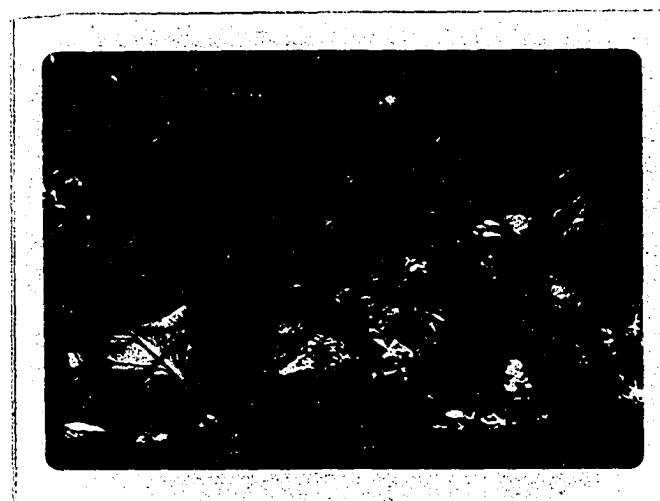
Fig. 12. Arbor vitae stands.

- A. Lycopodium at base of arbor vitae.
- B. Bulblet fern, skunk cabbage foliage,
and ground cover in arbor vitae
association.
- C. Partially decayed arbor vitae stump.

A.



B.



C.



Spiranthes ovalis was found west of Cedar Run at the very south end of the state-owned property. No Habenaria or Cypripedium was found south of the convergence of the streams. Probably the cypripediums were dug and sold as was much of the cinnamon fern in this region. It is doubtful that the two small orchids would have any commercial value. Either these small orchids have never been in this area or they have become extinct because the habitat has become drier as a result of dredging.

Because of wind damage in this southern region of Cedar Bog, the arbor vitae are generally smaller than those north of Woodburn Road. But trees of 12", 13", and 14 1/2" DBH were measured here. One large, downed arbor vitae log measured 25" four and one-half feet from the base. Three trees have developed from the branches of the fallen tree: the largest, 10 1/4" DBH, the other two only slightly smaller.

Most of the stands of Thuja occidentalis north of Woodburn Road contain many more herbaceous plants than those just described. There has been less wind damage in this region, but a few large arbor vitae were blown over during the summer of 1966. The large elms to the west which once provided a wind break are now dead. In fact, many of the large forest trees once in this region have been eliminated for one reason or another.

One interesting observation concerning arbor vitae reproduction is the frequency with which new trees develop from branches along downed logs. One example is found in Q D - 7 where an arbor vitae log 17 1/2" has fallen across Cedar Run; from it, five trees

are now growing, measuring 3 1/4", 4 1/2", 6", 6 1/2", and 11 1/2" DBH. In addition the largest of these sprouts has been bent until it is almost horizontal, and new "trees" are growing from it. Other trees in this quadrat measure from 14 1/2" to 17 1/2" DBH, as well as many much smaller.

The plants found here (Q E - 8 and D - 7) include Habenaria clavellata, H. psychodes, Spiranthes ovalis, Cypripedium calceolus, var. parviflorum, and Rubus pubescens. Anemonella thalictroides, Hepatica americana, Viola, spp. occur in abundance as do Equisetum arvense and Cystopteris bulbifera (Fig. 12B). Mitella diphylla is also common, and M. nuda occurs occasionally. Few shrubs are found here except Hydrangea arborescens and Lindera benzoin. One plant of Osmunda regalis was found in this area, Q D - 7, as was one group of Polypodium virginianum and one of Camptosorus rhizophyllus. The latter two are found growing on downed Thuja logs along and across Cedar Run.

Some of the largest living arbor vitae are found on Lottie McDaniel's property, the northeast corner of Q D - 7. Although some trees are smaller, the majority measure 8 1/2 to 17 1/2" DBH. This is the area in which there are practically no ground herbs except liverworts, Conocephalum, spp. In the south central part of the same quadrat (Q D - 7), most of the trees are between 6 and 12 1/2" DBH.

There is one small area of arbor vitae west of West Branch, Q G - 6 and 7. These large trees, widely separated, are apparently remnants of a larger stand. Two swales, or low seepage areas, form little streams here, emptying into West Branch. This particular

spot was probably much wetter at one time, though certainly long ago, because large oaks, typically found in mesic habitats, are found in regions adjacent to these swales today.

The Thuja stands once occupied a large area in the Mad River Valley (Dachnowski, 1910), but, aside from those growing in the Cedar Bog Nature Preserve, very few trees remain. South of Cedar Bog arbor vitae grow along Cedar Run about a mile south of Dallas Road, but today none occurs farther south in the Mad River drainage system. Even in this small area very few trees remain. Once, the cedars must have extended southward along Cedar Run as far as Mad River in Clark County (Evans, 1924).

Of all the bog associations in Cedar Bog, I would expect the Thuja occidentalis association to survive longest. Should some unfortunate occurrence eliminate the bog and marl meadow areas, probably the arbor vitae would survive; would withstand a great variety of environmental changes.

Swamp forest association

The swamp forest association occupies by far the greatest area in Cedar Bog, but there are at least three distinct segregates and considerable variation from area to area within the association. In the wooded western extension of the state-owned property, just five years ago the dominant tree was American Elm (Ulmus americana) with some red or slippery elm (Ulmus rubra) on the drier margins of the tract. The east end of this swamp forest segregate still has several very large elms, which will likely be killed by Dutch elm disease.

One large buttressed elm, measured at 6 1/2' to avoid the buttress, was 44" in diameter. Because it had fewer leaves and more dead wood in the summer of 1966, it was thought that this tree would soon die. In the spring of 1967, the tree blew down. Red and silver maple (Acer rubrum and A. saccharinum) and black and green ash (Fraxinus nigra and F. pennsylvanica var. sub-integerrima) are also in this area, Q G - 11 and 12. In addition, many large tuliptrees (Liriodendron tulipifera) occur along the eastern edge of this swamp forest segregate.

Perhaps most interesting here are the numerous large cinnamon ferns (Osmunda cinnamomea) and silvery glade ferns (Athyrium thelypteroides). Some cinnamon fern fronds stand five feet or more, growing from a rhizome-like stem 6 to 12 inches above the soil surface. Evans (1944) reported that in 1924 florists paid the local residents to dig these handsome plants for commercial use. Species of Dryopteris occur here, too. Shrubs found in this region include blackberry, spice bush and some Canadian taxus. During the summer, head-high stinging nettles are present in almost every open area.

Just west of this area (Q H and I - 10, 11, and 12) the big elms are now dead. But in the late summer of 1962, the elms were alive and appeared vigorous; there was no shrub under-story except in one area (Q H - 10 and 11) where spice bush formed a thicket; and there were few herbaceous plants. Ebony spleenwort (Asplenium platyneuron) and several species of Dryopteris were

scattered widely throughout the area with a few asters and golden-rods. But generally the ground was only covered with leaves in various stages of decay.

Only three years later, the summer of 1965, this same region was an almost impenetrable thicket of nettles, blackberries, spice bush, shrubby dogwoods, and Actinomeris. The elms were dead and some blown over. Ferns, now rare, were at the base of sycamores, silver or red maple trees which are scattered throughout the area.

Probably within 20 or 25 years the trees, particularly maples, will over-top the shrubs and herbs, and the area may again resemble the glade-like region it used to be. It will no doubt first become a secondary maple community similar to the vegetation in quadrats F and G - 9. After natural thinning, it should return to an open swamp forest habitat.

The young silver and red maple community (Q F and G - 9) is part of the swamp forest association but its successional pattern is only beginning. When I visited Cedar Bog in the late 1940's, there were no woody plants in this tract except one large cottonwood and one stand of silky dogwood (Cornus obliqua). For the most part, tall grasses and some horseweed dominated the area. Doubtless, this tract was never farmed or the dogwood would have been removed, but it may have been heavily pastured. Possibly, too, it once was all arbor vitae which were cut for telephone poles. Lowering the water level may have resulted in silver maple, red maple, and elm seedlings becoming established.

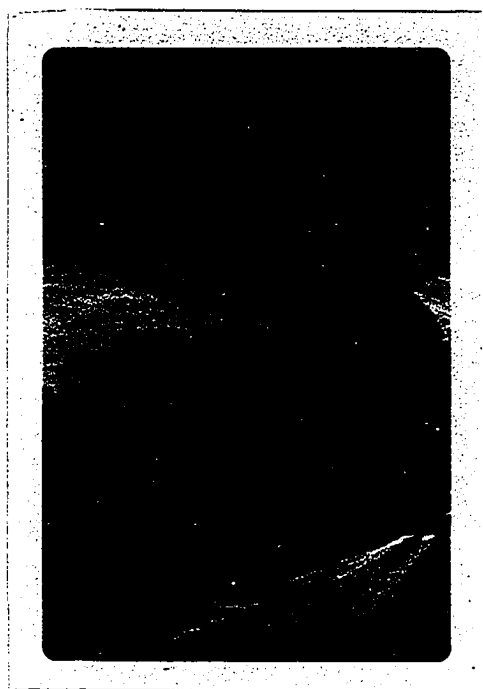
There are no maple trees here more than 20 years old, and most of the young elms are now dead. Natural thinning is occurring with the death of the small maples as well as elms. A large sycamore measuring 44" DBH grows just south of Woodburn Road at the northwest corner of this quadrat. Sycamores also grow along the west bank of West Branch in the northern part of this tract.

There is no shrub under-story, but some ferns are found here, particularly near the margin of the arbor vitae stands along the stream. Several different herbaceous species occur here, primarily violets (Viola species), garlic mustard (Allaria officinalis), several Umbelliferae (Thaspium, Sanicula, and Osmorhiza), Greek valerian (Polemonium reptans), and colonies of wood anemone (Anemone quinquefolia). In every somewhat open area touch-me-not (Impatiens capensis) is waist high from mid-summer until frost.

This community will probably become a mature swamp forest dominated by red and silver maple; eventually the two areas, this and the one described above, will be continuous.

Although not generally so considered, I think the tuliptree community south of Woodburn Road (Q F - 9) must also be considered a swamp forest community (Fig. 13). The soil here is largely peat and is wet, or at least damp, throughout the year. Even though I have never seen water ponded here, skunk cabbage (Symplocarpus foetidus) grows in all parts of the quadrat. Hepatica americana, Anemonella thalictroides, Viola, spp., Oxypolis rigidior, and Eupatorium rugosum are abundant in this community.

Fig. 13. Tuliptree Swamp Forest, Q E - 9.



The principal shrubs found in this area are spice bush and elderberry, forming a definite shrub layer. The tuliptrees are between 24" and 30" DBH. Extremely large, vigorous poison ivy (Rhus radicans) grows up many tree trunks.

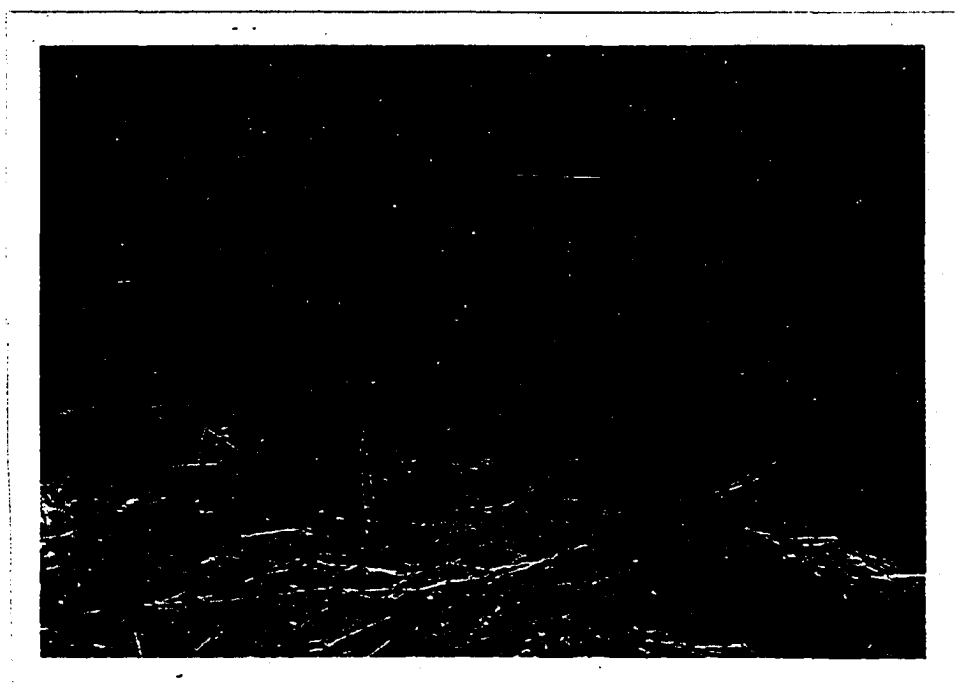
Nannyberry (Viburnum lentago) and Cornus spp. are found. Grape vines (Vitis riparia), virgin's bower clematis (Clematis virginiana), and wild yam (Dioscorea villosa) clamber over one another, over small shrubs and the broken fence. Hypericum spathulatum provides a spot of color near West Branch in late July and early August.

The tuliptree stands at the east end of the swamp forest farther south (Q F - 10 and 11) are also old; one measures 34 1/2" DBH. The trunk is inclined almost horizontally for about five feet, then grows upright, as if it had been hit by a falling tree which eventually rotted away. To the imaginative, it resembles the so-called Indian trail marker trees.

In this area, there is a mixture of plants: maple, ash, and a few arbor vitae. The largest trees are tuliptrees. There are also ferns, Eupatorium spp., mosses, a few goldenrods and asters, Oxypolis, and dwarf raspberry in this area. Because small arbor vitae occur in some areas, Thuja may become dominant.

North of Woodburn Road the swamp forest association occupies the large central area of the Cedar Bog Nature Preserve (Fig. 14). But even here, two distinctly different communities exist. Just north of the road, in quadrats E and F - 8, 7, 6, and part of 5, are many large dead elm stumps. In addition, ash,

Fig. 14. Swamp Forest Association, Spring, 1967.



basswood (Tilia americana), musclemwood or blue beech (Carpinus caroliniana), are numerous throughout the area. On the west margin are mature tuliptrees, swamp white oak (Quercus bicolor), some relatively large butternut trees (Juglans cinerea) and, toward the north end, some large red maples. A few mature wild cherries (Prunus serotina) are also found here.

On the west margin, some tuliptrees were measured from 31" to 34 1/2" DBH, and one swamp white oak at 26" DBH. In one place on the east bank of West Branch six tuliptrees, one quite large, grow quite close together--in fact, they appear joined at the base. Although no evidence remains, these six, all of different ages, growing in such close proximity, indicate that they most probably originated from one old stump.

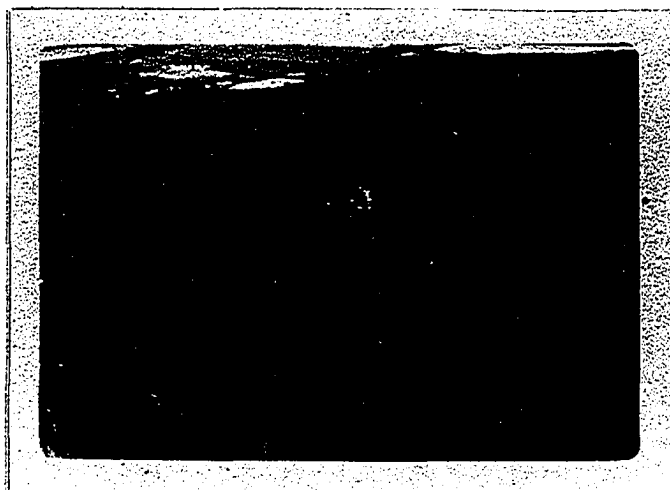
Shrubs in this section are mainly spice bush, elderberry, and dogwood, although a few shrubs of Prunus and Crataegus are scattered throughout. Herbs include Hepatica, Allaria, species of Thalictrum, a few lilies (Lilium michiganense), Desmodium species and wild yam (Dioscorea villosa). In the slightly drier and more open areas are many composites: Helianthus giganteus, Eupatorium rugosum, Rudbeckia laciniata, Senecio aureus, Erigeron spp., Aster simplex, and Actinomeris alternifolius.

The swamp forest to the north end of the state-owned property (Q D, E, F, and G - 1, 2, 3, and 4) was dominated by elms which, with few exceptions, are now dead (Fig. 15). My designation as swamp forest is debatable, but I've retained it, for the area is a swamp forest habitat. At present, thickets of

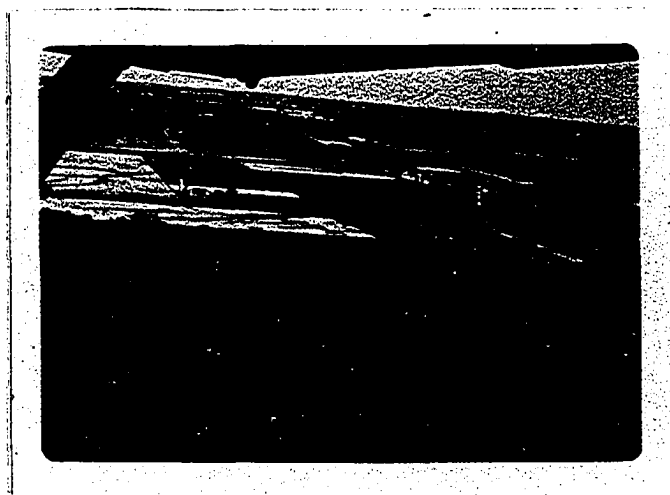
Fig. 15. Aerial views, summer, 1966, showing dead elms.

A. North end of state-owned property.

B. Western extension.



A.



B.

Cornus and Rubus cover the area; stinging nettles are six feet high in summer; and species of Galium clamber over other plants. These areas are almost impassable in the summer. Relatively large red maples are widely scattered throughout the zone, as well as one large sycamore and a few mature tuliptrees. But no seedlings of these trees are now evident. On the west margin are several butternut seedlings and a few oak trees, Q. imbricaria and Q. muehlenbergii in quadrat F - 2. One old, large, red elm, and several relatively large ash trees are found across the north end of the state-owned property. Some Prunus is also here.

To predict the successional pattern in this district of the Bog is pure conjecture. I would expect butternut, ash, tuliptree, and red maple to dominate. It is also possible that some arbor vitae may invade this region because they are more likely to succeed in the summer shade of shrubs and coarse annuals. The solitary, small arbor vitae growing 50 to 100 feet into the swamp forest west of the Thuja stands along Cedar Run provide evidence for this possibility.

Should this portion of the Bog become slightly drier, oaks, particularly shingle oak (Q. imbricaria) and chinquapin or yellow oak (Q. muehlenbergii), growing to the west, might spread eastward into this section. There is evidence for this view, too, because young oaks only 10 to 12 feet high grow on the east bank of West Branch, particularly toward the north in Q F - 4, 5, and 6.

The hardwood forest association

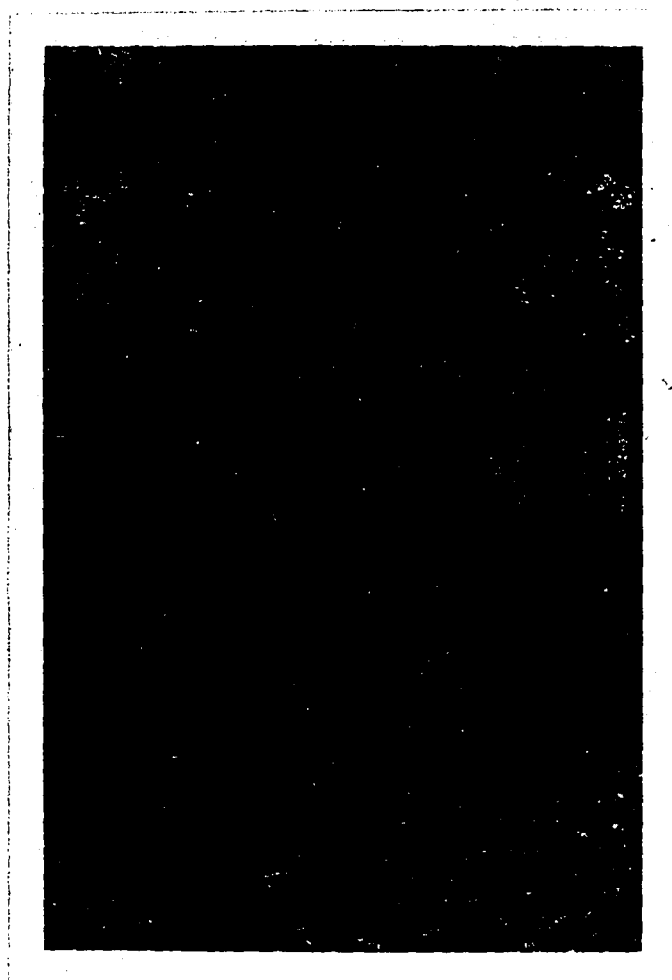
There are two distinctly different hardwood forest segregates in Cedar Bog, differing not so much in species composition, but in aspect and location. At the west end of the western extension, is a mixed hardwood forest, with beech, maple, oak, and hickory trees. This particular forest seems to follow the topographic map line showing a five-foot increase in elevation. Although the soils map shows this area to be poorly drained, the soils must be reasonably well drained. Either this area overlays a large gravel lens, or the drainage area is just too small to be indicated on the soils map.

Large beech trees (Fagus grandifolia), measuring 27" to 33 1/4" DBH grow near the boundary between the swamp forest and hardwood forest (Q I - 10) and in quadrat H - 12, on the southern border of the western extension. Interestingly, no young beeches are here except for small root sprouts under some of the older trees. However, beech will no doubt persist, although good sugar maple reproduction is already well established (Fig. 16). The largest of the maple in this area measures 46 1/2" DBH, and one other measures 40" DBH.

West of the beech trees (Q J - 11) are several hickories; one shagbark hickory (Carya ovata) measuring 27" DBH, and another 25 1/2" DBH. Also, there are sweet pignuts (Carya glabra and C. ovalis), and one specimen of mockernut hickory (C. tomentosa). Dr. A. B. Ream of Mechanicsburg, whose hobby is cultivating nut trees, believes that there are few, if any, "pure" hickory species

Fig. 16. Hardwood Forest, Western Extension.

Note young sugar maple trees.



in the county. He believes that hybridization and introgression have resulted in practically every tree having some characteristics of at least two species (personal communication). Certainly, a judgment as to what species are represented in Cedar Bog has not been easy.

Many oaks are growing with the beech and hickory. The most common species is swamp white oak (Quercus bicolor). In addition, chinquapin oak (Q. muehlenbergii) and several trees identified as Q. schumardii are present. No typical red oak (Q. borealis var. maxima), is found in this part of the Bog, but some specimens appear to be hybrids of the northern red oak. One swamp white oak measures 34" DBH; the largest Schumard's red oak is 41" DBH; others of the same species measure 34 1/2" and 32" DBH.

Surprisingly, there are still a few large elms in this area. Most are red elm (Ulmus rubra); one measures 31" DBH. Hackberry (Celtis occidentalis) is found throughout this part of the Bog, as well as in the swamp forest association. Many small Ohio buckeye trees (Aesculus glabra) are found near the end of the western extension. The largest observed was only 7" DBH. Apparently the mature tree which seeded the area is now dead. One honey locust tree (Gleditsia triacanthos) is located in Q J - 12, along with several hawthorns (Crataegus, spp.).

The shrub under-story, where it occurs, is composed of spice bush, prickly ash, dogwood and, in a few places, blackberry. The shrubs are found mainly on the forest margins where shade is less dense. The only sub-canopy trees found in the oak-hickory

communities are small sugar maples, small buckeyes, and a few oak seedlings.

Sugar and red maples up to 10" DBH and small oaks grow along the northern margin of the forest extension (Q G, H, and F - 10). Most trees on the southern boundary are larger but not as old as those nearer the center of the tract. Here, too, a veritable thicket of spice bush and berries grow as a shrub under-story.

Throughout this deciduous forest, the ground is thickly covered with grasses and herbs; violets, garlic mustard (Allaria officinalis), wake robin (Trillium sessile), phlox (P. divaricata), running strawberry vine (Euonymus obovatus), myrtle (Vinca minor), a few sedges, and many grasses and mosses. In late fall asters (particularly A. simplex), a few goldenrods (Solidago), and clammy leafcup (Polymia canadensis) flower in the deciduous forest. Vines are frequent. The most common ones are Smilax rotundifolia, Polygonum scandens, Rhus radicans, and two species of Vitis. One colony of the orchid, Aplectrum hyemale, was found beside a mature beech. Wild leek (Allium tricoccum) is abundant.

It is improbable that this region will become wetter or drier than it is now. Although sugar maple may replace the hickories, the hardwood forest in Cedar Bog will likely remain much the same despite the lack of visible evidence of beech reproduction. The young oaks now present will doubtless remain in the association for at least a century, perhaps eventually replaced by a beech-maple climax association.

Oak-maple segregate

The most puzzling portion of the hardwood forest association is the oak-maple segregate north of Woodburn Road and west of West Branch (Q G and F - 2 through 8). Surprisingly, there are no tuliptrees in this area although large ones are found just across the stream only 20 or 25 feet away. The trees in this tract are widely separated, much smaller and obviously younger than those in the western extension, but nonetheless mature. Unlike the hardwood forest in the western extension, a denser shrub under-story and fewer flowering herbaceous plants are present.

The origin of this area is conjecture, but it was probably wetter at one time. Possibly this section (Q G and F - 2 through 8) and that belonging to Harry Booher lying to the west (Q G, H, and I - 2 through 7) once were similar. The entire area may have been a bog meadow association followed by a swamp forest association.

Today, these two sections are very different. Booher's woods contain primarily dead elms, resembling the swamp forest at the north end of Cedar Bog. A few large seepage areas are present, resulting in small streams which flow from Booher's property through the state-owned property into West Branch. Although I have not investigated this area in detail, it appears similar to the swamp forest association and probably the soil is continually moist.

In contrast, the canopy species on the state-owned property are primarily oak and maple. Except for the seepage areas and

small streams coming from Booher's woods, the soil is firm, much drier and better drained than areas to the west or east of the stream.

These contrasts may be the result of dredging. West Branch has been dredged on probably more than one occasion. Evidence of dredging is still visible along the west bank, where a raised ridge parallels the stream. Possibly Booher's property was actually wetter following dredging because drainage toward West Branch was limited by the ridge west of the stream. Too, erosion of the dredged material toward the west deposited sandy peat and some gravels on top of the original peat west of West Branch, raising the soil surface even more. Repeated dredging would thus continue to raise the level of the soil surface in the state-owned portion, at the same time ponding even more water on Booher's property. This procedure would then explain the differences in the two areas today.

Regardless of how it may have occurred, I think that the oak-maple segregate in Cedar Bog is much better drained than any of the adjoining areas. It has been disturbed and altered by man within the last 50 to 75 years; more disturbed than any other area of the present state-owned property.

This disturbance has doubtless led to the establishment of some hybrids and consequently, some perplexing problems in plant identification. One excellent example of these problems concerns one oak tree growing on the west bank of West Branch. The bark and growth habit resemble swamp white oak (Alderman, personal communication); the leaves look most like Q. stellata and the

acorns have the characteristics of bur oak (Q. macrocarpa). One less extreme example is an oak near Woodburn Road at the west edge of the state-owned land which has the aspect of pin oak (Q. palustris); leaves and winter buds resemble black oak (Q. velutina); but the inner bark is not orange; and the acorns look like those of red oak (Q. borealis var. maxima). Certainly the oaks should be thoroughly investigated.

It is not implied, however, that all the trees in the area are hybrids. There are several chinquapin oaks; at least one clearly identifiable red oak; many swamp white oaks, and silver and red maple. Far to the north (Q F - 2 and 3) there is shingle oak (Q. imbricaria) and one that very closely resembles swamp chestnut oak (Q. michauxii) as well as Shumard's red oak. On the boundary of quadrats F - 5 and 6 is one black walnut tree, measuring only 7" DBH, with several seedling walnuts. Several butternut (Juglans cinerea) seedlings are here, too. Wild cherry (Prunus serotina) also grows in this region of the Bog, as do red and black ash (Fraxinus pennsylvanica var. subintegerrima and F. nigra). Most of the sub-canopy trees are blue beech (Carpinus caroliniana) but one hop hornbeam (Ostrya virginiana) is located in Q G - 5.

There is a dense shrub under-story in many areas of this segregate. The species include dogwood (Cornus), prickly ash (Xanthoxylum americanum), berry briars (species of Rubus), wild roses (mostly R. palustris, R. caroliniana, and R. virginiana, with some hybrids), ninebark (Physocarpus opulifolius), and nanny-berry (Viburnum lentago). St. John's wort (Hypericum spathulatum) also grows along the road, as do cattails (Typha latifolia).

Herbaceous plants include one stand of Christmas fern (Polystichum acrostichoides), a few plants of bottle gentian (Gentiana andrewsii), scattered ferns (Dryopteris), violets, some sedges and grasses. In the seepage areas skunk cabbage (Symplocarpus foetidus) is found and on the stream bank grows Iris virginica.

If there is no change in the water regime, one would expect no change, particularly of the canopy species, for perhaps centuries. I would expect the oak to remain a dominant species. The shrub layer will probably become less dense as the canopy species become larger. Some species may be eliminated if the water level becomes lower. Over many years, beech and maple may become established here, but it seems probable that this unique oak stand will remain two or three centuries.


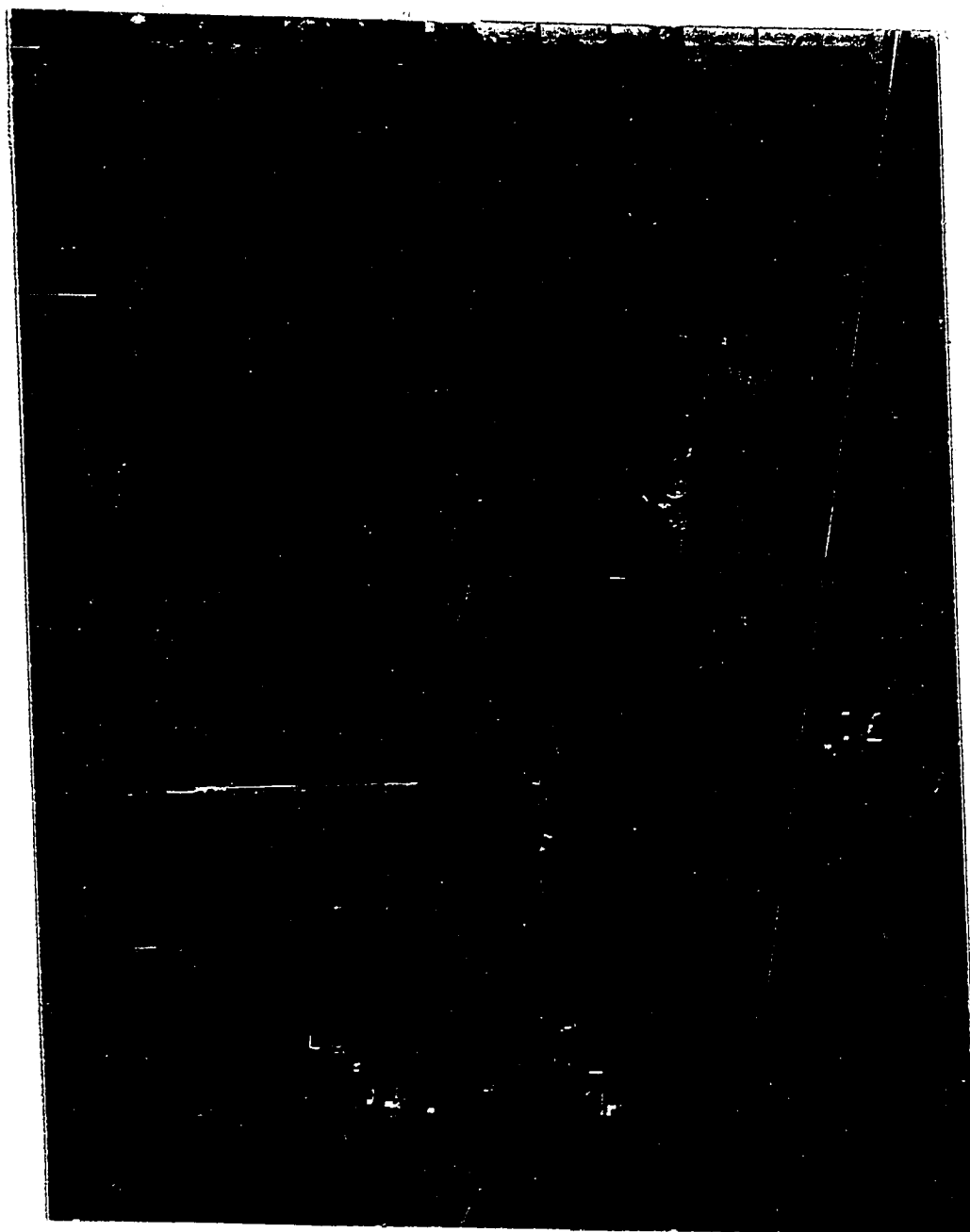


Fig. 17. Aerial photograph of the Cedar Bog area with quadrats illustrated.



PHENOLOGY

A phenological study of the Cedar Bog vegetation was begun in 1963. Because of the relatively short period of observation, the information to date is incomplete but this study is being continued. Data for 1963 through 1966 are listed in Table VII.

Not every species in the Bog is recorded. Primarily the listing shows the flowering dates of herbaceous plants on the state-owned Preserve and would be most useful to people wishing to see specific plants in Cedar Bog because most "showy" perennials are included. Note, too, that a greater variety of plants are in flower in August and September, yet students rarely visit the Bog at this time of year.

Genera with different species flowering over a long period (such as Aster, Rudbeckia, and Solidago), with an over-lap in flowering periods, are listed by genus only. For example, Aster, spp. includes all the species of aster found in Cedar Bog; but each species is listed separately in the Annotated Plant List with its specific flowering period.

Each month is arbitrarily divided into four periods: days 1 through 7, the first period; days 8 through 15, the second period; days 16 through 23, the third period; and days 24 to the end of the month, the fourth and last period. If a species is

recorded as in flower the first and third periods of the month, logically, it was also in flower the second period. This is not shown in the data, because only individuals actually observed were noted.

TABLE VII. Phenological data, Cedar Swamp, Champaign County, Ohio

Species	Date of bloom									
	1963	1964			1965			1966		
	May	Mar.	Apr.	May	Mar.	Apr.	May	Mar.	Apr.	May
<i>Actaea pachypoda</i>	•									
<i>Allaria officinalis</i>	••		••							•
<i>Anemone</i> <i>quinquefolia</i>			••				•			
<i>Anemonella</i> <i>thalictroides</i>	••		••			••			•••	•
<i>Aquilegia</i> <i>canadensis</i>	•			•			•			
<i>Arisaema</i> <i>triphellum</i>	•									••
<i>Caltha palustris</i>	•						•			
<i>Cardamine, spp.</i>	••		•				•			
<i>Cypripedium</i> <i>calceolus</i>				•			•			
<i>Dodecatheon meadia</i>	•			•						
<i>Erigeron, spp.</i>				•						
<i>Geranium maculatum</i>			•				•			••
<i>Hepatica americana</i>	•		•					•		
<i>Hypoxis hirsuta</i>	•			••						
<i>Iris virginica</i>	•									•
<i>Krigia biflora</i>				•						
<i>Lindera benzoin</i>			•						•	
<i>Maianthemum canadense</i>	•			•			•			•
<i>Mitchella repens</i>	•			•						
<i>Mitella, spp.</i>	••		•	•						•
<i>Nasturtium</i> <i>officinale</i>									••	•
<i>Pedicularis</i> <i>canadensis</i>	•									
<i>Phlox divaricata</i>			•				••			
<i>Physocarpus</i> <i>opulifolius</i>				•						
<i>Polemonium reptans</i>	•		•							•
<i>Ribes, spp.</i>				•						
<i>Rubus, spp.</i>				•						
<i>Salix, spp.</i>			•			•••		•	••	
<i>Senecio, spp.</i>	•		•				•			•
<i>Smilicina, spp.</i>	••						•			••

TABLE VII (cont.)

Date of bloom

Species	1963	1964			1965			1966		
	May	Mar.	Apr.	May	Mar.	Apr.	May	Mar.	Apr.	May
<i>Symplocarpus foetidus</i>		•						•	•	•
<i>Thalictrum clavatum</i>	•									
<i>T. dasycarpum</i>				•						
<i>Trientalis borealis</i>				•			•			•
<i>Trillium, spp.</i>	•		•	•		•	•		•	•
<i>Uvularia, spp.</i>			•						•	•
<i>Valeriana ciliata</i>	•			•						
<i>Viburnum lentago</i>				•						
<i>Viola, spp.</i>	•		•	•						•
<i>Zizia aurea</i>	•		•	•						

TABLE VII(cont.)

Species	Date of bloom							
	1963		1964		1965		1966	
	June	July	June	July	June	July	June	July
<i>Agrimonia</i> , spp.				• • •				
<i>Allium cernuum</i>				• •				• •
<i>Allium tricoccum</i>				• •				
<i>Anemone virginica</i>				•				• •
<i>Aralia racemosa</i>	•							
<i>Arisaema dracontium</i>	•			• •				•
<i>Asclepias</i> , spp.								
<i>Cacalia tuberosa</i>	•		•			•		• •
<i>Calopogon pulchellus</i>	•		•					• •
<i>Campanula</i> , spp.				•				• •
<i>Cornus</i> , spp.	•						•	
<i>Cypripedium reginae</i>	•							
<i>Drosera rotundifolia</i>								•
<i>Erigeron</i> , spp.	•			•		•		
<i>Filipendula rubra</i>				•				
<i>Habenaria clavellata</i>				•				• •
<i>H. psycodes</i>				•	•			• • •
<i>Helianthus</i> , spp.								•
<i>Hydrangea arborescens</i>							•	
<i>Hypericum</i> , spp.								•
<i>Impatiens capensis</i>				•				•
<i>Krigia biflora</i>	•							
<i>Liatris spicata</i>				•				
<i>Lilium michiganense</i>				•		•		• •
<i>Lysimachia</i> , spp.			•	• • •				•
<i>Phlox maculata</i>			•	• • •				• •
<i>Physocarpus opulifolius</i>	•							•
<i>Polygonatum pubescens</i>	•							•
<i>polytmia canadensis</i>				•			•	• •
<i>Potentilla fruticosa</i>	•						•	• •
<i>Rosa</i> , spp.				•		•		• •

TABLE VII (cont.)

[illegible]

TABLE VII (cont.)

Species	Date of bloom							
	1963		1964		1965		1966	
	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.	Aug.	Sept.
<i>Actinomeris</i>			•		•••		••	•
<i>Agrimonia</i> , spp.	•				•	•		
<i>Allium cernuum</i>	•						••	
<i>Amphicarpa bracteata</i>				•	•	•		
<i>Apios americana</i>			•					
<i>Asclepias</i> , spp.		•	•					
<i>Aster</i> , spp.	••	••	••	••	••	••		•••
<i>Bidens</i> , spp.		•		•	••	•	•	
<i>Blephilia hirsuta</i>					•			
<i>Cacalia tuberosa</i>	•							
<i>Campanula</i> , spp.	•		•					
<i>Chelone glabra</i>				••	•			•
<i>Cirsium</i> , spp.	••		••		•		••	••
<i>Clematis virginiana</i>	•		•					
<i>Coreopsis tripteris</i>	•		•••	•			•	•
<i>Drosera rotundifolia</i>	•							
<i>Epilobium</i> , spp.			•		•			•
<i>Erigeron</i> , spp.			•		•			
<i>Eupatorium</i> , spp.	••	•	••	•		•	•••	••
<i>Filipendula rubra</i>	•						•	
<i>Gentiana andrewsii</i>		•						
<i>G. crinita</i>		•		•				••
<i>Gerardia purpurea</i>	•		•					
<i>Helenium autumnale</i>	••	•						•
<i>Helianthus</i> , spp.	•		•	•	••••	•	•••	••
<i>Heliopsis helianthoides</i>			•					
<i>Hypericum</i> , spp.			•		•	•	•	
<i>Impatiens capensis</i>	•	•	•					•
<i>Liatrus spicata</i>	•						••	
<i>Lactuca</i> , spp.			•					
<i>Lobelia</i> , spp.	•••		•		••	•		•

TABLE VII (cont.)

Date of bloom

103

[illegible]

Date of bloom

Species	1964		1965		1966	
	Oct.	Nov.	Oct.	Nov.	Oct.	Nov.
<i>Agrimonia gryosepala</i>			•			
<i>Aster</i> , spp.	•		••		•••	
<i>Euphorbia vermiculata</i>			•			
<i>Gentiana</i> , spp.					••••	••
<i>Lobelia</i> , spp.					•	
<i>Oxypolis rigidior</i>	•				•	
<i>Parnassia glauca</i>					•	
<i>Potentilla fruticosa</i>					•	•
<i>Solidago</i> , spp.	•		•		••••	
<i>Sonchus asper</i>			•			
<i>Spiranthes ovalis</i>						•

ANNOTATED PLANT LIST

In the Annotated Plant List, in most cases, the following information is given:

(1) My collections in Cedar Bog are compared with lists published by Kellerman and Werner (1893) and Kellerman and Wilcox (1895). The name "Kellerman" alone is used to indicate these publications. Two other botanists, Mrs. E. Jane Spence and W. J. Biddlecombe, both of Springfield, collected plants in Cedar Bog prior to 1895. Their specimens are in The Ohio State University Herbarium.

Unless otherwise stated, all specimens referred to here are in the Herbarium of The Ohio State University. No comprehensive attempt was made to search for Kellerman, Werner, or Wilcox specimens in other herbaria.

A small, but interesting, collection of plants is at Urbana College. Most of these specimens were collected in the early 1800's by Milo G. Williams, plus some by W. S. Sullivant and John Samples. Those collected in Cedar Bog are noted in the Annotated Plant List.

To determine species previously reported from Cedar Bog or Champaign County, I have consulted Dachnowski (1912), Franks (1931), Stuckey (1966), Hicks (undated), and specimens in The Ohio State Herbarium in addition to the Kellerman lists.

(2) The frequency or occurrence of a species is designated by one of the following terms: rare, occasional, frequent, common, or abundant. These are my judgments, based on how often a particular species was observed.

(3) The location of collections or occurrence of species is noted by the quadrat system indicated in Figures 7, 8, and 17. Plant associations in which species are found are also illustrated in Figures 7 and 8.

(4) The date of flowering, where given, is specific for the species and thus expands the information given in Table VII.

(5) Plant species common to both Cedar Bog and the Northern Lower Peninsula of Michigan are starred. Information is taken from Gates and Ehler (1924), Gates (1942), and Voss (1954 and 1956). Plant species in the list generally considered boreal species are indicated. Prairie species are noted, when that information is known. But a clear delineation of prairie species is not now available. A few species appear to be most common on the eastern coastal plain and the Mississippi embayment. These are also noted in the List.

The estimated age of trees has been calculated from information given by Fowells (1965). These are purely estimates, based on the average or most common annual increment in diameter of the species described. These are included simply to give a general idea of the age of various forest stands in Cedar Bog.

When certain information seems important with reference to a genus, it is found under the sub-heading for that genus. In

these introductions I have outlined some of the problems encountered in identification. In addition, I have expressed my sincere thanks to those who have generously assisted in identification or have checked my identifications.

Nomenclature of all woody plants follows Braun (1961); and, in general, herbaceous flowering plants follow Fernald (1950), although additional works, particularly monographs have been consulted. Nomenclature of ferns and other pteridophytes follows Wagner (1962, 1963, and 1965); Wherry (1961), and Blasdell (1963).

Voucher specimens for all the species given in this list are deposited in The Ohio State University Herbarium. A quadrat map is deposited with the collection. Duplicates, where available, will be deposited in the herbarium at Urbana College, Urbana, Ohio.

ACERACEAE

*Acer negundo L.

Boxelder

Reported by Kellerman; no specimen. Infrequent in the swamp forest association. Q G - 10 and small trees in Q F - 3.

Acer nigrum Michx. f.

Black maple

Only two specimens collected seem typical of the species based on presence of stipules. Several are intermediate and appear to be hybrids of A. nigrum and A. saccharum. These specimens probably are results of introgressive hybridization as reported by Desmarais (1952), Kriebel (1957), and Braun (1961).

*Acer rubrum L.

Red maple

Very common; usually associated with silver maple in moderately wet areas of the swamp forest. One large tree in

Q H - 11 measured 40" DBH. Average annual growth in diameter (Fowells, 1965) indicates this tree may be well over 100 years old.

*Acer saccharinum L. Silver maple

Reported by Kellerman; no specimen. The most abundant maple in the Bog. In almost all forest regions, especially in wet areas in the center of region north of Woodburn Road and in swamp forest of western extension.

*Acer saccharum Marsh. Sugar maple

One specimen collected by Kellerman but no location given. In west end of hardwood forest. Some very large trees in Q J and I at boundary of 10 and 11. One tree, 30 1/2" DBH; possibly 150 years old (Fowells, 1965). Three specimens appear to be hybrids with A. nigrum.

ALISMATACEAE

*Alisma plantago-aquatica L.

Reported by Kellerman; no specimen. Rare. Q F - 8 in West Branch just north of Woodburn Road. Flowers, late August.

*Alisma subcordatum Pursh. Eastern water plantain

Previously unreported from Cedar Bog. Aquatic. Occasional in Q F - 10 at convergence of streams and in Q F - 8, West Branch, just north of Woodburn Road.

*Sagittaria latifolia Willd.

Specimen from Cedar Bog, Kellerman, 1894. Rare. At edge of West Branch, Q F - 8.

AMARYLLIDACEAE

Hypoxis hirsuta (L.) Coville Yellow star grass

Reported by Kellerman but no specimen. Rare. Q D - 7 in the arbor vitae association. Flowers, mid-May to early June.

ANACARDIACEAE

*Rhus radicans L. Poison ivy

Not collected. Abundant in swamp forest. Many large fruit-bearing vines.

*Rhus vernix L. Poison sumac

Reported by Kellerman; no specimen. Common along Cedar Run both north and south of Woodburn Road. Not collected.

APOCYNACEAE

*Apocynum sibiricum Jacq. Indian hemp

Previously unreported in Champaign County. Occasional. Q E - 9 on roadside west of east bridge.

Vinca minor L. Myrtle

Probably adventive in the hardwood forest association of the Bog. Occasional. Previously unreported from Champaign County. Q J - 11.

ARACEAE

Arisaema dracontium (L.) Schott. Green dragon

Rare. Found only in one place, Q F - 4. Flowers, mid-June.

*Arisaema triphyllum (L.) Schott. Jack-in-the-pulpit

Abundant in all swamp forest associations, as well as in

many arbor vitae stands. Sometimes the only herbaceous plant in young, dense arbor vitae areas. Flowers, May.

*Symplocarpus foetidus (L.) Nutt. Skunk cabbage

Abundant. On roadsides; in all wet areas of swamp forest and arbor vitae associations. Q E and F - 8 and 9. Flowers, March and April (Fig. 18).

ARALIACEAE

*Aralia racemosa L. Spikenard

Reported by Kellerman; no specimen. Common in arbor vitae association, Q D - 7 and swamp forest, Q F - 10 and 11. Flowers, mid-June.

ASCLEPIADACEAE

*Asclepias incarnata L. Swamp milkweed

Reported by Kellerman but no specimen. In bog meadow and arbor vitae associations. Frequent. Flowers, mid-July to early August.

There are two distinctly different subspecies in Cedar Bog, but neither completely fits Woodson's subspecies (Woodson, 1954). Specimens #1144 (Q D - 8) and #207 (Q E - 9) are somewhat like A. incarnata L. subsp. incarnata but are conspicuously pubescent. Stems repeatedly branched. Leaves leathery with truncate bases. Specimens #525 (Q D - 6) and #552 (Q D - 7) are most nearly like subsp. pulchra. Unbranched (#552) or a single branch. Corollas completely purplish (#525) or pinkish-purple with cream at very base (#552). Leaves thin, not leathery.

Fig. 18. Skunk cabbage, Symplocarpus
foetidus (L.) Nutt.



Woodson (1954) considers var. pulchra as "adventive in Ohio . . . watersides and moist soil, frequently in somewhat brackish tidal marshes." The alkaline soil in Cedar Bog and the water heavily charged with calcium carbonate would seem to provide a similar habitat.

*Asclepias syriaca L. Common milkweed

Reported by Kellerman; no specimen. Occasional on roadsides through the Bog in sunny areas. Flowers, July.

ARISTOLOCHIACEAE

Asarum canadense L. Wild ginger

Previously unreported from Cedar Bog. Frequent in hardwood forest in western extension. Also common in woods throughout the county.

Hexastylis virginica (L.) Small ?

Identification not certain because the plant has not been seen in flower. This species was planted in Cedar Bog by Carl Horst of Dayton. Mr. Horst has confirmed this to me (personal communication). One plant in arbor vitae stand, Q E - 8.

BALSAMINACEAE

*Impatiens capensis Meerb. Spotted touch-me-not

Abundant throughout all the swamp forest. I. pallida Nutt. was never found in the state-owned Preserve, but does grow on the stream banks where Cedar Run enters Mad River. I. capensis is listed by Gates (1942) as I. biflora Walt.

BERBERIDACEAE

Berberis thunbergii DC Japanese barberry

Previously unreported from Cedar Bog. An adventive. Rare,
Q F - 7.

*Caulophyllum thalictroides (L.) Michx. Blue cohosh

Frequent in swamp forest associations of Cedar Bog and
occasional in hardwood forest. Flowers, late April.

*Podophyllum peltatum L. May-apple

Common in young maple stand south of Woodburn Road,
Q F - 9 and in western extension hardwood forest.

CAMPANULACEAE

Campanula americana L. Tall bellflower

Common on roadsides, Q E - 8 and Q F - 8. Flowers, August.
Specimen #1237 appears to be C. americana L. var. illinoensis
(Fresn.) Farw. Collected once in arbor vitae stand, Q E - 10.
Leaves are broadly ovate, not long tapering as in the species,
and petioles are distinct; not winged.

*Campanula aparinoides Pursh.

Reported by Kellerman; specimen collected by Werner, 1892.
Abundant throughout bog meadow. Flowers, mid-July through
September. Boreal species.

*Lobelia kalmii L.

Reported by Kellerman; specimen collected by Wilcox, 1894.
Abundant in bog meadow. Flowers, August and September. Relict
boreal species.

Lobelia puberula Michx.

Downy lobelia

Previously unreported from Champaign County. Specimens #172, #615, and #987, all found in Q D - 6, most closely resemble this species. Specimen #1247 from Q E - 9 may be a hybrid of this species with L. siphilitica; sepals are auricled but plant is pubescent. Flowers, late August and September.

*Lobelia siphilitica L.

Great blue lobelia

Reported by Kellerman; no specimen. Common in arbor vitae and swamp forest associations.

There is great variation in this species in Cedar Bog: corolla may be deep blue, definitely lavender with no blue or blue with conspicuous white protuberance and lip; leaves may be petiolate or not, glabrous to even hirsute. These plants may be examples of introgressive hybridization between L. puberula and L. siphilitica in a disturbed habitat. Practically every specimen collected has some characteristics of both species. Flowers, late August and September.

CANNABINACEAE

Humulus lupulus L.

Common hop

Reported by Kellerman; no specimen. As escape in Cedar Bog. Occasional, in swamp forest, Q E - 4 and 5. Also Q E - 9.

CAPRIFOLIACEAE

*Lonicera dioica L.

Honeysuckle

Reported by Kellerman but no specimen. Occasional in Q F - 4, 6, and 8 in the swamp forest association. The specimens

from Cedar Bog are atypical and grade toward L. prolifera (Kirchn.) Rehd. or L. flavida Cockerell; the latter reported as a possible hybrid between L. dioica and L. prolifera (Braun, 1961).

L. prolifera has been collected in Champaign County but not L. dioica.

Lonicera maackii Maxim.

An escape previously unreported in Champaign County.
Occasional in Q J - 11 and Q I - 11.

*Sambucus canadensis L. Elderberry

Reported by Kellerman; no specimen. Common in swamp forest north of Woodburn Road; occasional along roadside, south.

*Viburnum lentago L. Nannyberry

Reported by Kellerman and specimen collected by Werner, 1893. Frequent in swamp forest and hardwood forest associations, Q E and F - 9; Q J - 10. Flowers, mid-June.

Viburnum prunifolium L. Blackhaw

Previously unreported from Cedar Bog. In deciduous forest, Q J - 10. Flowers, late May.

CARYOPHYLLACEAE

Saponaria officinalis L. Bouncing-bet

An escape previously unreported from Champaign County.
Along roadsides, Q E - 8 and 9; Q F - 9. Flowers, July.

CELASTRACEAE

Euonymus atropurpureus Jacq. Wahoo bush

Reported by Kellerman but no specimen. Occasional on the stream banks, West Branch, Q F - 4 and 6 and in the swamp forest, Q E - 6 and 8. Also, rarely in western extension, Q I - 11.

Euonymus obovatus Nutt. Running strawberry-bush

Infrequent on stream bank, Q F - 6, and frequent in deciduous forest, Q I - 11.

*Celastrus scandens L. Bittersweet

Never observed in flower in Cedar Bog, proper, probably as a result of dense shade. In fence rows east of the Bog, it does flower and fruit. Occasional in swamp forests, Q F - 6 and Q G - 11.

COMPOSITAE

Actinomeris alternifolia (L.) Britt. Wing-stem

Reported by Kellerman as Verbesina, but no specimen. Very common along roadside and along West Branch. Flowers, August.

Ambrosia artemisiifolia L. Roman ragweed

European weed reported by Kellerman, but no specimen. Frequent on roadsides.

Ambrosia trifida L. Greater ragweed

Reported by Kellerman; no specimen. Very common on roadside, especially in sunny, wet areas.

Arctium minus (Hill) Bernh. Burdock

In semi-shaded areas, Q F - 8, 9, and 10. Frequent.

Aster, spp.

Special appreciation is due Dr. T. Richard Fisher for checking the Aster specimens. Here, too, there are frequently intergrading specimens and some hybridization has probably occurred. With one exception, Speer (1958) is followed here.

A majority of the asters listed here have not been reported from Champaign County. Doubtless, this is due to the small number of collections made in the county. This group should be more thoroughly investigated in Champaign County.

Aster cordifolius L.

Infrequent in Q E - 9 and Q J - 11. Flowers in September.

Aster dumosus L.

Previously unreported from the county. Frequent in shade of swamp forest and arbor vitae associations, Q F - 9 and Q E - 5 and 9. Three specimens assigned to this species, #626, #643, and #1267, may be hybrids. They were collected the last week of August and the first week of September, whereas all the others were collected in October.

*Aster junciformis Rydb.

Unreported from Champaign County and previously collected in only a few northeastern counties of Ohio. Possibly this species should be reduced to a variety of A. puniceus, but, following Speer (1958), is retained as a separate species here. The foliage is distinctly different from A. puniceus. Found only in the bog meadow, Q D - 6 and 7; Q E - 9. Frequent. Flowers, September. Listed by Gates as A. junceus Ait. Boreal species.

*Aster laevis L.

Smooth aster

Previously unreported from Cedar Bog. Occasional in bog meadow, Q F - 9 and on stream bank, Q E - 9. Flowers, late September and October.

*Aster lateriflorus (L.) Britt.

Reported by Kellerman; specimen collected by Werner 1892. Common in bog meadow, secondary swamp forest, Q F - 9, and even in open areas in arbor vitae association. Always in wet situations. Flowers, late August into October.

Aster lowrieanus Porter

Previously unreported from Champaign County. Rare in bog meadow, Q D - 8. Flowers, late September.

*Aster macrophyllus L.

Species previously unreported from Champaign County. Rare in bog meadow, Q D - 8. Flowers, late August. Specimen #178 closely resembles the variety ianthinus (Burgess) Fern., but is not recognized as a variety by Speer.

Aster novae-angliae L.

New England aster

Reported by Kellerman, but no specimen. Common in bog meadows, Q E - 9 and Q F - 9. Flowers, early September.

Aster pilosus Willd.

Reported by Kellerman as A. ericoides pilosus (Willd.) Porter, but no specimen. On stream bank, West Branch, north of Woodburn Road. Only one plant observed. Flowers, early October.

Aster prenanthoides Muhl.

Reported by Kellerman; no specimen. In arbor vitae stands west of Cedar Run, Q D - 7 and in bog meadow, Q D - 8. Flowers, late September and early October.

*Aster puniceus L.

Reported by Kellerman, whose specimen was collected in 1894. Abundant in bog meadow areas, Q D - 6, 7, and 8 and also in arbor vitae, Q E - 7 and 9. Flowers, mid- to late September.

*Aster puniceus L. var. lucidulus (Gray) Fern.

Previously unreported from Champaign County. This variety is not recognized by Speer, but it seems to be distinctive.

Occasional in the bog meadow, Q E - 9 and Q D - 8. Flowers, late September. Listed as A. lucidulus (Gray) Wieg. by Gates (1942).

Aster simplex Willd. var. interior (Wieg.) Cronq.

Occasional in arbor vitae association, Q E - 8 and 9. Flowers, late September, early October.

Aster simplex Willd. var. ramosissimus (T. & G.) Cronq.

Previously unreported in Champaign County. Occasional in the marl meadow, Q D - 6 and Q E - 6. Flowers, September and October.

Aster simplex Willd. var. simplex

Frequent in swamp forest and arbor vitae associations, Q D - 5 and 8; Q F - 7 and 10, and Q G - 10. Flowers, September and October.

Aster umbellatus Mill.

Reported by Kellerman; specimen collected by Werner, 1892. Frequent at edge of arbor vitae stands, Q E - 9, Q D - 9, and Q D - 5 and in swamp forest, Q F - 10. Flowers, September and early October.

Bidens aristosa (Michx.) Britt.

Reported by Kellerman; Werner's specimen collected in 1892. In bog meadow, Q D - 6 and Q E - 9. Flowers, September.

*Bidens cernua L.

Occasional in stream margin, West Branch, Q F - 8. Flowers, early September.

*Bidens comosa (Gray) Wieg.

Not previously reported from Champaign County. Common. Aquatic in West Branch, Q F - 7 and 9. Flowers, late August and early September.

Bidens coronata (L.) Britt.

Reported by Kellerman as B. trichosperma (Michx.) Britt., but there is no specimen. Occasional in marl meadow, Q D - 4 and 7. One specimen collected in Q E - 9 is probably var. tenuiloba (Gray) Sherff. or an extreme ecotype of B. aristosa. Flowers, late September.

Bidens laevis (L.) BSP

Reported by Kellerman; Werner's specimen collected 1892. Only one specimen collected, Q F - 5, along the West Branch and this is not typical. The plant looks very similar to B. cernua, but the chaff is red-tipped and is thus judged to be B. laevis or a hybrid of that species. Flowers, mid-September.

Cacalia suaveolens L.

Reported by Kellerman; no specimen from Champaign County.

Rare. In swamp forest zone, Q F - 4. Flowers, October.

Cacalia tuberosa Nutt. Indian plantain

Reported by Kellerman. Specimen collected by Werner, 1892. Common in the bog meadow regions, Q D - 6 and 8, Q E - 9. Flowers, July and August.

*Cichorium intybus L. Chicory

Introduced in Cedar Bog. Not previously collected from Champaign County. Frequent along roadsides. Flowers, July.

*Cirsium muticum Michx. Swamp thistle

Reported by Kellerman; no specimen. Common in bog meadow and at margin of arbor vitae stands, Q D - 6 and 7, Q E - 4. Flowers, August (Fig. 19).

Cirsium vulgare (Savi.) Tenore Bull thistle

Reported by Kellerman; no specimen. In drier areas east side of Bog, Q D - 7 and 8; roadside, Q E - 9 and in deciduous forest margin, Q J - 12. Flowers, early September.

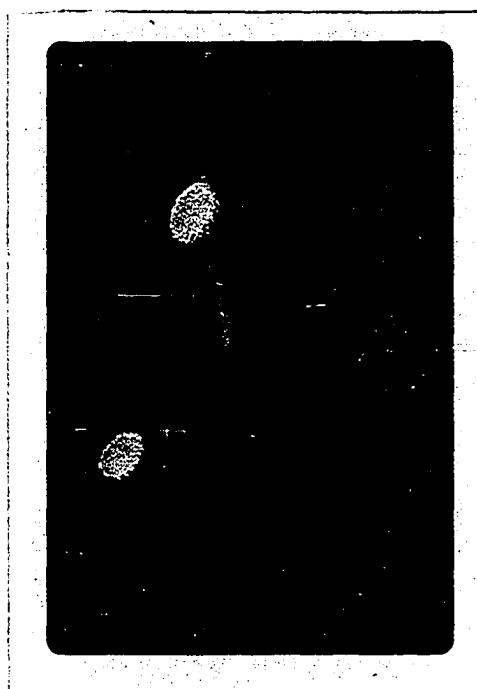
Coreopsis tripteris L.

Previously unreported from Champaign County. Common in marl and bog meadow, Q D - 5 and 6, Q E - 5. Flowers, August.

Erechtites hieracifolia (L.) Raf.

Reported by Kellerman; no specimen from Champaign County. In roadside ditch, Q F - 8. Rare. Specimen collected is var. intermedia Fern. Flowers, late August.

Fig. 19. Swamp thistle, Cirsium muticum Michx.



Erigeron annuus (L.) Pers.

Reported by Kellerman; no specimen. Occasional on roadsides, Q D - 7 and Q E - 8, and at margins of deciduous forest in field, Q J - 10. Flowers, July to early August.

*Erigeron philadelphicus L.

Not previously reported from Cedar Bog. Frequent along path beside West Branch. Flowers, May and June.

Erigeron strigosus Muhl. Daisy fleabane

Reported as E. ramosus (Walt.) BSP by Kellerman; no specimen. Occasional along west path, Q F - 7 and 8 and east side in swamp forest, Q D - 8. Flowers, July and August.

Eupatorium fistulosum Barrett

Previously unreported in Champaign County. Rare. East side of Bog, Q C - 8. Flowers, late August.

*Eupatorium maculatum L. Spotted Joe-pye-weed

Not previously collected from Cedar Bog, although reported by Hicks (undated). Occasional in drier areas on far east side of Bog, Q D - 7 and on roadside Q F - 8. Flowers, late August.

*Eupatorium perfoliatum L. Common boneset

Reported by Kellerman; no specimen. Occasional in bog meadow, Q D - 7. Flowers, late August and early September.

*Eupatorium purpureum L. Joe-pye-weed

Reported by Kellerman; no specimen. Occasional, marl meadow Q D - 6. Flowers, early August.

Eupatorium rugosum Houtt. White snakeroot

Reported by Kellerman as E. ageratoides L.; no specimen. Abundant in swamp forest, Q D - 7, Q E - 9 and Q F from north end of Bog south to Woodburn Road. Flowers, September to early October.

Helenium autumnale L. Sneezeweed

Not recorded in Kellerman's publications, although a specimen was collected by him in 1894. Common in the bog meadow and marl meadow associations. Flowers, late August and throughout September.

Helianthus, spp.

Probably the majority of sunflower species listed here can be considered prairie species, possibly introduced into the area during the Xerothermic period.

Helianthus giganteus L.

Recorded by Kellerman; Werner's specimen collected, 1892. Common in bog meadow, Q D - 5, 7, 8, and 9; Q E - 7, 8, and 9, as well as in swamp forest, Q F - 10. Flowers, late August and early September.

Helianthus grosseserratus Martens

Previously unreported from Champaign County. Frequent in drier areas of swamp forest, Q E - 4 and 9, Q F - 8. Flowers, July to September.

Helianthus hirsutus Raf.

Previously unreported from Champaign County. Occasional in bog meadow, Q D - 9, Q E - 9, and Q F - 11. Flowers, late August and early September.

Helianthus maximiliani Schrad.

Rare. Collected only in Q E - 9. Flowers, early September. Prairie species (Slife et al., 1960).

Heliopsis helianthoides (L.) Sweet Ox-eye

Reported by Kellerman but no specimen. Common along the path paralleling the West Branch, Q F - 6, 7, and 8. Flowers, July and August. Possibly a prairie species.

Krigia biflora (Walt.) Blake

Previously unreported from Champaign County. Common, bog meadows, Q D - 5 and 7, Q E - 9. Flowers, May.

Lactuca biennis (Moench.) Fern. forma integrifolia (T. & G.) Fern.

Previously unreported from Champaign County. Found only once in deciduous forest, western extension, Q H - 10. Flowers, October.

*Lactuca canadensis L. var. latifolia Ktze. Wild lettuce

Reported by Kellerman; specimen collected by Werner, 1893. However, Werner's specimen is annotated var. longifolia (Michx.) Farw. Occasional on roadsides. Flowers, mid-July to mid-August.

Lactuca floridana (L.) Gaerth. var. floridana

Not previously reported from Cedar Bog. Found only once near east bridge on roadside, Q E - 9. Flowers, mid-August.

Liatris spicata (L.) Willd. Blazing star

Reported by Kellerman as Lacinaria spicata (L.) Kuntze. Werner's specimen collected 1893. Common in bog meadow north of Woodburn Road, Q D - 4 and 6, Q E - 4. Flowers, mid-July through August. Relict prairie species (Braun, 1928).

Polymnia canadensis L.

Clammy leafcup

Kellerman's record probably based on Werner's specimen collected in 1892. Abundant throughout swamp forest. Begins flowering in late July and continues until a hard freeze, usually late October.

Prenanthes altissima L.

Unreported by Kellerman, although he collected a specimen in 1894, labeled Nabalus altissimus Hook. Occasional in arbor vitae stand south of Woodburn Road, Q E - 9. Flowers, mid-September.

*Prenanthes racemosa Michx.

Kellerman did not report his own specimen collected in 1894, labeled Nabalus racemosa Hook. Frequent in bog meadow, Q D - 5 and 7; along Cedar Run, Q D - 7. Flowers, September.

*Rudbeckia hirta L.

Black-eyed Susan

(Including R. serotina Nutt.)

Reported by Kellerman; Werner's specimen collected in 1893. Combination of these two as one species is based on an unpublished study of the rudbeckias in Ohio by Frederick in 1964. There are only small morphological differences among specimens collected in Ohio. Cytological studies would no doubt clarify the relationship between various forms.

Common in the bog meadow, Q D - 5 and 6; Q F - 11. Flowers from late June until near the end of August. Prairie species (Slife et al., 1960).

Rudbeckia fulgida Ait.

(Including R. speciosa Wend. and its varieties; R. tenax Boynt. & Bead.)

Reported by Kellerman; Werner's specimen collected in 1892. Also, Kellerman's specimen labeled Heliopsis helianthoides has been properly identified as a Rudbeckia.

Again, until cytological studies clarify the relationships in this genus, R. speciosa and R. tenax are included in R. fulgida, based on morphological similarity. One distinct variety is recognized below. Occasional at margins of arbor vitae stands in Q D - 7 and 8. Flowers, early August.

Rudbeckia fulgida Ait. var. umbrosa (Boynt. & Bead.) Cronq.

Previously unreported in Champaign County. The most common taxon of this species. In the marl and bog meadow associations, Q D - 5 and 8; Q E - 6. Flowers, August.

Rudbeckia laciniata L.

Reported by Kellerman, but no specimen. Common along the path beside West Branch, Q F - 6, 7, 8, and 10; also in Q D - 7. Flowers mid- and late August. Prairie species (Slife et al., 1960).

*Senecio aureus L.

Golden ragwort

Reported by Kellerman; no specimen. Abundant in swamp forest, Q E - 8 and Q F - 6, 7, and 8. Flowers, May to mid-June.

Senecio aureus X ?

One specimen (#106) has no basal tuft of leaves at anthesis. Three-pinnate leaves, near base of stem; lobes distant, deeply

serrate, not rounded as in S. aureus. Blooms mid-June. Could be an ecotype of S. aureus.

Silphium terebinthinaceum Jacq. Prairie-dock

Although reported by Kellerman, there is no specimen from Cedar Bog. One specimen collected in 1892 by Werner is labeled from Urbana. Abundant at the margin of the arbor vitae stands and bog meadow along Cedar Run, both north and south of Woodburn Road. Flowers from late July through August. Prairie species (Braun, 1928).

Silphium trifoliatum L.

Not recorded by Kellerman, but there is a specimen collected by Werner, 1893, as well as one collected by Kellerman, 1894. Occasional in bog meadow and marl meadow associations, Q D - 5, 6, and 7 and Q E - 5 and 6. Flowers late July and early August.

Solidago, spp.

Again, my thanks to Dr. Fisher for checking all the golden-rod specimens and for use of his key. Despite the fact that there are many species growing in the area, there is no evidence of hybridization or intergradation between species.

A majority of the species found in Cedar Bog are also found in the Michigan bog--Douglas Lake area. Whether or not these are boreal species is questionable. Although these species are common to both areas, they are also found in other habitats and therefore probably should not be considered boreal species.

*Solidago altissima L.

Previously unreported from Champaign County. Rare in edge of swamp forest, Q F - 9. Flowers, October.

*Solidago bicolor L.

Only one specimen collected in arbor vitae-swamp forest margin, Q F - 9. Flowers, early October. Fisher noted that this specimen is not typical of the species.

*Solidago canadensis L.

Reported by Kellerman; no specimen. Common along margins of both the swamp forest and bog meadow, Q E - 8 and 9 and Q F - 8, in somewhat drier areas. Flowers, late August to mid-September.

Solidago erecta Pursh.

Previously unreported in Champaign County but common in the marl and bog meadow, Q D - 6 and 7; Q E - 9. Flowers, mid-September to mid-October. May be a prairie species.

*Solidago flexicaulis L.

Found only once near West Branch, Q F - 5. Flowers, mid-October.

*Solidago nemoralis Ait.

Occasional along the path beside West Branch, Q F - 6 and 8. Flowers, mid-September to mid-October.

*Solidago ohioensis Riddell Ohio goldenrod

Kellerman's record probably based on Werner's specimen collected in 1892. Abundant in the bog meadow, Q E - 5, 6, and 9; Q E - 8 and 9; Q F - 11. Begins flowering in July and continues until killing freeze in October.

*Solidago patula Muhl.

Collected by Kellerman in Cedar Bog, 1894; reported, 1895. Only one rather poor specimen collected, Q E - 9, south bog meadow. Dr. Clara Weishaupt also collected a specimen from Cedar Bog October, 1960. Flowers, late August through September.

Solidago riddellii Frank.

Reported by Kellerman; no specimen. Common in bog meadows, Q D - 9 and Q E - 9. Flowers, mid-September until killing freeze.

*Solidago rugosa Mill. var. rugosa

Reported by Kellerman; Werner's specimen collected in 1892. Common in bog meadow, Q E - 9 and Q D - 7. Flowers, late August and early September.

Solidago rugosa Mill. var. aspera (Ait.) Fern.

One specimen, #650, collected September 8, 1964, in the marl meadow, Q D - 5.

*Solidago speciosa Nutt.

Previously unreported from Cedar Bog. Collected only once in late September in Q E - 8 among arbor vitae east of Cedar Run.

*Solidago uliginosa Nutt. Bog goldenrod

Voss (1956) states that this should correctly be called Solidago purshii Porter. Common in bog meadow, Q D - 5 and 6; Q E - 9, and Q F - 9. Flowers, late August to late September.

Solidago ulmifolia Muhl.

Previously unreported from Champaign County. Common in bog meadows, Q D - 6 and Q D - 8 and 9. Flowers, late September to mid-October.

*Sonchus asper (L.) Hill Sow thistle

Common along road through the Bog.

*Taraxacum officinale Weber Dandelion

Introduced in Cedar Bog. Although reported by Kellerman, there is no specimen. On roadsides and occasional in bog meadow.

*Tragopogon pratensis L. Goat's-beard

Found only once on roadside west of the state-owned property.

Vernonia altissima Nutt. Ironweed

Reported by Kellerman; no specimen. Most of the ironweeds in Cedar Bog are found on the east side, actually not on state-owned property, in Q D and C - 6, 7, and 8. A few are found in the open areas in Q H - 7, Q F - 11, and Q G - 10. This species is by far the most common and is very colorful in late August and early September. Prairie species (Slife et al., 1960).

Vernonia fasciculata Michx.

On August 28, 1965, a collection, #882, was made of a dozen inflorescences from the quadrats at the east of the Bog. Only one specimen in the collection is this species, but it has relatively typical flowers.

Vernonia altissima X fasciculata

In the collection mentioned above (#882) is one specimen that is an intermediate between the two species suggesting an F_1 hybrid. Another specimen also suggests this hybrid but seems somewhat more similar to V. altissima. These specimens may represent another example of introgressive hybridization. At any

rate, it is a problem which merits further investigation. Neither the species, V. fasciculata, nor the hybrid has been reported from Champaign County.

CONVOLVULACEAE

Convolvulus sepium L. var. sepium L.

Common along the roadsides in sunny areas. This is the most common variety.

Convolvulus sepium L. var. fraterniflorus Mackenz. & Bush

Previously unreported from Champaign County. Occasional.

Convolvulus sepium L. var. repens (L.) Gray

On roadside near east bridge, Q E - 9.

Cuscuta cephalanthi Engelm. Dodder

Previously unreported from Champaign County. Found once growing on Impatiens capensis Meerb. August.

*Ipomoea purpurea (L.) Roth

Previously unreported from Champaign County. Along the south side of Woodburn Road in the swamp forest, Q F - 9. Flowers, mid-August.

CORNACEAE

*Cornus alternifolia L. Pagoda dogwood

Collected by Werner 1893; reported by Kellerman. The most common dogwood in the Bog. Along roadsides and in swamp forest; occasional along margin of the bog meadow and in shrub communities. Flowers, late May. Probably a boreal species.

*Cornus amomum Mill

Reported by Kellerman; no specimen. A hybrid, C. amomum x obliqua has been collected in Logan County. This specimen is not typical and may be a hybrid rather than true C. amomum. Specimen #88 collected in Q F - 8.

Cornus X arnoldiana Rehd. (C. obliqua x racemosa)

First collected in Cedar Bog by McFarland in 1937. My collection from Q E - 4 in swamp forest, near West Branch. Specimen #574.

Cornus drummondi Meyer Roughleaf dogwood

Reported by Kellerman. Werner's specimen collected, 1892, is labeled C. asperifolia Michx. Occasional, in hardwood forest, Q I - 11 and Q H - 10.

*Cornus obliqua Raf. Silky dogwood

Kellerman's specimen collected in 1893, labeled C. amonum (sic), but this species not listed in Kellerman's publications. Common in swamp forest, especially along west path. Also beside West Branch south of the road. Q F - 8 and 9. This is the specie noted many years ago in what is now the secondary maple stand.

*Cornus racemosa Lam. Gray dogwood

Occasional in swamp forest, Q E - 7.

*Cornus stolonifera Michx. Red-osier dogwood

Reported by Kellerman; no specimen. Specimens are typical of this species with white pith and red branchlets. Occasional in shrub communities south of road, Q E - 9 and also in Q D - 4 and Q F - 5. Flowers, June. Relict boreal species.

CORYLACEAE

*Alnus rugosa (Du Roi) Spreng. Speckled alder

Reported by Kellerman; no specimen. Common throughout the wet shrub communities, Q E - 9, Q E - 6, and Q F - 10. Listed as A. incana (L.) Moench. by Gates. Boreal species.

One specimen, #804, appears to be var. americana (Regel) Fern.

*Betula pumila L. Swamp or dwarf birch

Reported by Kellerman and specimen collected by Werner, 1893. Abundant throughout all parts of the bog meadow. Generally considered a northern bog shrub (Braun, 1961), with Cedar Bog the southernmost extension of the species. Known also under the names B. glandulifera Butter and B. pumila L. var. glandulifera.

Carpinus caroliniana Walt. Ironwood, musclewood, blue beech

No specimen from Champaign County, but abundant in all swamp forest areas as sub-canopy, small tree.

Corylus americana Walt. Hazelnut

Reported by Kellerman; no specimen. Abundant in wet portions of swamp forest north of Woodburn Road, Q E and F - 7 and 8. Occasional in Q E - 6 and 9.

*Ostrya virginiana (Mill.) K. Koch Hop-hornbeam

Not previously reported from Champaign County. Noted only once. Relatively large tree, Q F - 6, in oak-maple forest west of West Branch.

CRUCIFERAE

Alliaria officinalis Andrz. Garlic mustard

Abundant in all swamp forest association areas. Common in hardwood forests. Flowers, early May.

Cardamine bulbosa (Schreb.) BSP Spring cress

Common in all swamp forest areas; abundant in Q D - 7, Q E - 6 and 8. Flowers, May.

Cardamine douglassii (Torr.) Britt. Purple bittercress

Frequent in hardwood forest, Q E - 8, Q F - 9, and Q G - 10. Late April and early May.

*Lepidium campestre (L.) R. Br.

Not previously reported from Cedar Bog. On roadsides, Q E and F - 8 and 9.

*Nasturtium officinale R. Br. Watercress

Kellerman's specimen, 1894, is labeled Roripa nasturtium (L.) Rusby. Abundant in West Branch. Remains green throughout the entire year. Flowers, May (Fig. 20).

CUCURBITACEAE

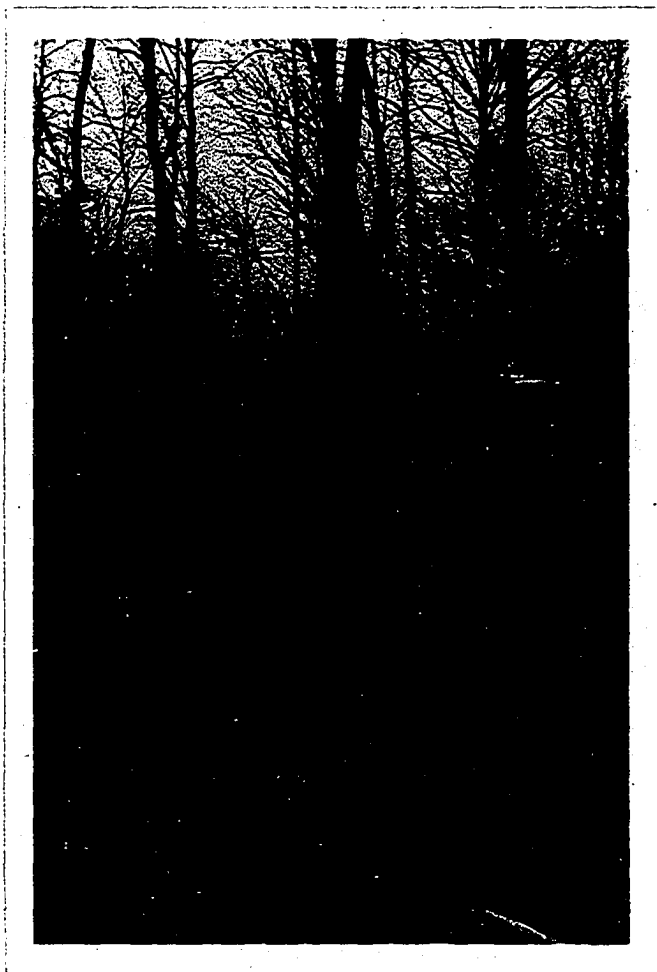
*Echinocystis lobata (Michx.) T. & G. Wild balsam apple

Reported as Micrampelis lobata (Michx.) Greene by Kellerman but no specimen. One specimen, Q G - 11. Flowers, mid-August. Also reported as M. lobata by Gates.

CYPERACEAE

Sincere thanks and appreciation are due Dr. Clara Weis-
haupt for her assistance in identifying the sedges.

Fig. 20. Watercress, Nasturtium officinale
R. Br. West Branch, January, 1966.



Carex annectens Bickn.

Previously unreported from Champaign County. Collected in fruit once on the roadside, Q E - 9. This area is usually mowed several times during the growing season. One collection indicates only that it was not seen in fruit at any other time. Plants, common.

*Carex aurea Nutt.

Previously unreported from Champaign County. Occasional in marl meadows, Q D - 5 and 7.

Carex bromoides Schkuhr.

Not reported by Kellerman, but specimen collected by Werner, 1893. Open areas in swamp forest, Q E - 4 and Q I - 11. Frequent.

*Carex buxbaumii Wahlenb.

Not reported by Kellerman, but Werner's specimen, 1893, is extant. Frequent in marl and bog meadows, Q D - 7 and Q E - 5.

*Carex cephalantha (Bailey) Bickn.

Previously unreported from Champaign County. Collected once in Q E - 5.

*Carex flava Mackenzie var. flava

Not reported by Kellerman, but specimen collected by Werner, 1893. Also, specimen at Urbana College, collected by W. S. Sullivant. Frequent in marl meadow, Q D - 6 and Q E - 8.

*Carex flava Mackenzie var. fertilis Peck.

Variety previously unreported from Champaign County. Common in marl meadows, Q D - 5 and 6, Q E - 5.

*Carex gracillima Schwein.

Not reported by Kellerman but Werner's specimen, 1893, is extant. Occasional in bog meadow, Q E and F - 9. Boreal species.

Carex grayii Carey

Reported as C. Asa-Grayi Bailey, by Kellerman. Werner specimen, 1893, also labeled C. Asa-Grayi. Collected once in deciduous forest, Q J - 11.

Carex hyalinolepis Steud.

Unreported by Kellerman probably because Werner's specimen of this species was originally labeled C. lacustris. Collected once on north side of Woodburn Road, arbor vitae stand, Q E - 8. May be more common but fruiting specimens unavailable as a result of roadside mowing.

*Carex interior Bailey

Previously unreported from Champaign County. Occasional in bog and marl meadows, Q D - 6 and Q E - 9.

*Carex lacustris Willd.

Reported by Kellerman, but specimen identified as C. hyalinolepis; thus, unreported from Champaign County. Collected once in marl meadow, Q D - 7.

*Carex lanuginosa Michx.

Previously unreported from Cedar Bog. Occasional, marl meadow, Q E - 5.

*Carex laxiflora Lam.

Unreported from Champaign County. Observed once in marl meadow, Q D - 6. Relict boreal species.

Carex lurida Wahlenb.

Previously unreported from Champaign County. Observed once, Q D - 6.

*Carex pensylvanica Lam.

Previously unreported from Champaign County. Occasional in Thuja association, Q D - 6 and 7, Q E - 9.

Carex radiata (Wahlenb.) Dew.

Unreported in Champaign County. Specimen is young and the identification is not certain. Observed once in the bog meadow, Q E - 9.

*Carex rosea Schkuhr.

Previously unreported from Champaign County. Observed once in hardwood forest, Q J - 10.

*Carex scabrata Schwein.

Previously unreported from Champaign County. Frequent in bog and marl meadow, Q D - 6 and Q E - 9.

*Carex sterilis Willd.

Reported by Kellerman as C. sterilis excelsior Bailey. Werner's specimen labeled C. sterilis, collected 1893. Occasional, marl meadow, Q D - 6.

*Carex stipata Muhl.

Previously unreported from Cedar Bog. Frequent in bog and marl meadows, Q E - 4 and 5, Q F - 8.

*Cladium mariscoides (Muhl.) Torrey

Reported by Kellerman and Werner specimen collected 1893.
Also specimen at Urbana College, collected by W. S. Sullivan; no date. Common in marl meadow, Q D - 5, 6, 7, and 8. Boreal species.
Reported by Gates (1942) as Mariscus mariscoides (Muhl.) Kuntze.

Cyperus strigosus L.

Common in marl meadow, Q D - 5 and 8.

Eleocharis, spp.

My sincere thanks to both Dr. Weishaupt and Dr. Ronald L. Stuckey for checking the identifications of Eleocharis.

*Eleocharis elliptica Kunth.

Previously unreported from Champaign County. Frequent in marl meadow, Q D - 6. Gates & Ehler (1924) reported this species as E. tenuis (Willd.) Schultes.

Eleocharis erthropoda Steud. (E. calva Torr.)

Frequent in marl meadow, Q D - 8.

*Eleocharis palustris (L.) R. & S.

There is some question about the identification of this specimen. I have called it E. palustris because it is most nearly like that species. Previously unreported from Cedar Bog. Specimen #97, from Q E - 4.

*Eleocharis rostellata Torr.

Not reported by Kellerman, but Werner specimen, 1892, labeled E. palustris has been determined to be E. rostellata. Abundant in marl meadow, Q E - 3, 6, and 8; Q E - 9. Forms solid mats and apparently reproduces primarily by rooting of the tips of the vegetative culms (La Rue, 1935).

*Eriophorum viridi-carinatum (Engelm.) Fern. Cotton sedge

Occasional in bog meadow, Q D - 6. Relict boreal species.

*Rhynchospora alba (L.) Vahl.

Reported by Kellerman; Werner specimen, 1893. Specimen at Urbana College may have been collected by Milo G. Williams; not dated. Abundant bog meadow, Q D - 6 and Q E - 9. Boreal species.

*Rhynchospora capillacea Torr.

Reported by Kellerman; his specimen collected 1894 and Werner's, 1892. Common in wet marl seepage areas, Q E - 6, 7, and 8; Q E - 9. Boreal species.

*Scirpus americanus Pers.

Frequent in bog meadow, Q D - 6 and 8, Q E - 4.

*Scirpus atrovirens Willd. Great river bulrush

No previous specimens from Cedar Bog. Common Q D - 7, Q E - 8 and 9, Q F - 8 and 9.

Scirpus fluviatilis (Torr.) Gray

Previously unreported from Cedar Bog. Observed once in Q D - 8.

*Scirpus heterochaetus Chase

Previously unreported from Champaign County but identification may not be correct, for the specimen is young. Observed once in Q E - 4.

*Scirpus validus Vahl. Great bulrush

Frequent in bog meadows, Q D - 6 and 8, Q E - 9.

DIOSCOREACEAE

Dioscorea villosa L. Wild yam

Kellerman's report probably based on Werner's collection in 1892. Abundant in swamp forest association.

DROSERACEAE

*Drosera rotundifolia L. Round-leaf sundew

Reported by Kellerman but no specimen. Abundant on hummocks in marl meadow, Q D - 7, 6, 5, and 4. One colony in arbor vitae stand, Q E - 9. Relict boreal species.

EQUISETACEAE

*Equisetum arvense L. Field horsetail

No specimen from Cedar Swamp. Common in arbor vitae stands.

*Equisetum hyemale L. var. intermedium A. A. eat.

One observation in bog meadow, Q E - 9.

ERICACEAE

*Gaultheria procumbens L. Wintergreen

Planted in Cedar Bog, Q E - 9 by Carl Horst of Dayton.

*Gaylussacia baccata (Wang.) K. Koch Black huckleberry

Not reported by Kellerman but specimen collected by Jane Spence from Cedar Bog in 1879 is labeled G. resinosa T. & G. Two specimens, Urbana College, are labeled Vaccinium dumosum curt. - card. (sic). Frequent in arbor vitae stands, Q D - 4 and 6. Occasional, Q E - 9.

EUPHORBIACEAE

Euphorbia vermiculata Raf.

Introduced. Along roadside in sunny, dry areas. Occasional.

FAGACEAE

*Fagus grandifolia Ehrh. American beech

Reported by Kellerman as F. atropunicea (Marsh.) Sudw. but no specimen. Several very large trees in Q I and J - 10 and 11. The largest measures 33 1/4" DBH; well over 250--possibly as much as 400--years old (Fowells, 1965).

Quercus, spp.

The oaks in Cedar Bog are difficult to identify. Only a few trees easily "fit" descriptions for any particular species. The majority of the trees are variants that have characteristics of several different species.

Recalling the history of the area, particularly that of the oak-maple segregate, it is not surprising that hybrids are found here--not only among the oaks, but other taxa as well. Stebbins (1950) pointed out that hybrids are most common in changing environments, in "disturbed" areas. Unquestionably, there have been many man-made, environmental changes in the Mad River Valley during the past 100 years. Improved drainage ditches resulted in successful cultivation of the formerly wet prairies. Removal of trees in adjoining areas resulted in environmental changes over the whole region. Removal of some arbor vitae from the Bog, itself, occurred in the early part of this century. The pattern of drainage was thus changed, and additional "disturbed"

areas were opened in which propogules could become established. The grassy prairies were burned annually by the Indians (Antrim, 1872). When this practice ended, additional areas were available for forestation. For these reasons, hybrids would be expected in some areas of Cedar Bog.

I want to express my sincere thanks to Dr. L. C. Chadwick, Department of Horticulture, The Ohio State University, and to O. A. Alderman, formerly Chief of the Division of Forestry, Ohio Department of Natural Resources, for their help. I have drawn heavily on their great resources of knowledge, but the final determinations are my own. Also, I consider these identifications tentative, for a continuing study of the oaks in Cedar Bog is planned. Hopefully, some of the problems involved may eventually be solved.

Quercus bicolor Willd.

Swamp white oak

Reported by Kellerman; no specimen. The most common oak in the Swamp; 16 specimens collected were determined to be this species, although not every one was "typical." Common in swamp forest, oak-hickory, and oak-maple segregate, Q F - 6, 7, and 8; and the entire western extension.

Quercus bicolor X muehlenbergii ?

Two specimens appear to be Q. bicolor hybrids.

Specimen #1399. A young tree ca. 20-25 feet high on the west bank of West Branch, Q F - 5. No acorns, probably because the tree is too young. Leaves resemble Q. bicolor in over-all appearance. Stellate hairs on the underside of the leaf but

definitely not densely pubescent. Terminal winter buds acute--not rounded as in Q. bicolor.

Specimen #1401, collected in the same general area, Q F - 5, is probably this hybrid. In over-all appearance, it appears to be Q. bicolor X imbricaria, but because a hybrid between different subgenera is unlikely, I have judged it to be the same as #1399. Leaf margins often undulate, not lobed; stellate hairs below, but not densely pubescent. Both stellate and adpressed hairs along the leaf margin visible on upper surface of the leaf. One year twigs, gray-brown rather than reddish-brown of Q. bicolor.

*Quercus borealis Michx. f. var. maxima (Marsh) Ashe Red oak
(Q. rubra L. of many authors)

Reported by Kellerman; no specimen. Only one tree-- actually, four trunks--is unquestionably red oak. The separate boles arise from one large trunk approximately two feet above the soil surface, and measure from 10 to 18" DBH. In Q F - 6.

Quercus borealis var. maxima X shumardii ?

(For discussion of Q. shumardii, see below)

This hybrid may be represented by two trees. Two collections (#1508 and #1032) from one tree in Q F - 11, northeast corner of the quadrat; one collection (#1389) from Q I - 11. The first has acorns like Q. borealis, but winter buds like Q. shumardii and heavy tufts of hair at vein axes below. The second has winter buds and acorns similar to Q. shumardii, but lacks the heavy tufts of hair at vein axes. Petioles are red.

Quercus borealis var. maxima X velutina ?

One specimen, #1421, from Q G - 10 appears to be this hybrid.

Quercus imbricaria Michx. Shingle oak

Reported by Kellerman, but his specimen collected in Urbana in 1897. One relatively large tree on west bank of West Branch, Q F - 4; few small ones east of the stream, Q F - 4 and 5.

*Quercus macrocarpa Michx. Bur oak

Reported by Kellerman; no specimen. Identification of this tree (two specimens, #1445 and 1507) is based on the acorns, about which there should be no question. Acorns are certainly like bur oak acorns. The tree is growing on the bank of West Branch, leaning over the stream. In addition, the bark characteristics and growth habit are those of Q. bicolor (Alderman, personal communication); therefore, it may be a hybrid of Q. macrocarpa and not the species.

Quercus michauxii Nutt. (or Q. michauxii - Q. montana Willd. complex) Swamp chestnut oak

(Q. prinus L. of many authors)

Four specimens belong in this group--and none have been reported from Champaign County. They are specimens #324, #1119, #1269, and #1396. Each is from a different area of Cedar Swamp. Taking into account the habitat, I have chosen to label these specimens Q. michauxii Nutt., despite the fact that Braun (1961) does not believe this species is native to Ohio. Both Chadwick and Alderman said "chestnut oak" when looking at these specimens.

Specimens #1396 (Q F - 3) and #1119 key directly to Q. michauxii; #1269 (Q J - 10) and #324 (Q F - 7) key to Q. montana

in Braun's key. No acorns were found with any of these specimens and, therefore, it is possible that these are all extreme variants of the hybrid Q. bicolor and Q. muehlenbergii.

Quercus muehlenbergii Engelm. Chinquapin or yellow oak

Reported by Kellerman; no specimen. There are 11 specimens which seem to be Q. muehlenbergii, although not all are "typical." Frequent west of West Branch Q F - 3, 4, 7, and 8; south of Woodburn Road in Q F - 10; Q I - 10 and 11; and Q J - 11.

Quercus palustris Muenchh. Pin oak

Only one specimen, #1400, collected in Q F - 5 seems to be this species. This is a young tree and I found no acorns.

Quercus palustris X borealis var. maxima

One large tree, Q F - 8, just north of Woodburn Road at the west edge of the state-owned property apparently represents this hybrid.

The growth habit is characteristic of pin oak; twigs are greenish-black; winter buds are similar to Q. palustris. But acorns, leaves, and bark are more like Q. borealis var. maxima.

Quercus shumardii Buckl. Shumard red oak

Previously unreported from Champaign County, but specimens from three trees are most nearly like this species. All are mature trees; all are so similar as to be almost indistinguishable; acorns have been collected from each tree. Therefore, it seems improbable that these are hybrid oaks. The largest tree, 40" DBH is in Q J - 11; another measuring 32" DBH in Q I - 12; the last is in Q G - 10. First two, 100 to 125 years old (Fowells, 1965).

Leaves frequently have reddish petioles and midribs; thick, prominent tufts of brownish hair along the midrib at the vein axils. Acorn cups, shallow, with smooth, tight scales. Acorns very closely resemble herbarium specimens and those from this species at Secrest Arboretum at Wooster. Brown winter buds are glabrous, covered with a waxy, gray cuticle. Winter twigs often have both a red and a green coloration overlaying the blackish bark. Southeast, and Gulf coastal plain; Mississippi embayment (Fowells, 1965).

Quercus stellata Wang.

Post oak

This species has been reported from Cedar Bog (Hicks, unpublished list), but no specimens from Champaign County have been recorded (Braun, 1961). Specimen #1009 most nearly resembles this species and was collected in Q J - 10, the oak-hickory segregate of the deciduous forest. Leaves resemble an extreme variant of Q. macrocarpa; acorns are similar to Q. alba L. Twigs gathered on October 10, 1965, are densely, downy pubescent. When comparing my specimen to Q. macrocarpa herbarium specimens, I noted that a specimen of bur oak collected about two miles north of Cedar Swamp (Herrick, July 2, 1957) had sparsely pubescent twigs. Yet, all other bur oak specimens examined were entirely glabrous.

Quercus velutina, Lam. is not being reported here, although several specimens looked like black oak. But none of the trees suspected of being black oak has the characteristic orange inner bark. Therefore, all must be hybrids--if, indeed, they bear any relationship to black oak.

None of the hybrids reported here have been previously listed from Champaign County.

GENTIANACEAE

*Gentiana andrewsii Griseb. Bottle gentian

Kellerman collected this species in 1894 in Cedar Bog. Occasional on the banks of West Branch, Q F - 8 and 9. Flowers, late September and early October.

Gentiana crinita Froel. Fringed gentian

Kellerman's report probably based on specimen collected by Werner, 1892. Abundant in the bog meadow, Q D - 5 and 6. Frequent south of Woodburn Road, Q E - 9. Flowers, late September into November.

GERANIACEAE

Geranium maculatum L. Wild geranium

No specimens from Champaign County. Common along west path and in swamp forest association. Flowers, late April and May.

GRAMINEAE

Grateful thanks to Dr. Weishaupt, who checked all the grass specimens.

Several grass specimens in the OSU Herbarium were collected by Kellerman and Werner in the early 1890's but were not reported by Kellerman in his publications. It's impossible to know why this occurred, but it may be that specimens were not identified until after the 1895 publication.

*Agrostis alba L.

Reported by Kellerman but no specimen. Occasional in bog meadow, Q D - 6. Considered by Tolstead (1942) to be a mesophytic prairie species.

*Agrostis perennans (Walt.) Tuckerm.

Previously unreported from Cedar Bog. Occasional in drier sections of Q D - 8.

*Andropogon gerardi Vitman Giant blue-stem

Reported by Kellerman and his specimen collected 1894. Considered by Tolstead (1942) to be a mesophytic prairie species. Frequent in bog meadow, Q D - 4, Q E - 9 and 4. Also one colony in opening in arbor vitae stand, Q F - 10.

*Andropogon scoparius Michx. Little blue-stem

Reported by Kellerman; collected 1894. With western dune grasses (Tolstead, 1942). Occasional in bog meadow, Q D - 4.

*Bromus ciliatus L.

Not reported by Kellerman, but Werner's specimen collected 1893. Only one specimen, #495, of this species. Collected Q D - 8. Bromus latiglumis (Shear.) Hitchc.

Previously unreported from Champaign County. Common along west path, Q F - 3, 4, 6, and 7.

*Calamagrostis canadensis (Michx.) Nutt.

Previously unreported from Cedar Bog. Occasional in Q D - 8. Probably boreal species.

Cinna arundinacea L.

Wood reed grass

Not reported by Kellerman, but his specimen was collected in Cedar Bog in 1894. Common along west path, Q F - 5, 6, and 8; in open areas of arbor vitae stands, Q E - 8 and 9; Q F - 10.

*Dactylis glomerata L.

Orchard grass

Previously unreported from Cedar Bog. Introduced Eurasian species. On roadside and in secondary maple zone, Q F - 9.

*Deschampsia caespitosa (L.) Breaux.

Reported by Kellerman and specimen collected by Werner in 1893. Specimen at Urbana College labeled Aira caespitosa L. was collected by W. S. Sullivant "Cedar Swamp near Springfield." Frequent in marl and bog meadows, usually on the banks of Cedar Run. Q D - 6 and 7, Q E - 9. Relict boreal species.

Elymus riparius Wieg.

Specimen labeled E. canadensis L. collected by Kellerman, 1894, but not in his published lists. Frequent along Woodburn Road, Q F - 8 and 9.

*Glyceria striata (Lam.) Hitchc.

Manna grass

Reported by Kellerman as Panicularia nervata (Willd.) Kuntze, but no specimen. Frequent in bog meadow zones, Q E - 3 and 9. Also along west path, Q F - 7 and 8.

*Hystrix patula Moench.

Bottle-brush grass

Previously unreported from Cedar Bog. Common along the west path, Q F - 6, 7, and 8.

Leersia virginica Willd.

Cutgrass

Reported by Kellerman as Homalocenchrus virginicus (Willd.) Britt. but no specimen. Occasional along Cedar Run in openings in arbor vitae stand, Q F - 10.

*Muhlenbergia glomerata (Willd.) Trin.

Reported by Kellerman as M. racemosa (Michx.) BSP; collected in Cedar Bog, 1894. Common in bog meadow, Q D - 8 and Q E - 8 and 9.

*Muhlenbergia mexicana (L.) Trin.

Reported by Kellerman. Werner's specimen, 1892. Occasional in bog meadow, Q D - 8.

*Muhlenbergia sylvatica Torr. Dropseed

Specimen reported and collected by Kellerman, 1894. Occasional along west path, Q F - 4 and 6.

Panicum clandestinum L.

Previously unreported from Champaign County. Observed once, Q F - 8.

*Panicum depauperatum Muhl.

Previously unreported from Champaign County. Observed only once, Q F - 11, east of Cedar Run.

*Panicum flexile (Gatt.) Scribn.

Not reported by Kellerman but his specimen collected, 1894, in the Bog. In marl meadow, Q D - 6. Occasional.

Panicum lanuginosum Ell. var.

This variety previously unreported from Champaign County. A south and southeastern coastal species. Occasional among arbor vitae, Q E - 8.

*Panicum latifolium L.

Reported by Kellerman; his specimen collected 1894, labeled P. macrocarpon Le Conte. Common in bog meadow, Q D - 6 and 8; Q E - 9.

*Phragmites communis Trin.

One large stand in bog meadow, Q E - 3.

*Poa palustris L.

Previously unreported from Champaign County. Occasional in swamp forest, Q E - 6.

*Poa sylvestris Gray

Previously unreported, Champaign County. Occasional, swamp forest, Q G - 11.

*Secale cereale L.

Rye

An escape in Cedar Bog. Previously unreported from Champaign County. Occasional in margins of hardwood forest, Q J - 11.

*Setaria viridis (L.) Beauv. Green foxtail grass

Occasional on roadsides, Q D - 8 and Q E - 9.

*Sorghastrum nutans (L.) Nash Indian grass

This may be the species Kellerman reported as Andropogon nutans avenaceus (Michx.) Hack. There is no specimen to check. Abundant in bog meadow, Q E - 9 and Q D - 6. Considered a mesophytic grass by Tolstead (1942).

Sporobolus heterolepis Gray Northern dropseed

Reported by Kellerman; his specimen collected 1894 and Werner's, 1893. Growing in Cedar Run, Q E - 9, although Fernald (1950) gives distribution as "dry trap, limestone or serpentine . . . rocks and prairies." Occasional.

GUTTIFERAE

*Hypericum mutilum L.

Previously unreported from Cedar Bog. One location; swamp forest association and shrub communities, Q D - 8. Flowers, early September.

Hypericum nudiflorum Michx.

Previously unreported in Ohio and identification not yet verified. Found growing in Cedar Run, Q F - 11. A coastal plain species.

Hypericum punctatum L.

This may be the species reported by Kellerman as H. maculatum Walt. but there is no specimen to check. Common along west path, Q F - 7 and 8. Flowers, late July into September.

*Hypericum spathulatum (Spach.) Steud. Shrubby St. John's wort

Reported by Kellerman and Werner's specimen, 1892, is this species, although labeled H. prolificum L. Common in roadside ditches and along Cedar Run. Flowers, late July and early August.

HIPPOCASTANACEAE

Aesculus glabra L.

Ohio buckeye

Previously unreported from Cedar Bog. Many small trees, Q J - 10 and 11; Q I - 11. Largest tree observed was only 7 1/2" DBH.

HYDROPHYLLACEAE

Hydrophyllum appendiculatum Michx. Waterleaf

No specimen of this genus from Champaign County. Large colony in Q H - 10. Flowers, late May.

IRIDACEAE

*Iris virginica L. Blue flag

Kellerman reported I. versicolor L. but there is no voucher specimen. Probably the specimen Kellerman reported was I. virginica. Two locations; pool in swamp forest, Q E - 7, and along West Branch Q F - 6.

JUNCACEAE

*Juncus acuminatus Michx.

Not reported by Kellerman; Werner's specimen, collected 1893. Occasional in marl meadow, Q D - 6 and Q F - 9.

*Juncus balticus Willd.

Frequent in marl meadows, Q D - 6 and Q E - 9.

*Juncus brachycephalus (Engelm.) Buchenau

Reported by Kellerman and specimens collected by both Kellerman, 1894, and Werner, 1892. Frequent, growing in Cedar Run, Q E - 9 and in marl meadow, Q D - 6 and 7.

*Juncus brevicaudatus (Engelm.) Fern.

Previously unreported in Champaign County. Frequent in Cedar Run, Q E - 8 and in marl meadow, Q D - 7 and 4; also Q E - 4.

*Juncus dudleyi Wieg.

Previously unreported from Cedar Bog. Observed once, marl meadow, Q D - 5.

Juncus interior Wieg.

Previously unreported from Champaign County. Observed once. Roadside ditch, Q F - 8.

*Juncus nodosus L.

Previously unreported from Cedar Bog. Abundant two locations, growing in Cedar Run, Q D - 6 and Q E - 8.

Juncus scirpoides Lam.

Previously unreported from Champaign County. Observed only once, Q E - 8.

JUNCAGINACEAE

*Triglochin maritimum L.

(T. maritima of most authors)

Reported by Kellerman, but his specimen, 1894, is labeled T. palustris L. Abundant. An aspect dominant in the marl meadow in late April. Q D - 5 and 6.

*Triglochin palustre L.

(T. palustris of most authors)

Previously unreported from Cedar Bog. Grows in Cedar Run, Q D - 4 and 6; Q E - 8 and 9. Frequent.

JUGLANDACEAE

Carya glabra (Mill.) Sweet Pignut hickory

Previously unreported from Champaign County. One specimen from Q G - 11.

Carya ovalis (Wang.) Sarg. Sweet pignut

Previously unreported from Champaign County. Two specimens from Q I - 11 and Q J - 10.

Carya ovata (Mill.) K. Koch Shagbark hickory

Reported by Kellerman but no specimen. One tree in Q I - 11 measures 25 1/2" DBH; probably ca. 80 years old (Fowells, 1965). Also occasional in Q F - 6.

Carya tomentosa Nutt. Mockernut hickory

Previously unreported from Champaign County. One specimen from Q G - 10.

Juglans cinerea L. Butternut

In Q E - 6 and 8. One large tree about 24" DBH, and many seedlings in Q F - 4 and 5. Common.

Juglans nigra L. Black walnut

Previously unreported from Champaign County--but, surely, just overlooked, for it is common throughout the county. One tree ca. 7" DBH and few seedlings in Q F - 6. Large tree on roadside just east of the state-owned property. Occasional in Cedar Bog.

LABIATAE

Blephilia hirsuta (Pursh.) Benth.

Locally abundant in Q H - 11 and Q I - 10 and 11. This may be the species Kellerman reported as B. ciliata (L.) Raf., but there is no specimen.

*Glechoma hederacea L.

Reported by Kellerman; no specimen. Frequent in arbor vitae stands and swamp forest, Q F - 9 and Q J - 11.

Lamium purpureum L.

Previously unreported from Champaign County. In hardwood forest. Common.

Lycopus rubellus Moench.

Previously unreported from Champaign County. Frequent in swamp forest, Q F - 7 and 8; Q D - 7 and 8. Flowers, late August and early September.

*Lycopus uniflorus Michx.

Previously unreported from Champaign County but Werner's specimen, 1892, labeled L. virginicus L. is probably this species. There is some doubt as to the correct identification of Werner's specimen. Occasional in arbor vitae zones, Q D - 7 and Q F - 9. Flowers, mid- to late August.

*Mentha arvensis L.

Observed once in Q E - 8. Early August.

Mentha cardiaca Baker

Previously unreported from Champaign County. Observed once in Q D - 8. Bog meadow. Flowers, early August.

Mentha citrata Ehrh.

The specimen Kellerman reported as M. piperita L. appears to be this species. There is some doubt concerning the identification of his collection in 1894. Observed once in Q D - 8 in open bog meadow. Flowers, late August.

*Monarda fistulosa L. var. mollis L. Wild Bergamot

Previously unreported from Cedar Bog. Occasional, bog meadow, Q D - 8. Also along Cedar Run, south toward Mad River. Flowers, early August.

*Nepeta cataria L.

Catnip

Reported by Kellerman but no specimen. Observed once in bog meadow, Q D - 8. Flowers, late August.

Physostegia virginiana (L.) Benth. False dragonhead, Obedience plant

Reported by Kellerman but no specimen. One large colony at edge of bog meadow, Q E - 4. Flowers, mid-August.

*Prunella vulgaris L. Self-heal

Reported by Kellerman; no specimen. Abundant throughout arbor vitae and swamp forest association.

Pycnanthemum virginianum (L.) Durand and Jackson Mountain-mint

Unreported by Kellerman, but his specimen, 1894, and Werner's, 1893, are extant. Both are labeled Koellia virginiana (L.) McM. Frequent in bog meadow, Q E - 9. Flowers, August and early September.

Scutellaria epilobiifolia A. Hamilton

Previously unreported from Champaign County. Frequent in bog meadow, Q D - 6 and 8. Flowers, July to early August.

*Scutellaria lateriflora L. Mad-dog skullcap

Reported by Kellerman but no specimen. Frequent in swamp forest, Q D - 7, Q E - 4, Q F - 6 and 11. Flowers, August.

*Teucrium canadense L. var. virginicum (L.) Eaton

Wood sage or American germander

Reported by Kellerman; no specimen. Common in hardwood forest, Q I - 10 and Q J - 11. Flowers, July.

LAURACEAE

Lindera benzoin (L.) Blume Spicebush

Reported by Kellerman. Specimen collected by Spence, 1879.

Abundant in swamp forest association and shrub communities. Flowers, April.

LEGUMINOSAE

*Amphicarpa bracteata (L.) Fern. var. bracteata Hog-peanut

Common in swamp forest and along west path, Q F - 6, 7, and 8; Q E - 7 and 8. Flowers, August. Listed as Falcata pitcheri T. & G. by Gates.

Amphicarpa bracteata (L.) Fern. var. comosa (L.) Fern. Hog-peanut

Reported by Kellerman; his specimen collected 1894, labeled Falcata comosa J. F. Gmel. Common on roadside and in swamp forest, Q E - 8. Flowers, August.

*Apios americana Medic. Groundnut

Reported by Kellerman; no specimen. Abundant in swamp forest north of Woodburn Road. Gates (1942) listed this species as Glycine apios L. and Apios tuberosa Moench.

Cercis canadensis L. Redbud

Reported by Kellerman; no specimen. Occasional in swamp forest, Q F - 6.

*Desmodium canadense (L.) DC

Reported by Kellerman, but no specimen. Occasional Q E - 9. Flowers, mid-August. Listed as Meibomia canadensis Adans. by Gates. Desmodium dillenii Darl.

Previously unreported from Champaign County. Occasional along west path, Q F - 7. Flowers, late August.

Desmodium laevigatum (Nutt.) DC

Previously unreported from Champaign County. Occasional, south side Woodburn Road, Q E - 9. Flowers, mid- to late August.

Desmodium paniculatum (L.) DC

Previously unreported from Cedar Bog. Frequent along west path, Q F - 4, 6, and 8. Flowers, August.

Gleditsia triacanthos L. Honeylocust

One tree in hardwood forest association, Q J - 11.

*Lathyrus palustris L.

Occasional in shrub communities, Q F - 10 and Q D - 8.

Robinia pseudo-acacia L. Black locust

Reported by Kellerman; no specimen. In swamp forest, Q E - 6. Occasional.

Trifolium arvense L. Rabbit-foot clover

Not previously reported from Champaign County. Occasional on roadsides, Q E - 8 and 9. Flowers, May.

Trifolium dubium Sibth. Yellow sweet clover

Occasional on roadside, Q E - 8. Flowers, late August.

*Trifolium pratense L. Red clover

Reported by Kellerman; no specimen. Occasional on roadside, Q F - 8. Flowers, August.

LENTIBULARIACEAE

*Utricularia cornuta Michx. Bladder-wort

If Kellerman's report was based on Werner's specimen, this is the species listed. Werner's specimen, 1893, labeled U.

intermedia Hayne has been determined U. cornuta. Frequent in marl meadow, Q D - 6. Flowers, June to early August.

*Utricularia intermedia Hayne

Kellerman reported this species, but voucher specimen determined as U. cornuta. Occasional in marl meadow, Q D - 5 and 6. Flowers, May to mid-October.

LILIACEAE

Allium cernuum Roth.

Nodding wild onion

Unreported by Kellerman, but a specimen collected by Werner 1893 extant. Abundant in all bog meadow areas and in open areas of arbor vitae stands, Q D - 7 and 8; Q E - 9. Flowers, July and August.

*Allium tricoccum Ait.

Wild leek

Abundant in swamp forest, Q F - 6 and 7; Q E - 8. Occasional in deciduous forest, Q I - 10. Flowers, mid-June to early July.

Clintonia borealis (Ait.) Raf. Bluebeard lily

Planted in Cedar Swamp by Mr. Carl Horst in Q E - 9. Identification doubtful, because plant has not bloomed.

Lilium michiganense Farw.

Michigan lily

Frequent in swamp forest and along West Branch north of Woodburn Road, Q F - 6, 7, and 8. Flowers, early July.

*Maianthemum canadense Desf.

False lily-of-the-valley

Abundant in arbor vitae stands, Q D - 7 and 8; Q E - 7, 8, and 9. Flowers, May. Two specimens, Urbana College. Relict boreal species.

*Polygonatum pubescens (Willd.) Pursh. Solomon's seal

Reported by Kellerman as P. biflorum (Walt.) Ell. No specimen. Frequent in swamp forest, Q F - 6. Flowers, June.

*Smilacina racemosa (L.) Desf. False solomon's seal

Reported by Kellerman as Vagnera racemosa (L.) Morong. No voucher specimen. Frequent in swamp forest, Q F - 6 and 7; Q G - 11. Flowers, mid- to late May.

*Smilacina stellata (L.) Desf. Starry false solomon's seal

Reported by Kellerman and specimen Werner, 1893. Abundant in arbor vitae stands, Q E - 8 and 9; Q F - 8. Flowers, early May.

Smilax rotundifolia L.

Identification based on leaf shape and erose, irregularly thickened leaf margins. Not seen in flower or fruit. Occasional in deciduous forest, Q J - 11.

*Smilax tamnoides L. var. hispida (Muhl.) Fern. Cat's-brier

Reported by Kellerman; his specimen collected 1894 and labeled S. hispida Muhl. Frequent along west path, Q F - 6, 7, and 8. Also in swamp forest, Q F - 9 and Q E - 9.

*Tofieldia glutinosa (Michx.) Pers. False asphodel

Abundant in bog meadow zones, Q D - 6 and 7; Q E - 9. Flowers, July.

*Trillium flexipes Raf. Nodding trillium

No specimen from Cedar Bog, but possibly this is the species reported by Kellerman as T. erectum L. Abundant in all swamp forest zones. Flowers, late April and early May.

*Trillium grandiflorum (Michx.) Salisb. Large-flowered trillium

Reported by Kellerman; no specimen. Abundant in arbor vitae and swamp forest associations. Flowers, May.

Trillium sessile L.

Toad trillium

Frequent in deciduous forest area, Q I and J - 11.

*Uvularia grandiflora Sm.

Giant bellwort

Not previously reported from Cedar Bog. Common in swamp forest, Q F - 7 and 8. Flowers, late April and May.

Uvularia perfoliata L.

Bellwort

Frequent in swamp forest, Q F - 7, along west path. Flowers, early May.

*Zigadenus glaucus Nutt.

White camass

Reported by Kellerman. Werner's specimen, 1893, labeled Z. elegans Pursh. Abundant in bog meadow zones, Q D - 6 and 7. Boreal species.

LYCOPODIACEAE

*Lycopodium lucidulum Michx.

Shining clubmoss

Unreported by Kellerman, but specimen collected by Biddlecombe in 1875. Occasional in arbor vitae stands, Q F - 7, 11, and 12.

LYTHRACEAE

Lythrum dacotanum Nieuw.

Loosestrife

(L. alatum Pursh. of most authors)

Reported by Kellerman; no specimen. Occasional in bog meadow, Q D - 6. Flowers, late August.

Lythrum hyssopifolia L. Gayfeather

Previously unreported from Champaign County and the identification is uncertain. Petals are longer than expected but sepals are shorter than appendages. Possibly, these two taxa are ecotypes of L. dacotanum. Specimen at Urbana College. Occasional, Q D - 7. Flowers, late July.

MAGNOLIACEAE

Liriodendron tulipifera L. Tuliptree

Reported by Kellerman but no specimen. Dominant in tuliptree zones and common in other swamp forest areas.

MENISPERMACEAE

Menispermum canadense L. Moonseed

Reported by Kellerman; no specimen. Occasional in swamp forest, Q F - 6 and 8.

MORACEAE

Morus alba L. White mulberry

Previously unreported from Cedar Swamp. Rare, in deciduous forest, Q G - 12.

OLEACEAE

*Fraxinus americana L. var. americana White ash

Reported by Kellerman but no specimen. Common in swamp forest, Q F - 7 and 10; Q H - 11.

Fraxinus americana L. var. biltmoreana (Beadle) J. Wright

Previously unreported from Cedar Bog. Observed once, Q F - 9.

*Fraxinus nigra Marsh. Black ash

Most abundant ash in the Bog. Swamp forest, Q E - 8;
Q F - 1 through 8; Q G and H - 10 and 11.

*Fraxinus pennsylvanica Marsh. var. pennsylvanica Red ash

Variety unreported in Champaign County. Observed and
collected once in Q F - 9.

*Fraxinus pennsylvanica Marsh. var. subintegerrima (Vahl Fern.

Green ash

Previously unreported from Cedar Bog. The second most
common ash in the Bog. In swamp forest, Q E - 1, 5, and 7;
Q F - 7, 9, and 11; Q G - 10.

ONAGRACEAE

*Circaea quadrisulcata (Maxim.) French & Sav. Enchanter's nightshade

Reporter by Kellerman; no specimen. Common in swamp
forest, Q E - 6, Q F - 7, and Q G - 11.

Epilobium coloratum Biehler

Reported by Kellerman and his specimen collected 1894.
Occasional in bog meadow, Q D - 6 and 8. Flowers, mid-August.

*Epilobium glandulosum Lehm. var. adenocaulon (Hausk.) Fern.

Rare, on margin of West Branch, Q F - 7. Flowers, late
August. Probably, a relict boreal species.

*Epilobium leptophyllum Raf.

One collection from bog meadow, Q D - 6. Flowers, late
August.

*Oenothera biennis L.

Evening primrose

Reported by Kellerman but no specimen. Occasional roadside and bog meadow, Q D - 8 and Q E - 9. Flowers, September.

OPHIOGLOSSACEAE

*Botrychium multifidum J. G. Gmel.

Previously unreported from Champaign County. In deciduous forest, Q J - 11. Collected and observed only once.

*Botrychium virginianum (L.) Sw.

Frequent in swamp forest, Q F - 3, 6, and 10.

ORCHIDACEAE

Aplectrum hyemale (Muhl.) Torr. Putty-root

Previously unreported from Cedar Bog. One colony, deciduous forest, Q I - 11. Flowers, June.

*Calopogon pulchellus (Salisb.) R. Br. Grass-pink orchid

Common in marl and bog meadows, Q D - 6, 7; Q E - 9. Flowers, mid-June and July.

*Cypripedium calceolus L. var. parviflorus (Salisb.) Fern.

Small yellow ladyslipper

Reported by Kellerman. Werner's specimen, 1894, labeled C. hirsutum Mill. Specimen at Urbana College collected by M. G. Williams. At margin of bog meadow and arbor vitae, Q D - 7 and Q E - 8. Rare. Flowers, late May and June. Boreal species.

*Cypripedium reginae Walt. Showy ladyslipper

Reported by Kellerman. Specimens both Werner and Spence, 1892, at OS. Frequent in arbor vitae and bog meadow zones, Q D - 6 and 7; Q E - 5. Flowers, mid- to late June. Boreal species.

Goodyera pubescens (Wild.) R. Br. Rattlesnake plantain

Rare in two locations in Q E - 9. Flowers, late July.

G. tessellata Lodd. may also be in this quadrat. One plant planted by Carl Horst but has never been observed in flower.

*Habenaria clavellata (Michx.) Spreng. Green wood orchid

Reported by Kellerman. Specimen collected by Werner, 1893. Drier parts of arbor vitae stands, Q D - 7, Q E - 8 and 9. Common. Flowers, mid-July to early August. Relict boreal species.

*Habenaria psycodes (L.) Spreng. Small purple fringed orchid

Occasional in swamp forests, Q E - 8 and 9. Flowers, July. Boreal species.

*Liparis loeselii (L.) Richards Bog twayblade

Kellerman did not report this species but Werner specimen, 1893, is labeled Leptorchis loeselii (L.) MacM. Two colonies in arbor vitae stands, Q F - 9 and Q E - 9.

*Spiranthes ovalis Lindl. Small flowered ladies'-tresses

Previously unreported from Champaign County. Frequent in swamp forest, Q E - 8 and 9. Flowers, September and October. Boreal species.

OSMUNDACEAE

*Osmunda cinnamomea L. Cinnamon fern

Reported by Kellerman. Three specimens from Cedar Swamp (OS): Spence, 1877; Biddlecombe, 1878; and Werner, 1893. Common, Q G and F - 11 and 12.

*Osmunda regalis L. Royal fern

One small group of plants in arbor vitae, Q E - 9.

OXALIDACEAE

Oxalis europaea Jord.

Previously unreported, Champaign County. Observed once,
Q F - 7.

PAPAVERACEAE

*Sanguinaria canadensis L. Bloodroot

No specimen from Champaign County. Swamp forest, Q D - 7.

PHYRMACEAE

*Phryma leptostachya L. Lopseed

Common in swamp forest, Q E - 9, Q F - 8 and 9, and Q J - 11.

PHYTOLACCACEAE

Phytolacca americana L. Pokeweed

Reported by Kellerman as P. decandra L.; no specimen.
Occasional in hardwood forest, Q H - 11.

PINACEAE

*Thuja occidentalis L. Arbor vitae

Reported and collected by Kellerman (1894) and Werner
(1892). Dominant coniferous evergreen in Cedar Swamp. Relict
boreal species.

PLANTAGINACEAE

*Plantago lanceolata L. English plaintain

Introduced in Cedar Bog. Previously unreported. Oc-
casional on roadsides, Q E - 9.

*Plantago rugelii Dcne. Rugel's plaintain

Reported by Kellerman. Werner's specimen, 1892. Occasional in bog meadow, Q D - 6.

PLATANACEAE

Platanus occidentalis L. Sycamore

Reported by Kellerman, but no specimen. Common throughout all swamp forest. Largest tree, 44" DBH.

POLEMONIACEAE

Phlox divaricata L. Blue phlox

Frequent in the hardwood forest, Q I - 11. Flowers, late April and May.

Phlox maculata L. Wild sweet william

Reported by Kellerman. Werner specimen collected 1893. Common in bog meadow and along West Branch, Q D - 6, 7, and 8; Q E - 9, and Q F - 8. Flowers, mid-June to mid-July.

Phlox paniculata L. Fall phlox

No specimen from Champaign County. Occasional, Q E - 10 and Q F - 7. Flowers, late August and early September.

Polemonium reptans L. Greek valerian

Reported by Kellerman but no specimens from Champaign County. Frequent in swamp forest, Q F - 9. White-flowered form collected by Dr. Ronald L. Stuckey, #1528, 1963. Flowers, May.

POLYGONACEAE

*Polygonum hydropiperoides Michx.

Reported by Kellerman; no specimen. Occasional swamp forest, Q D - 6 and Q F - 7.

Polygonum orientale L. Prince's feather

Reported by Kellerman; no specimen. Occasional in arbor vitae stand, Q E - 8.

*Polygonum pensylvanicum L.

Reported by Kellerman; no specimen. Occasional in arbor vitae stand, Q D - 7.

*Polygonum persicaria L.

No voucher specimen for Kellerman's report. One collection in deciduous forest, Q J - 11. Rare.

*Polygonum punctatum L. Dotted smartweed

Reported by Kellerman; his specimen collected 1894. Common in arbor vitae stand and along west path, Q D - 7 and 8; Q F - 6.

Polygonum scandens L.

Previously unreported from Champaign County. On fence, Q D - 8 and in hardwood forest, Q G - 10 and Q J - 10. Occasional.

Rumex verticillatus L. Swamp dock

Occasional, roadside ditches, Q D - 8 and Q E - 9.

Tovara virginiana (L.) Raf. Virginia knotweed

Reported by Kellerman as Polygonum virginianum L., but no specimen. Common in swamp forest, Q D - 8, Q E - 6, and Q F - 8.

POLYPODIACEAE

*Adiantum pedatum L. Maidenhair fern

Reported by Kellerman but no specimen. Frequent in swamp forest, Q E - 7, 8, and 9.

Asplenium platyneuron Oakes Ebony spleenwort

Previously unreported from Champaign County. In arbor vitae stand, Q D - 7 and in swamp forest, Q F - 10 and G - 11. Occasional. Specimen collected by M. G. Williams at Urbana College.

*Athyrium pycnocarpon Tidestrom Glade fern

One colony, swamp forest, Q E - 7. Fronds frequently four feet tall.

*Athyrium thelypteroides Desv. Silvery glade fern

Reported by Kellerman; no specimen. Abundant swamp forest, Q G and F - 11 and 12.

Camptosorus rhizophyllus (L.) Link. Walking fern

Reported by Kellerman. Specimens collected by Spence 1878 and 1886; Werner 1892. One small colony on a fallen arbor vitae log across Cedar Run, Q D - 7.

Cystopteris, spp.

This is the most abundant fern in Cedar Bog, found throughout the arbor vitae association and in some areas of the swamp forest. There is great variation among the plants in the Bog. Identification of species and hybrids follows Blasdell (1963).

*Cystopteris bulbifera (L.) Bernh. Bulblet fern

Reported by Kellerman; his specimen collected 1894. One by Spence before 1880. Abundant in arbor vitae association,

Q F and E - 8 and Q E and D - 7. Frequent in other arbor vitae stands and occasional in swamp forest, Q F - 9. Typically, this species has long slender and tapered fronds. Stipe only $1/4$ to $1/3$ or less the length of blade. Rachis and rachillae not winged. Indusium usually truncate. Uni- and multicellular, glandular hairs throughout. Veins end in the sinuses of the margin.

Cystopteris bulbifera hybrids

Seven specimens collected during this study are, I believe, hybrids of C. bulbifera with C. fragilis (L.) Bernh. Although I have not collected specimens of C. fragilis in Cedar Swamp, it is found in many wooded areas in Champaign County. Almost without exception, the putative hybrids bear bulblets, but morphological characters are different, as noted below.

Cystopteris x laurentiana (Weath.) Blasdell

(C. bulbifera x fragilis)

Specimens #1244 and #1121-B. Over-all appearance of C. fragilis; tripinnate, pinnae close, most overlapping, especially at base of blade. Indusia with scattered glands and lacerate apex. Bulblets borne on rachis and rachillae. Some specimens glabrous throughout.

Cystopteris x tennesseensis Shaver

Specimens #1121-A and 1160. Blade deltoid in over-all appearance. Stipe half or more the length of the blade. Mostly bipinnate with only few lower pinnae thrice cut. Veins ending in sinuses, rarely in teeth. Bulblets on rachis and rachillae; sometimes covered with hairs.

Cystopteris bulbifera x ?

Three specimens do not fit Blasdell's descriptions of hybrids. They are #406-A, 482-A, and 1121-C. Not typically C. bulbifera, although most bear bulblets. Veins often end in the teeth, instead of in emarginations. Some blades have no sori or abortive sori. Indusia, when present, frequently shallowly lobed, not truncate.

Dryopteris campyloptera Clarkson (D. dilatata Gray)

One specimen (#1353) collected in Q F - 10 during this study and three collected in 1962 most nearly resemble this species. A search for additional specimens was unsuccessful. Following the death of the elms, the area is sunny and overgrown with stinging nettles and briars. Species previously unreported from Champaign County.

*Dryopteris clintoniana Dowell Clinton's wood fern

Reported by Kellerman; no specimen. Occasional in swamp forest, Q D - 4, Q F - 9, and Q D - 4.

*Dryopteris cristata Gray Crested fern

Not reported by Kellerman but specimens collected by Biddlecombe, 1877, and Spence, 1892. Large colonies in Q D - 7 and Q F - 6.

*Dryopteris intermedia Gray Evergreen wood fern

Occasional in swamp forest, Q E - 6, Q F - 10 and 11, and Q G - 12.

*Dryopteris spinulosa (O. H. Muell.) Watt Spinulose wood fern

The most common Dryopteris in the Swamp. Common in swamp forest bordering arbor vitae, Q D - 7, Q E - 7 and 8, Q F - 7 and 11.

*Onoclea sensibilis L. Sensitive fern

Reported by Kellerman but no voucher specimen. Frequent Q E - 7 and 8, Q F - 5 and 6.

*Polypodium virginianum L. Rock polypody

Previously unreported from Champaign County. One location-- on a downed arbor vitae log along Cedar Run, Q E - 7.

Polystichum acrostichoides Schott. Christmas fern

Reported by Kellerman as Dryopteris acrostichoides (Michx.) Kuntze, but no specimen. Only two small plants observed in the Bog, Q F - 7, west of West Branch, and in Q I - 11.

*Thelypteris palustris Schott. var. pubescens Fern. Marsh fern

Reported by Kellerman as Dryopteris thelypteris (L.) A. Gray, but no specimen. Common in bog meadow, and in arbor vitae stand along Cedar Run, Q D - 7 and 8, Q E - 7, 8, and 9.

PORTULACACEAE

Claytonia virginica L. Spring beauty

Occasional in deciduous forest, Q H - 10 and Q I - 11. Flowers, late April.

PRIMULACEAE

Dodecatheon meadia L. Shooting-star

One relatively large colony, Q E - 5. Flowers, mid-May.

*Lysimachia ciliata L. Loosestrife

Common in swamp forest, Q D - 6 and Q E - 8. Flowers, mid-June through July. Probably relict boreal species.

*Lysimachia quadriflora Sims Linear-leaf loosestrife

Reported by Kellerman as Steironema radicans (Hook.) A. Gray. Werner specimen, 1892, labeled L. quadriflorum (Sims) A. S. Hitchc. Common in bog and marl meadows, Q D - 5 and 7, Q E - 6. Flowers, July and August.

*Trientalis borealis Raf. Star flower

Reported by Kellerman. Three specimens from Cedar Bog: Spence, 1892; Werner and Wilcox, 1893. Also specimens at Urbana College, collected by M. G. Williams. Frequent in arbor vitae stands, Q D - 7, Q E - 8 and 9. Flowers, mid-May. Relict boreal species.

RANUNCULACEAE

*Actaea pachypoda Ell. White baneberry

Reported by Kellerman; no specimen. Common in arbor vitae and swamp forest associations, Q D - 7, Q F - 8, 10, and 11. Flowers, mid-May. Listed by Gates as A. alba (L.) Mill.

Anemone quinquefolia L. Wood anemone

Reported by Kellerman. Spence collection, 1891, is var. interior Fern. My specimen #717, and perhaps another, #259, are also var. interior. Frequent in swamp forest association and occasional in hardwood forest.

*Anemone virginiana L. Thimbleweed

Frequent along Woodburn Road and the west path, Q F - 8 and 9. Flowers, July into early August.

Anemonella thalictroides (L.) Spach. Rue anemone

No specimen from Champaign County but abundant in arbor vitae and swamp forest associations. Q E - 7 and 8, Q F - 9 and 10. Flowers, mid-April to mid-May.

*Aquilegia canadensis L. Wild columbine

Reported by Kellerman; no specimen. Frequent at margin of arbor vitae stands, Q E - 6 and Q F - 7. Flowers, May.

*Caltha palustris L. Marsh marigold

Reported by Kellerman; no specimen. Abundant in swamp forest north of Woodburn Road, Q E and F - 7 and 8; also on the margins of West Branch. Flowers, May. Probably, boreal species.

*Clematis virginiana L. Virgin's bower

Reported by Kellerman. Werner's specimen collected 1892. Occasional at edge of swamp forest, Q E - 5 and 8, Q E - 9. Flowers, August.

*Hepatica americana (DC) Ker. Liverwort

No specimen from Champaign County. Abundant in arbor vitae association and edge of swamp forest, Q E - 6, 7, 8, and 9. Also, Q F - 7. Flowers, April to early May.

*Ranunculus abortivus L. Kidney-leaf buttercup

Reported by Kellerman; no specimen. Observed once, Q F - 9. Flowers, early May.

Ranunculus hispidus Michx.

Previously unreported from Cedar Bog. Observed once in swamp forest, Q F - 10. Flowers, late April.

*Ranunculus recurvatus Poir.

Occasional in swamp forest Q F - 8 and 9. Flowers, May.

Ranunculus repens L.

Creeping buttercup

Previously unreported from Champaign County. Frequent in hardwood forest, Q H and I - 10 and 11, Q G - 11. Flowers, April.

*Ranunculus septentrionalis Poir.

Swamp buttercup

Frequent in swamp forest, Q E - 7, Q F - 7 and 10. Flowers, late April to mid-May.

Thalictrum clavatum DC

Lady rue

Previously unreported from Champaign County. Observed once, Q E - 8, early May.

*Thalictrum dasycarpum Fisch. and Lall.

Purple meadow-rue

Reported by Kellerman; no specimen. Frequent in bog meadow, Q D - 6, Q E - 8, and Q F - 11. Flowers, early June.

*Thalictrum diocium L.

Early meadow-rue

Occasional in swamp forest, Q E - 7. Flowers, late April.

Thalictrum polygamum Muhl.

Previously unreported from Champaign County, but abundant in swamp forest, Q F - 5, 7, and 11; Q H - 11; and Q I - 11. Flowers, June and early July.

Thalictrum revolutum DC

Unreported from Champaign County. Occasional in swamp forest, Q F - 8 and 9. Flowers, June.

RHAMNACEAE

*Rhamnus alnifolia L'Her.

Reported by Kellerman. Werner's specimen collected 1893.
Common in shrub communities at margin of bog and marl meadows,
Q D - 6, Q E - 5 and 9. Boreal species.

ROSACEAE

*Agrimonia gryposepala Wallr. Agrimony

Frequent in swamp forests, Q E - 7 and 8, Q F - 6.
Flowers, July.

Agrimonia parviflora Ait.

Occasional in Q D - 5 and 7. Also Q F - 10. Flowers,
late August.

Agrimonia pubescens Wallr.

Unreported previously from Champaign County. Collected
twice, same location, Q F - 7.

Crataegus crus-galli L. Cockspur thorn

Occasional in deciduous and swamp forests, Q F - 7 and
Q J - 11. No specimen from Champaign County, although reported
by Kellerman.

Crataegus punctata Jacq. Dotted hawthorn

Reported by Kellerman but no specimens previously col-
lected from Champaign County (Braun, 1961). Collected once in
deciduous forest, Q J - 11.

Filipendula rubra (Hill) Robins Queen-of-the-prairie

Reported by Kellerman as Ulmaria rubra Hill. No specimen.
Frequent in bog meadow, Q E and F - 9. Flowers, July and August.

*Fragaria vesca L.

Woodland strawberry

Occasional along west path, Q F - 8. Flowers early May.

*Geum canadense Jacq.

Avens

Frequent in hardwood and swamp forests, Q E - 7 and 9,
Q H - 11, and Q J - 10. Flowers, July to early August.

*Geum vernum (Raf.) T. & G.

Occasional in Q F - 7. Flowers, mid-May.

Geum virginianum L.

Collected once in deciduous forest, Q I - 10. Flowers,
July.

*Physocarpus opulifolius (L.) Maxim.

Ninebark

Reported by Kellerman. His specimen collected in 1894;
Werner's, 1892. Abundant in shrub zones along Cedar Run and
West Branch, Q D - 5 and 6, Q F - 6 and 7, Q E - 9. Flowers,
mid-June.

*Potentilla fruticosa L.

Shrubby cinquefoil

Reported by Kellerman; his specimen 1894 and Werner's,
1892. Abundant in bog meadows, Q E - 8 and 9. Flowers, June to
late September. Relict boreal species.

*Prunus pensylvanica L. f.

Pin chokecherry

Previously unreported from Champaign County. Collected
once at margin of marl meadow, Q D - 5.

*Prunus serotina Ehrh.

Wild black cherry

Reported by Kellerman but no specimen. Common in parts
of swamp forest, Q E - 2, 3, 4, and 5; Q F - 7.

Pyrus coronaria L.

Wild crabapple

Reported by Kellerman but no specimen. Observed once,
Q E - 8. Flowers, mid-May.

*Pyrus malus L.

Apple

One tree in secondary swamp forest, Q F - 9. Flowers,
late April.

*Pyrus melanocarpa (Michx.) Willd.

Black chokecherry

Unreported by Kellerman but three specimens collected by
him and labeled Rhamnus cathartica L. have been correctly identified as P. melanocarpa. In addition, Werner's specimen labeled Aronia nigra, collected in 1892. Also, specimens at Urbana College. Frequent in swamp forest, Q D - 7, Q F - 5 and 9. Flowers, mid- to late May.

*Rosa carolina L.

Reported by Kellerman; no specimen. Collected once,
Q D - 4. Flowers, early July.

Rosa carolina x palustris

Two plants appear to be this hybrid, though they may be R. virginiana Mill. See below. Specimens, #473 from Q F - 8 and #1136 from Q F - 9. Plants larger than R. carolina; prickles straight; leaf-rachis, villous and flowers deep pink. Previously unreported. Flowers, mid- to late July.

*Rosa palustris Marsh.

Swamp rose

Previously unreported from Cedar Bog. Most common rose in the swamp; in swamp forest zones, Q D - 8, Q E - 9, Q F - 8 and 10. Flowers, July.

Rosa setigera Michx.

Prairie rose

Reported by Kellerman; no specimen. Frequent in drier parts of bog meadow, Q E - 8 and Q F - 9. Flowers, July.

Rosa virginiana Mill.

Despite Gleason (1952) and Braun (1961), I believe this is the correct designation for my specimens #642 and #899. Both were collected in fruit.

Erlanson (1934) states that the hybrid R. palustris x carolina--which specimens #642 and #988 resemble--is highly sterile. In R. palustris, $2n = 14$; R. carolina, $2n = 28$; and R. virginiana, $2n = 28$ (Erlanson, 1929). My specimens have well-developed, apparently normal, achenes, which I believe would not be true if they represented hybrids. Therefore, I believe these are species of Rosa and they key to R. virginiana. Specimens #473 and #1136 (reported as hybrids, above) may also be this species. They were collected from the same quadrats. Unfortunately, the problem was not anticipated and the plants were not marked when in flower. The species previously unreported in Ohio (Braun, 1961).

*Rubus allegheniensis Port.

Sow-teat blackberry

No specimens from Champaign County. One large colony in swamp forest, Q E - 5. Fruits, early August.

Rubus frondosus Bigel

Previously unreported in Champaign County. Observed once, Q F - 8. Flowers, late May.

*Rubus occidentalis L. Black raspberry

Reported by Kellerman, but no specimen. Frequent along west path, Q F - 7 and 8; also, Q F - 9. Flowers, late May.

Rubus pensilvanicus Poir.

Previously unreported from Champaign County. Occasional along west path, Q F - 5 and 6, Q D - 8. Fruits, early August.

*Rubus pubescens Raf.

Reported by Kellerman. Specimen collected by Spence, labeled R. triflorus Richards, in 1880. Williams, three specimen at Urbana College. Abundant as ground cover in arbor vitae stands. Q E - 6 and 8; Q F - 6, 7, 9, 10, 11, and 12. Flowers, late April, early May; fruits, early July. Boreal species.

Sanguisorba canadensis L. American burnet

Reported by Kellerman; Werner's specimen, 1892. Common in bog meadows, Q E - 9 and F - 10. Flowers, late August.

RUBIACEAE

Galium aparine L. Bed-straw

Reported by Kellerman, but no specimen. Common in swamp forest, Q D - 7, Q E - 6 and 7, Q G - 11.

*Galium asprellum Michx.

Observed once, Q D - 8.

*Galium concinnum T. & G. Shining bed-straw

Reported by Kellerman; no specimen. Occasional in bog meadow, Q D - 8.

*Galium obtusum Bigel

Previously unreported from Cedar Bog. Occasional in swamp forest, Q E - 6.

*Galium trifidum L.

Previously unreported from Champaign County. Swamp forest zone, Q G - 11. Occasional.

*Galium triflorum Michx. Sweet-scented bed-straw

Abundant, swamp forest, Q D - 7; Q E - 5, 6, 9, and 10; Q I - 10 and 11.

*Mitchella repens L. Partridge-berry

Reported by Kellerman; specimens collected by Spence, 1877 and 1892. Common in drier arbor vitae zones, Q D - 7, Q E - 9, and Q F - 10 and 11. Flowers, May.

RUTACEAE

Ptelea trifoliata L. Hop-tree, Wafer-ash

Reported by Kellerman, but no specimen. Occasional in swamp forests, Q D - 8 and Q F - 7. Southeast coastal plain and Mississippi Embayment species (Bailey, 1962).

*Xanthoxylum americanum Mill. Prickly ash

Reported by Kellerman; no specimen. Occasional in Q D - 8; common in Q F - 6, 7, and 8; and Q H and I - 10.

SALICACEAE

*Populus deltoides Bart. Cottonwood

Reported by Kellerman as P. monilifera Ait. No specimen. Occasional in Q F - 7. One large tree 37" DBH, in Q F - 9.

*Populus grandidentata Michx. Bigtooth aspen

Kellerman's specimen collected in Urbana, 1897. Observed once at margin of hardwood association, Q I - 9.

*Populus tremuloides Michx. Quaking aspen

Occasional, Q E - 10 and Q F - 11.

Salix amygdaloides Anderss. Peach-leaf willow

Previously unreported from Cedar Bog. Observed once, Q E - 8.

*Salix discolor Muhl. Pussy willow

Reported by Kellerman; his specimen collected 1894. Common on margins of marl meadow, in shrub zone, Q D - 6.

*Salix glaucophylloides Fern. Blueleaf willow

Previously unreported from Champaign County. Rare, Q E - 8 and Q F - 11.

*Salix nigra Marsh Black willow

Reported by Kellerman, but no specimen. Two large trees joined at the base on west bank of Cedar Run, Q F - 11, measure 19 1/2" and 20 1/2" DBH.

*Salix rigida Muhl.

Unreported from Cedar Bog. North side Woodburn Road, Q E - 8; one shrub.

Salix sericea Marsh

Unreported from Cedar Bog. Margins of marl meadow, Q D - 6 and on banks of Cedar Run, Q E - 9 and Q F - 9 and 10. Occasional.

Salix X subsericea (Anderss.) Schneid.

Previously unreported from Cedar Bog. Rare. East bank of Cedar Run, Q F - 10.

SARRACINIACEAE

*Sarracenia purpurea L. Pitcher-plant

In Q D - 6. Planted in Cedar Bog, perhaps several times. Evans (1944) states that he set plants in Cedar Bog in two places in 1925. There is one plant present today, but it is not vigorous.

SAXIFRAGACEAE

Hydrangea arborescens L. Hydrangea

Reported by Kellerman; specimen collected by Wilcox 1894. Occasional in arbor vitae stand Q E - 7 and 8. Flowers, early July.

*Mitella diphylla L. Bishop's cap

Reported by Kellerman; no specimen. Abundant in arbor vitae stands, Q E - 7, 8, and 9; Q F - 10 and 11. Flowers, late April to mid-May.

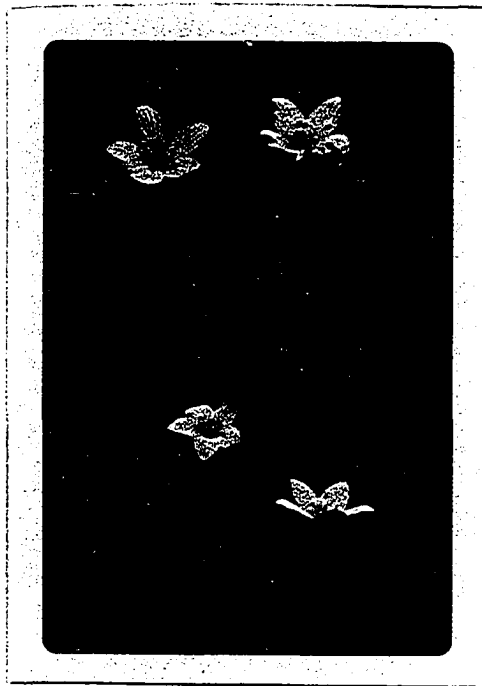
*Mitella nuda L. Miterwort

Rare in arbor vitae association, Q E - 6 and 7. Flowers, mid-May. Specimen at Urbana College collected by M. G. Williams in Cedar Bog is labeled Mitella ^{nuda} / cordifolia Lamark. with a note added, "Very rare, John H. Schaffner."

*Parnassia glauca Raf. Grass-of-Parnassus, Bog stars

Reported by Kellerman. Werner's specimens collected in 1892. Common in bog meadow and arbor vitae associations, Q D - 6 and 7; Q E - 8 and 9. Flowers, late August and September (Fig. 21).

Fig. 21. Grass-of-Parnassus, Parnassia glauca Raf.



*Ribes americanum Mill. Wild black currant

Reported by Kellerman but no specimen. Occasional in swamp forest, Q E - 7, Q F - 9, and Q E - 6 and 9. Flowers, June.

*Ribes cynosbati L. Prickly gooseberry

Reported by Kellerman but no specimen. Occasional Q E - 8, Q F - 8 and 9. Flowers, early June.

*Ribes glandulosum Gauer

Previously unreported from Champaign County. Observed once, Q E - 7, in arbor vitae association. Boreal species (Braun, 1961).

*Ribes hirtellum Michx. Smooth gooseberry

Not reported by Kellerman but Werner specimen labeled R. oxycanthoides L. has been identified as R. hirtellum. Rare in Q F - 7 and 8. Flowers, June.

SCROPHULARIACEAE

*Chelone glabra L. var. glabra Turtle-head

Occasional in bog meadow, Q D - 6 and 8. There is no specimen and no report of this variety from Cedar Bog.

Chelone glabra L. var. linifolia Coleman

Kellerman's specimen 1894 labeled C. glabra L. is this variety. Rare, Q D - 8. Both varieties bloom late August and Early September.

Gerardia purpurea L.

Unreported by Kellerman, but his specimen collected in 1894. Frequent in marl meadows, Q D - 6 and Q E - 5. Flowers, late August and early September.

*Mimulus ringens L.

Reported by Kellerman, but no specimen. Rare. Q E - 9, on margin of Cedar Run. Flowers, mid-August.

*Pedicularis canadensis L. Lousewort

Reported by Kellerman but no specimen. Occasional in bog meadow, Q D - 6. Flowers, mid-May. Boreal species.

Pedicularis lanceolata Mickx. Wood betony

Reported by Kellerman. Werner's specimen collected 1892. Common in swamp forest, Q D - 5 and 8, Q E - 9, and Q F - 9. Flowers, late August and early September.

*Scrophularia marilandica L.

Reported by Kellerman, but no specimen. Frequent, Q G - 11, in swamp forest.

*Verbascum thapsus L.

Reported by Kellerman; no specimen. On roadside, Q E - 9. Flowers, late July.

Veronica anagallis-aquatica L.

Reported by Kellerman but his specimen, 1894, is not this species but V. comosa Richter; therefore, unreported from Champaign County. Aquatic in Cedar Run, Q F - 10, at convergence of streams.

Veronica comosa Richter

Kellerman's specimen is extant. Common in Cedar Run, West Branch and in seepage areas at edge of arbor vitae stand. Flowers, mid-August.

*Veronica scutellata L.

Previously unreported in Champaign County. Observed once,
Q F - 11. Flowers, mid-June.

SOLANACEAE

*Physalis longifolia var. subglabrata (Mackenzie & Bush) Cronq.

Unreported by Kellerman but Werner's specimen, 1893,
labeled P. lanceolata Michx. has been determined as this species.
Occasional Q E - 9 and Q F - 9. Flowers, August.

*Solanum americanum Mill.

Previously unreported in Champaign County. Observed once,
Q F - 10.

*Solanum dulcamara L. Nightshade

Reported by Kellerman; no specimen. Occasional, Q E - 6
and 8.

Solanum nigrum L. Black nightshade

Reported by Kellerman; no specimen. This and S. americanum
may be one species. Occasional, Q E - 8.

SPARGANIACEAE

*Sparganium chlorocarpum Rydb. Bur-reed

Previously unreported from Cedar Bog. In Cedar Run,
Q F - 10, at the convergence of the stream. Also abundant in
Cedar Run near Mad River. Probably, boreal species.

TAXACEAE

*Taxus canadensis Marsh. Canadian yew

Reported by Kellerman. His specimen collected 1894. Three specimens collected by M. G. Williams, Urbana College. Common in arbor vitae association, Q F and G - 11 and 12. Relict boreal species.

TILIACEAE

*Tilia americana L. Basswood, Linden

Reported by Kellerman and his specimen dated 1894. Common in swamp forest, Q E - 6, 8, and 9; Q F - 5, 6, 7, and 8.

TYPHACEAE

*Typha latifolia L. Cattail

Reported by Kellerman; no specimen. Occasional in roadside ditch, Q F - 8 and along West Branch, Q F - 6.

ULMACEAE

Celtis occidentalis L. Hackberry

Reported by Kellerman; no specimen. Common throughout all swamp forest zones.

*Ulmus americana L. American elm

Reported by Kellerman but no specimen. Once abundant in swamp forests, Q F - 3, 4, 5, 6, 7, 8, 9, 10; Q G, I, and H - 10 and 11. No large trees remain but some smaller ones.

Ulmus rubra Muhl. Red or slippery elm

Reported by Kellerman; no specimen. Common in swamp forests, Q E - 6; Q F - 7 and 8; Q G, H, and I - 10. One large tree, Q E - 2.

Ulmus thomasi Sarg.

Unreported from Champaign County. Observed and collected once in hardwood association, Q G - 11.

UMBELLIFERAE

*Angelica atropurpurea L.

Common along Woodburn Road, Q F - 9. Flowers, late May.

Chaerophyllum procumbens (L.) Crantz Spreading chervil

Previously unreported from Cedar Bog. Occasional, Q G - 11, swamp forest. Flowers, late May.

*Cicuta maculata L. Spotted water-hemlock

Occasional, Q E - 8 and 9. One specimen, #865, highly atypical but may be result of insect or disease injury. Flowers, mid-June.

Cryptotaenia canadensis (L.) DC Wild chervil

Common in swamp forest, Q D - 7, Q F - 5, 7, and 8. Flowers, late May to late June.

*Daucus carota L. Wild carrot

Introduced in Cedar Bog. Occasional on roadside, Q E - 8. Flowers, late July.

*Osmorhiza claytoni (Michx.) C. B. Clarke

Occasional in Q F - 8 and 9. Flowers, early June.

*Osmorhiza longistylis (Torr.) DC Anise root

Common in Q F - 7, 8, and 9. Swamp forest. Flowers, early to mid-May.

Oxypolis rigidior (L.) C. & R.

Cowbane

Not reported by Kellerman but Werner's specimen collected in 1892. An extremely variable species found throughout swamp forest zones, Q D - 7, Q E - 9, and Q F - 9. Abundant. Flowers, August to mid-September.

*Pastinaca sativa L.

Wild parsnip

Reported by Kellerman but no specimen. On roadside, Q F - 9. Occasional. Flowers, early July.

Sanicula canadensis L.

Black snakeroot

Occasional, south side Woodburn Road, Q F - 9 and along west path, Q F - 7. Flowers, early July.

*Sanicula gregaria Bickn.

Unreported by Kellerman but Spence specimen, 1878, is extant. Occasional, Q E - 8 and Q F - 9. Flowers, early to mid-May. Probably, boreal species.

*Sanicula marilandica L.

Reported by Kellerman but no specimen. Occasional swamp forest, Q F - 9.

*Sanicula trifoliata Bickn.

Black snakeroot

Previously unreported from Cedar Bog. Occasional, Q F - 6 and Q E - 7.

Thaspium barbinode (Michx.) Nutt.

Reported by Kellerman; Werner's specimen collected 1893. Common in swamp forest zones, Q E - 8; Q F - 6, 7, 8, and 9. Flowers late May and early June.

Thaspium trifoliatum (L.) Gray

Unreported previously from Champaign County. Observed once, Q F - 9.

Zizia aurea (L.) W. D. J. Koch Golden alexander

Frequent in swamp forest, Q F - 8 and Q E - 8.

URTICACEAE

*Boehmeria cylindrica (L.) SW False nettle

Reported by Kellerman but no specimen. Frequent, swamp forests, Q F - 4 and 9, Q E - 8.

*Laportea canadensis (L.) Wedd. Wood nettle

Reported by Kellerman; no specimen. Abundant in all open areas of swamp forest.

Parietaria pennsylvanica Muhl.

Previously unreported from Cedar Bog. Collected once, bog meadow Q E - 4.

*Pilea pumila (L.) Gray Clearweed

Reported by Kellerman; no specimen. Abundant in arbor vitae stands, Q D - 8, Q E - 9, Q F - 6 and 9.

Urtica dioica L. Stinging nettle

Throughout open swamp forest.

Urtica procera Muhl.

Possibly reported by Kellerman as U. gracilis Ait., but no specimen. Abundant in both swamp forest association and arbor vitae stands.

VALERIANACEAE

Valeriana ciliata T. & G.

Reported by Kellerman as V. edulis Nutt. and Werner's specimen, 1893, is so labeled. Frequent in marl meadow, Q D - 5 and Q E - 4 and 5. Flowers, mid-May. Specimen at Urbana College dated 1839 with a notation (possibly by Milo G. Williams) "not known in works of botany." There is no published report of this specimen, although Cedar Bog is the type locality for this species.

Valerianella intermedia Dyal.

Previously unreported from Cedar Bog. Introduced. Large patches in Q E - 5 and along Woodburn Road, Q E - 8 and Q G and H - 8. Flowers, late May and June.

VERBENACEAE

*Verbena hastata L.

Blue vervain

Reported by Kellerman; no specimen. Frequent only in bog meadow, Q D - 8. Flowers, late August.

Verbena urticifolia L.

White vervain

Rare. Collected once, Q F - 10. Flowers, late July.

VIOLACEAE

Kellerman did not report a single violet species from Cedar Bog, although one species had been collected by E. Jane Spence in 1877. It is possible that the Spence collection was not obtained by The Ohio State University until later.

It seems highly improbable that Werner, who collected in Cedar Bog for two or more years, did not see any violets. The only

logical explanation seems to be that this plant family was inadvertently omitted from the published lists. On the other hand, admittedly, Werner did not deposit any violet specimens at The Ohio State University Herbarium.

Nomenclature and keys used in identification of the violets follows Russell (1965).

*Viola affinis Le Conte Common violet

(V. papilionacea Pursh. of most authors)

No specimens from Champaign County. Frequent in Q E - 5 and Q F - 7. White flowered form collected in Q F - 7 is specimen #21. One specimen, #1025, was collected in flower in early October. Flowers, usually, late April and May.

Viola blanda Willd.

Specimen collected by Spence in 1877. Also a specimen collected by Williams at Urbana College. Two colonies on partially decayed logs in arbor vitae association, Q F - 10 and 11.

*Viola conspersa Reichenb. American dog-violet

Common in arbor vitae and swamp forest association, Q D - 6, Q E - 4 and Q F - 7 and 9. Flowers, late April and May.

*Viola cucullata Ait. Marsh blue violet

Unreported from Cedar Bog. Common in bog meadow and occasional in swamp forest, Q D - 7, Q E - 6 and 9, Q H - 10. Flowers, late April and early May.

*Viola macloskeyi Lloyd ssp. pallens (Banks) M. S. Baker

(V. pallens (Banks) Brainerd)

Previously unreported from Cedar Bog. Frequent in arbor vitae and swamp forest, Q E - 6 and Q F - 7. Flowers, late April through May. Probably, boreal species.

Viola nephrophylla Greene(V. papilionacea Pursh., in part)

Previously unreported from Champaign County. Distinguished from V. affinis by beard on spurred petal. Most common violet in Cedar Bog. Abundant in arbor vitae and swamp forest associations, Q D - 5 and 7, Q F - 7 and 8. Flowers, late April through May.

*Viola pubescens Ait. var. pubescens Downy yellow violet

Previously unreported from Cedar Bog. Rare in swamp forest Q F - 7. Flowers, late April and early May.

*Viola pubescens Ait. var. eriocarpa (Schwein.) Russell

(V. pensylvanica Michx.)

Previously unreported from Cedar Bog. Frequent in swamp forest, Q E - 6 and Q F - 9. Flowers, mid-April to May.

Viola pubescens Ait. var. pubescens x var. eriocarpa

Two specimens appear to be this hybrid, #282-A from Q F - 9 and #1055 from Q G - 11. The older leaves are glabrous and several basal leaves are present. Unreported previously. Flowers, late April and early May.

Viola rostrata Pursh. Long-spurred violet

Previously unreported from Champaign County. Common in oak-maple segrege, Q F - 4 through 8. Specimens collected do not have as long a spur as might be expected, but still most nearly resemble this species. Flowers, late April and May.

Viola sororia Willd.

Unreported previously from Cedar Bog. Observed once,
Q I - 10, in the hardwood forest. Flowers, late April.

Viola walteri House

Previously unreported from Champaign County. Frequent in
only one location, Q E - 6. Flowers mid- to late April. Dis-
tribution map (Russell, 1965) shows this species most common to
southeastern United States.

VITACEAE

*Parthenocissus quinquefolia (L.) Planch. Virginia creeper

Reported by Kellerman; no specimen. Occasional in Q D - 7.

Vitis riparia Michx. Wild grape

Not reported by Kellerman but one of his specimens col-
lected in 1894 labeled V. vulpina L. has been determined this
species. Occasional, Q E - 9 and Q F - 8.

Vitis vulpina L. Frost grape

Reported by Kellerman and specimen collected in 1894.
Occasional, Q D - 4.

SPECIES REPORTED BY KELLERMAN, NOW REJECTED

Some species reported by Kellerman from Cedar Bog have not been observed or collected during the past four years. The species listed below are rejected for one of the following reasons:

(1) There is no voucher specimen to substantiate Kellerman's report of the species. In addition, there are no specimens in the OSU Herbarium that have been collected in Cedar Bog either before or since Kellerman's report.

(2) Voucher specimens of species reported by Kellerman have been determined to be a different species than that reported.

(3) Notation with the specimen shows that the plant was not collected in Cedar Bog.

Names in parentheses are those listed by Kellerman.

BORAGINACEAE

Cynoglossum virginicum L. No specimens from Champaign County.

Hacklia virginiana L. (Lappula virginiana (L.) Greene) No specimen from Cedar Bog.

COMPOSITAE

Achillea millefolium L. Only specimen from Champaign County collected in Urbana.

Antennaria plantaginifolia (L.) Richards. No specimen from Cedar Bog.

Anthemis cotula L. Only specimen, from Urbana.

Arctium lappa L. No specimen.

Bidens frondosa L. No specimen.

Cirsium altissimum (L.) Spreng. (Carduus altissimus L.) No specimen.

Gaillardia pulchella Foug. (G. aristata Pursh.) No specimen.

Heliopsis scabra Dunal. No specimen.

Inula helenium L. No specimen.

Lactuca scariola L. Kellerman's specimen collected in Urbana.

Prenanthes boottii (DC) A. Gray. No specimen.

Rudbeckia triloba L. No specimen.

Solidago gigantea Ait. No specimen.

Tanacetum vulgare L. No specimen.

Xanthium chinense Mill. (X. canadense Mill.) No specimen.

CYPERACEAE

Bulbostylis capillaris (L.) Britt. No specimen.

Carex lupulina Muhl. No specimen.

Carex sparganioides Muhl. No specimen.

Fimbristylis capillaris (L.) Gray. No specimen.

EUPHORBIACEAE

Acalypha virginica L. No specimen.

Euphorbia maculata L. Also, syn. E. nutans Lag. No specimens.

FAGACEAE

Quercus alba L. Kellerman's specimen collected in Urbana.

GRAMINAE

Andropogon nutans avenaceus (Michx.) Hack. Name rejected. May

refer to Sorghastrum nutans (L.) Nash.

Digitaria sanguinalis (L.) Scop. (Panicum sanguinale L.) No specimen.

Echinochloa crusgalli (L.) Beauv. (Panicum crus-galli L.) No specimen.

Eragostis hypnoides (Lam.) BSP. No specimen.

Eragostis megastachya (Koel.) Link (E. major Host.) No specimen.

Glyceria pallida (Torr.) Trin. (Panicularia pallida (Torr.) Kuntze) No specimen.

Panicum dichotomiflorum Michx. (P. proliferum Lam.) No specimen.

Setaria glauca (L.) Beauv. (Chamaeraphis glauca (L.) Kuntze) No specimen.

IRIDACEAE

Iris versicolor L. Kellerman's specimen determined I. virginica L.

JUNCACEAE

Juncus effusus L. No specimen.

LABIATAE

Collinsonia canadensis L. No specimen.

Hedeoma pulegioides (L.) Pers. No specimen.

Lycopus americanus Muhl. No specimen.

Marrubium vulgare L. Only specimen from Urbana.

Mentha spicata L. No specimen.

Monarda didyma L. Only specimen from a garden in Urbana.

Scutellaria incana Muhl. No specimen from Cedar Bog.

LEMNACEAE

Lemna trisulca L. No specimen.

LILIACEAE

Smilacina trifolia (L.) Desf. No specimen.

Trillium erectum L. All specimens are T. flexipes Raf.

ONAGRACEAE

Oenothera linifolia Nutt. (Kneiffia pumila (L.) Spach.) No specimen.

OXALIDACEAE

Oxalis corniculata L. No specimen.

PLANTAGINACEAE

Plantago major L. No specimen.

POLYGONACEAE

Polygonum aviculare L. No specimen.

Polygonum erectum L. No specimen.

Polygonum sagittatum L. No specimen.

Rumex crispus L. No specimen.

Rumex obtusifolium L. No specimen.

POLYPODIACEAE

Athyrium filix-femina (L.) Roth (Asplenium filix-foemina (L.) Bernh.) No specimen. Probably the species Kellerman referred to was Athyrium thelypteroides Desv.

PORTULACACEAE

Portulaca oleracea L. No specimen.

PRIMULACEAE

Lysimachia radicans Hook. (Steironema radicans (Hook.) A. Gray) No specimen.

RANUNCULACEAE

Cimicifuga racemosa (L.) Nutt. No specimen.

Coptis groenlandica (Oeder) Fern. No specimen.

ROSACEAE

Agrimonia striata Michx. No specimen.

Crataegus succulenta Link var. macracantha (Lodd.) Eggles. No specimen.

Rubus flagellaris Willd. (R. villosus Ait.) No specimen.

SAURURACEAE

Saururus cernuus L. No specimen from Cedar Bog.

SALICACEAE

Salix alba L. No specimen.

Salix alba vitellina (L.) Koch. No specimen.

SANTALACEAE

Comandra umbellata (L.) Nutt. No specimen.

SAXIFRAGACEAE

Heuchera americana L. No specimen.

Ribes oxyacanthoides L. Werner's specimen determined R. hirtellum
Michx.

SCROPHULARIACEAE

Afzelia macrophylla (Nutt.) Kuntze

Gratiola aurea Muhl. No specimen.

Mimulus alatus Soland. No specimen.

SOLANACEAE

Datura stramonium L. No specimen.

STAPHYLEACEAE

Staphylea trifolia L. Not in Cedar Bog; in County Line Bog.

URTICACEAE

Urtica gracilis Ait. No specimen.

VITACEAE

Vitis cordifolia Michx. Specimen determined V. vulpina L.

SPECIES APPARENTLY EXTINCT

Recall that Cedar Bog once covered a much larger area than today. Species collected in "Cedar Swamp" in the 1890's and before may have been collected many miles from the present state-owned property. The following list records all species reported by Kellerman and collected at some time in Cedar Bog, but which were not observed during this study. Specimens are in The Ohio State University Herbarium.

Three reasons may account for no collections during 1963-1967:

- (1) The species reported earlier are indeed extinct in Cedar Bog as a result of environmental changes.
- (2) Frequency of these species is so greatly reduced and they are so rare that observation is difficult or unlikely.
- (3) The species are not and never were growing in the present Cedar Bog Nature Preserve.

APOCYNACEAE

Apocynum cannabinum L.

Kellerman's specimen collected in 1894; not observed in the present Cedar Bog during this study.

CAMPANULACEAE

Lobelia cardinalis L.

Werner's specimen collected in the Bog in 1892. No later specimens, however.

CARYOPHYLLACEAE

Arenaria serpyllifolia L.

Wilcox's specimen collected in "Cedar Swamp," but noted that the collection was made near Bowlusville, which is several miles south of Cedar Bog.

COMPOSITAE

Eclipta alba (L.) Haussk.

Werner's specimen collected in 1892.

CONVOLVULACEAE

Cuscuta gronovii Willd.

Kellerman's specimen collected in 1894.

CRUCIFERAE

Lepidium virginicum L.

Reported by Kellerman. Specimen collected by Schaffner in 1937.

CYPERACEAE

Carex inflexus Muhl. (C. aristatus Rott.)

Werner's specimen, 1893.

Carex tuckermanii Dew.

Werner's specimen collected in 1893.

Carex woodii Dew. (C. tetanica woodii (Dew.) Bailey)

Specimen collected by Werner in 1893.

Scirpus cyperinus (L.) Kunth.

Kellerman's specimen, 1894.

Scleria verticillata Muhl.

Two specimens collected by Werner in 1893.

EUPHORBIACEAE

Euphorbia humistrata Engelm.

Specimen collected by Werner in 1892.

GRAMINAE

Echinochloa pungens (Poir.) Rydb.

Kellerman's specimen collected in 1894 is labeled Panicum galli - - ?

Muhlenbergia schreberi Gmel. (M. diffusa Schreb.)

Reported by Kellerman. Collected by Brooks in Cedar Bog, 1960.

LABIATAE

Lycopus virginicus L.

Werner's specimen collected in 1892.

Stachys tenuifolia Willd. (S. aspera Michx.)

Specimen collected by Werner, 1893.

LEGUMINOSAE

Trifolium repens L.

Reported by Kellerman. Specimen collected in Cedar Bog in 1960 by Herrick.

POLYGONACEAE

Polygonum hydropiper L.

Specimen collected by Kellerman in 1894.

Polygonum punctatum Ell.

Kellerman's specimen collected in 1894.

PRIMULACEAE

Samolus parviflorus Raf.

Werner's specimen collected in 1892 is labeled S.

floribundus HBK.

RANUNCULACEAE

Hydrastis canadensis L.

Specimen collected in 1929 by Hicks.

ROSACEAE

Amelanchier canadensis (L.) Medic.

Specimen collected in Cedar Bog by M. G. Williams is at Urbana College.

Geum rivale L.

Specimens collected by Wilcox, 1893; Spence, 1879; and Williams, not dated.

SOLANACEAE

Nicandra physalodes (L.) Pers.

Werner's specimen labeled Physalodes physalodes (L.) Britton, collected in 1893.

THYMELAEACEAE

Dirca palustris L.

Specimen collected by Werner in 1893. Also collected earlier by Williams, whose specimen is at Urbana College. Collected recently by Herrick, 1957.

UMBELLIFERAE

Sium suave Walt.

Collected by Werner 1892; labeled Sium cicutaeifolium Schrank.

QUESTIONABLE SPECIES

The following species have been reported by Kellerman. They have either been reported from Champaign County (not Cedar Bog) since Kellerman's publications, or are cosmopolitan weeds which might be expected in any habitat. None have been collected in Cedar Bog, either before or since Kellerman's publications. Therefore, although it is possible, there is no proof that these species were or are in Cedar Bog.

ACANTHACEAE

Justicia americana (L.) Vahl. (Dianthera americana L.)

Collected by Herrick at Kiser Lake in 1958. If this species were once in Cedar Swamp, I believe it is extinct today.

AMARANTHACEAE

Amaranthus albus L.

Amaranthus retroflexus L.

There are no specimens of these two species from Champaign County, but it is probable that they are in the county. May have been observed by Kellerman beyond the area of the present Swamp.

ANACARDIACEAE

Rhus glabra L.

Specimen collected by Schaffner and Jennings at Brush Lake in 1903.

ANNONACEAE

Asimina triloba (L.) Duval

Herrick specimen 1958 from Kiser Lake. Common throughout the western parts of the county.

AQUIFOLIACEAE

Ilex verticillata (L.) Gray

Collected by Stover and Horton at the County Line Bog in 1930.

CAPRIFOLIACEAE

Triosteum perfoliatum L.

One specimen collected by French in 1901 at St. Paris.

Viburnum acerfolium L.

Only specimen collected in 1901 by Norman and no location is given.

CHENOPODIACEAE

Chenopodium album L.

No specimen from Champaign County but undoubtedly is found throughout the county.

COMPOSITAE

Bidens bipinnata L.

Specimen collected by Norman in 1901, but no location given.

Erigeron canadensis L.

Herrick's specimen collected in 1960 at Kiser Lake.

Helianthus tuberosa L.

McFarland, 1937, collected this species one mile south of Cedar Bog.

CRUCIFERAE

Barbarea vulgaris R. Br.

Specimen collected by Schaffner and Tyler, 1902, Brush Lake. Common throughout the county.

CYPERACEAE

Carex frankii Kunth.

Schaffner and Jennings' specimen collected at Brush Lake in 1902.

DIPSACEAE

Dipsacus sylvestris Huds. Teasel

No specimens from Champaign County. But is common throughout the area.

GRAMINAE

Panicum capillare L.

Specimen from Brush Lake collected by Schaffner and Jennings in 1902.

Poa compressa L.

Collected by Brooks, 1962, near Crayon, northwest part of the county.

Poa pratensis L.

No specimen, but common throughout the county.

JUNCACEAE

Juncus tenuis Willd.

Collected by Gordon and Chapman in 1932 at the Raised Bog, near the Fairgrounds in Urbana, Ohio.

LABIATAE

Leonurus cardiaca L.

Collected by Horlacher in Urbana in 1906.

LEGUMINOSAE

Psoralea onobrychis Nutt.

Hicks' collection from Kenard Bog in 1933.

MORACEAE

Maclura pomifera (Raf.) Schneid.

Collected by Herrick in 1957 at state route 55 and Mad River.

OXALIDACEAE

Oxalis stricta L.

Norman's specimen collected 1901 but no location given.

POLYGONACEAE

Polygonum convolvulus L.

Collected by Horlacher in Urbana in 1906.

RUBIACEAE

Cephalanthus occidentalis L.

Only specimen from Champaign County by Jennings and Tyler at Brush Lake in 1902. At County Line Bcg.

SCROPHULARIACEAE

Verbascum blattaria L.

One specimen collected by Horlacher in Urbana in 1906.

Veronica peregrina L.

Schaffner and Tyler specimen from Brush Lake in 1902.

STATISTICAL SUMMARY
COMPARISON WITH KELLERMAN'S REPORTS

Species reported by Kellerman <u>et al.</u> , before 1895	365
Species reported by Kellerman, and collected 1963-1967 . . .	239
Species reported by Kellerman but rejected with reference to Cedar Bog for lack of evidence	73
Questionable species; may or may not have occurred in Cedar Bog	27
Species apparently now extinct	26
Species collected (Frederick, 1963-1967) previously reported by Kellerman	239
Species collected, reported by others	104
Species previously unreported in Ohio	2
Species previously unreported from Champaign County	106
Species previously reported from Champaign County, but not reported from Cedar Bog	40
Additional varieties within species	15
Hybrids collected	14
Species planted in Cedar Bog (Horst and Evans)	4
Total, all taxa collected, 1963-1967	524
Total taxa not previously reported from Cedar Bog	178

OTHER SPECIES NOW EXTINCT

Species listed below were unreported by Kellerman, but, with one exception, voucher specimens are at The Ohio State University. None have been collected during this study and no specimens from Cedar Bog have been deposited at OS since the original ones. Therefore, these are probably species now extinct in Cedar Bog. Too, it is possible that the original collection was made outside the limits of the Swamp, today.

AMARANTHACEAE

Acnida altissima Riddell

Specimen collected by Kellerman in 1894.

COMPOSITAE

Prenanthes crepidinea Michx.

Kellerman's specimen collected in 1894.

CYPERACEAE

Carex leptalea Wahl.

Collected by Spence in 1877; originally labeled C. polytrichoides Muhl. ex Schkuhr. This species is not listed for Ohio by Fernald (1950), but several herbarium specimens extant.

Carex viridula Michx.

Three specimens collected by Werner in 1893. One labeled, C. flava var. graminis; two labeled C. viridula and also C. ordin

Ritz. Collected by Thomas, 1933, from Kenard Bog. Specimen at Urbana College, collected by W. S. Sullivant in 1839; labeled C. oederi Schart.

Cyperus rivularis Kunth.

Kellerman's specimen, labeled C. diandrus Torr., collected in 1894. Schaffner and Jennings also collected this species from Brush Lake in 1902.

GRAMINAE

Eragrostis frankii Steud.

Werner's specimen collected in 1892.

ORCHIDACEAE

Medeola virginiana L.

Werner's specimen collected in 1893. Also one at Urbana College, labeled Gyromia virginica Nutt.

Pogonia ophioglossoides (L.) Ker.

Specimen at Urbana College collected by M. G. Williams but not dated. Also Samples' specimen at University of Michigan (Stuckey, 1966).

RHAMNACEAE

Rhamnus lanceolata Pursh.

Specimen collected by Spence from Cedar Swamp in 1879. Two other specimens from Champaign County; neither collected from Cedar Swamp.

A P P E N D I X

NON-VASCULAR PLANTS IN CEDAR BOG

No detailed search was made to find non-vascular plants, but those which were observed or collected in Cedar Bog during this study are listed below. The list obviously is incomplete but is included here as a record of those non-vascular plants known to be in the Bog today.

GENERA OF ALGAE IN CEDAR BOG

Sincere thanks to Dr. C. E. Taft for his assistance in identification of the algae. Classification follows Smith (1950).

DIVISION CHLOROPHYTA

CHARACIACEAE

Chara

Abundant in Cedar Run. Almost filling the stream during July and August.

CHAETOPHORACEAE

Chaetophora

In Cedar Run, south of Woodburn Road, Q E - 9 and 10.

Stigeoclonium

In shallow pools, swamp forest Q E - 6.

CHLAMYDOMONADACEAE

Chlamydomonas

Two species, differing in size. Back-water pool of side stream seepage area, West Branch, Q E - 5.

CHLOROCOCCACEAE

Chlorococcum

Back-water pool, West Branch, Q E - 6.

CLADOPHORACEAE

Cladophora

In Cedar Run and West Branch, April and May.

DESMIDIACEAE

Closterium

Pool, swamp forest, Q E - 6 and West Branch, Q E - 5.

Cosmarium

Back-water pool beside West Branch, Q E - 5.

HYDRODICTYACEAE

Pediastrum

Back-water pool beside West Branch, Q F - 5.

OÖCYSTACEAE

Chlorella

In protozoans, partially stagnant pool at margin of West Branch, Q F - 4.

Oöcystis

Partially stagnant pool at margin of West Branch, Q F - 4.

ULOTRICHACEAE

Ulothrix

Shallow water, swamp forest, Q E - 6.

ZYGNEMATACEAE

Mougeotia

In West Branch, Q F - 5 and 6. Also, shallow water, arbor vitae stand, Q D - 7.

Spirogyra

Common in almost every body of water in Cedar Bog. At least three species: two species, one chloroplast, but differing in size; one species with two chloroplasts; one with replicate end walls. One species showing lateral conjugation.

Zygnema

In pools in bog meadow, Q E - 9, and in marl meadow, Q D - 5.

DIVISION CHRYSOPHYTA

FRAGILARIACEAE

Fragilaria

Shallow pools, swamp forest, Q E - 6.

Synedra

Swamp forest shallow water, Q E - 6.

GOMPHONEMATACEAE

Gomphonema

Also in shallow pools, swamp forest, Q E - 6.

NAVICULACEAE

Navicula

Swamp forest shallow pools, Q E - 6.

Pinnularia

Shallow pools, swamp forest, Q E - 6.

TRIBONEMATACEAE

Tribonema

In swamp forest pools, Q E - 6 and in West Branch, Q F - 5.

DIVISION CYANOPHYTA

NOSTOCACEAE

Nostoc

In marl meadow, Q D - 4, 5, and 6. Black, felty masses on the marl.

OSCILLATORIACEAE

Oscillatoria

Shallow pools, marl meadow, Q D - 9 and Q D - 6. Also, swamp forest, Q E - 6.

DIVISION EUGLENOPHYTA

EUGLENACEAE

Euglena

Rare in back-water pool beside West Branch, Q F - 5.

DIVISION RHODOPHYTA

BATRACHOSPERMACEAE

Batrachospermum

In Cedar Run. Grows year around. The picture (Fig. 22) was taken in February.

LICHENS IN CEDAR BOG

My sincere thanks to Dr. E. D. Rudolph for identification of the lichens. Classification follows Hale (1961).

Some lichens were observed, particularly species of Parmelia, on the trunks of trees on the south side of the western extension hardwood forest. But all of those collected were found in the arbor vitae associations of Cedar Bog.

Fig. 22. Batrachospermum growing in
Cedar Run, February, 1967.



DIVISION EUMYCOPHYTAClass Lichenes

CLADONIACEAE

Claydonia capitata (Michx.) Spreng.Claydonia chlorophaea (Flörke) Spreng.Claydonia coniocraea (Flörke) Spreng.Claydonia furcata (Huds.) Schrd.Claydonia nemoxyna (Ach.) Nyl.

PARMELIACEAE

Candelaria concolorParmelia borrieriParmelia caperataParmelia rudecta

PELTIGERACEAE

Peltigera canina

PHYSICIACEAE

Physcia aipoliaPhyscia millegranaPhyscia stellarisPyxine soorediata

USNEACEAE

Usnea strigosa group

LICHENS IMPERFECTI

Crocynia membranacea (Dicks.) Zahlbr.Lepraria membranacea (Dicks.) Vain.

BRYOPHYTES OBSERVED IN CEDAR BOG

My thanks to Dr. R. M. Giesy for his assistance in identification of the mosses. Classification follows Conard (1956).

DIVISION BRYOPHYTAClass Hepaticae

CEPHALOZIACEAE

Odontoschisma prostratum (Sw.) Trevis.

Frequent in wet, seepage areas in the arbor vitae association. Often associated with mosses.

MARCHANTIACEAE

Conocephalum conicum (L.) Wiggers

Common as ground cover in arbor vitae stand, Q D - 7. Occasional, in other wet arbor vitae stands.

Class Musci

DICRANACEAE

Dicranella, sp.

On downed arbor vitae log across Cedar Run, Q D - 6.

DITRICHACEAE

Ceratodon purpureus (Hedw.) Brid.

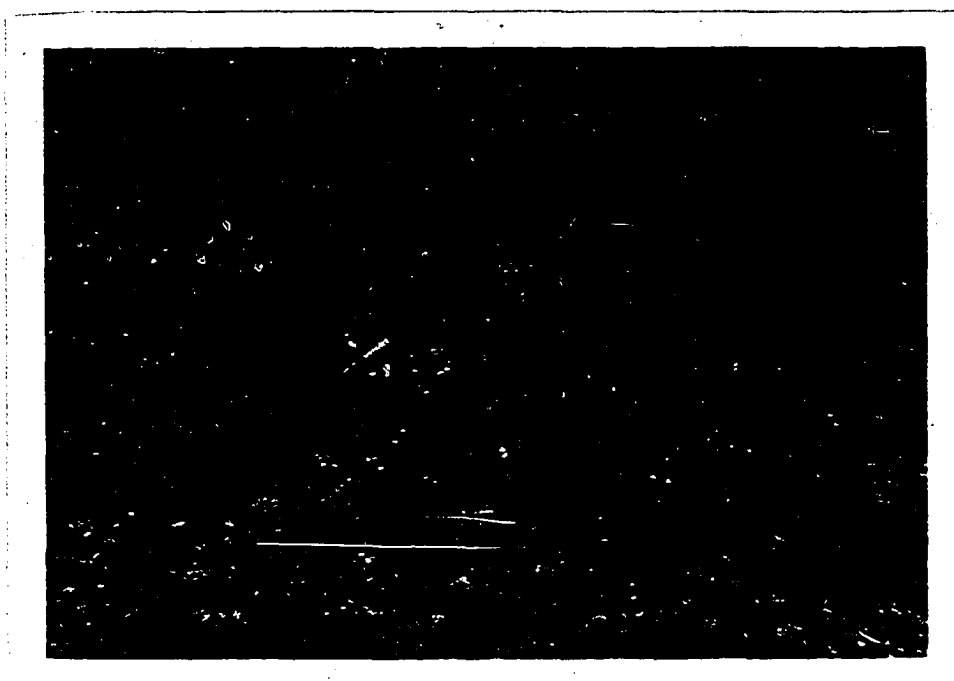
On rotting log, Q E - 10. Also in oak-maple segregate of hardwood association, and swamp forest association, Q F - 10 (Fig. 23).

FISSIDENTACEAE

Fissidens obtusifolium Wills.

On log along the margin of West Branch, Q F - 5.

Fig. 23. Ceratodon purpureus growing on
rotting logs, swamp forest association, Q F - 10.



Fissidens osmundoides (Swtz.) Hedw.

On wet marl at margin of arbor vitae stand, Q D - 6.

Fissidens subbasilaris Hedw.

On wet soil in swamp forest, Q F - 10.

Fissidens taxifolius Hedw.

On rotting log near West Branch in oak-maple segregate of hardwood association.

HYPNACEAE

Amblystegium irriguum (Wils.) B. & S. var. spinifolium Sch.

Growing almost in the water. West Branch, Q F - 3 and 4.

Amblystegium juratzkanum Schimp.

In water, edge of Cedar Run, Q D - 6.

Amblystegium varium (Hedw.) Lindb.

On damp, peaty soil in Q F - 9.

Brachythecium oxycladon (Brid.) J. & S.

Base of arbor vitae, Q F - 9.

Climacium americana Brid.

In arbor vitae stands, Q E - 9 and Q D - 7.

Climacium dendroides (L.) Web. & Mohr.

Seepage areas along Cedar Run.

Drepanocladus revolvens (C. Mull.) Warnst.

Almost in water in swamp forest association, Q E - 7.

Leptodictyum trichopodium (Schultz) Warnst.

On wet, rotting log bank of West Branch.

Leptodictyum riparium (Hedw.) Warnst.

Almost in the water in backwater pool at the margin of West Branch.

Associated with Conocephalum.

LESKEACEAE

Anomodon rostratus (Hedw.) Schimp.

At the base of arbor vitae trees.

Thuidium delicatulum (Hedw.) Mitt.

Common in arbor vitae stands.

Thuidium recognitum (Hedw.) Lindb.

Associated with Mnium, on rotting log, Q F - 9.

LEUCOBRYACEAE

Leucobryum albidum (Brid.) Lindb.

Occasional in arbor vitae stands, Q E - 9.

Leucobryum glaucum (L.) Schrimp.

Occasional in Q D - 7.

MNIACEAE

Mnium affine Bland.

Most common Mnium in Cedar Bog. In many areas of both the arbor vitae and swamp forest associations.

Mnium cuspidatum Hedw.

On soil in swamp forest association.

POLYTRICHACEAE

Atrichum angustatum (Brid.) Bry. Eur.

On wet soil in arbor vitae stand, Q E - 9.

Polytrichum ohioense R. & C.

On soil in secondary swamp forest association, Q F - 9.

SPHAGNACEAE

Sphagnum, sp.

Probably is S. capillaceum (Weiss.) Schrank. One colony,
Q D - 4.

TETRAPHIDACEAE

Tetraphis pellucida Hedw.

With lichens and leafy liverwort on rotting wood, Q F - 10.

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