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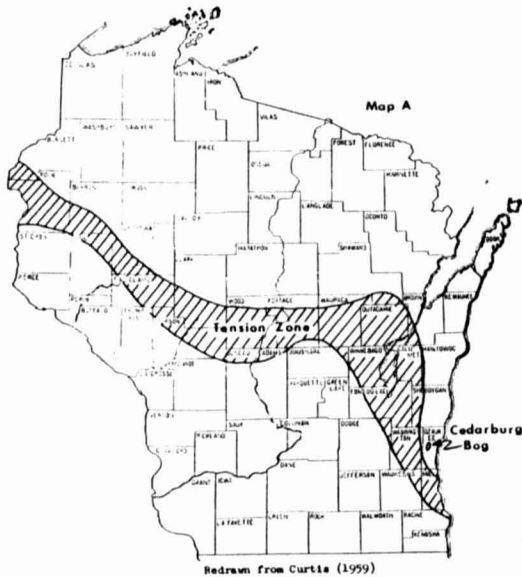
Milwaukee, Wisconsin

Fall, 1981

VASCULAR PLANTS NEAR THE MARGINS OF THEIR RANGE IN CEDARBURG BOG. PART I. GYMNOSPERMS AND MONOCOTS

Marginal populations are those located at the extreme or periphery of a species' range. In the context of this paper, marginal populations refer to a geographical periphery rather than to possible ecological margins. A wide ranging species may be composed of several different varieties or ecotypes. Marginal populations of plants are of special interest to plant taxonomists, ecologists, ecological geneticists and biogeographers because they may exhibit different characteristics than more centrally located populations. This is likely because plants at the boundaries of their species' range may experience extreme ecological conditions beyond which they cannot survive.

When range limits are plotted for the plants of Wisconsin, a large number of both northern and southern limits stretch across the state diagonally in a rather confined zone, running from northwest to southeast. This "tension zone" (see Curtis 1959) approximates the boundary between the prairie-forest floristic province to the southwest and the northern hardwoods province to the northeast. The northern hardwoods province extends south as far as Ozaukee Co., but the extension is restricted to the eastern most counties of the state which are affected climatically by Lake Michigan (Map A).



The Cedarburg Bog, Ozaukee Co., is located at the extreme southern end of the northern hardwood forest province. Curtis (1959) uses the Cedarburg Bog as a typical example of both northern wet forest and open bog communities. The central portion of this 810 hectare wetland contains the southern most outlier of string bog development in North America (Grittenger 1970). Since the bog contains examples of vegetation types which are at or near the southern extent of their range in Wisconsin, it is of interest to ask which species of plants reach their range limits there.

The purpose of this paper is to present the gymnosperm and monocot species which have geographically marginal populations in Cedarburg Bog. The dicots will be presented in a later paper. The ranges of bog plants on the vascular plant list for the Field Station were initially surveyed using Gleason (1952) to determine which species were possibly near the edge of their range in Wisconsin. County range maps for Wisconsin were constructed using the University of Wisconsin - Madison, - Milwaukee and Field Station herbaria. In addition, maps from

the following works were used: Picea and Thuja (Fassett 1930); Potamogeton (Ross and Calhoun 1951); Eriophorum and Scirpus (Green 1953); Smilacina (McIntosh 1950); Orchids (Fuller 1933) and (Case 1964). Habitat descriptions and general ranges were obtained from Gleason (1952), Voss (1972), Fassett (1976), Fassett (1957), Preston (1961), Rosendahl (1955) and the works listed above. Each species is presented with its common name, range and habitat description and additional notes regarding distribution.

Picea mariana (Mill.) BSP. Black Spruce. (Pinaceae). Map 1.

Ranges from Labrador to Alaska south to n. Minn. and s. central Mich. and in the mountains to W. Va. One of the dominants of the northern forest lowlands (Curtis 1959), black spruce is entirely restricted to cold, acid, sphagnum bogs in the southern portion of its range. A few black spruce can be found in the eastern and southeastern parts of the Cedarburg Bog, but in general conditions are probably not acid enough for spruce. In contrast, a 2 hectare bog, 1km west of Cedarburg Bog, is a well developed spruce-tamarack bog. It probably represents the southern-most black spruce bog in the state.

Thuja occidentalis L. White Cedar, Arbor Vitae (Cupressaceae). Map 2.

Ranges from Que. and N. S. to Hudson Bay and s.e. Sask., s. to N. J., Pa., Mich., and Minn., s. in the mountains to N. C. and Tenn., with outlyers in O., Ind., Ill. and Mo. It usually grows in wet soil and swamps where it can form dense forests, but it can be found sparingly in almost all kinds of woods except the driest. Arbor vitae is not common in acid bogs and grows chiefly on calcareous soils. In most habitats, it is a rather small tree, but under favorable conditions, it can achieve considerable size. Curtis (1959) states "There is an island in Cedarburg bog...which contains a number of white cedar stumps all over 4 feet in diameter." Very common in northern and northeastern Wisconsin, southern collections are usually from single localities in each county. Herbarium records from Dane and Rock counties (?) may be cultivated specimens.

Potamogeton obtusifolius Mert. & Koch. Najadaceae. Map 3.

Ranges from Que. and N. S. s. to n. N. J., w. to Minn. and w. Ont. This submerged aquatic is frequently found in bog waters; it is quite local in lakes, ponds and streams throughout its range. Collections from Mud Lake in Cedarburg Bog are all sterile and thus are difficult to distinguish from possible coarse forms of P. berchtoldii.

Of the species that are near the southern margin of their range in Cedarburg Bog, the family Cyperaceae is the most represented. The following nine species belong to the Cyperaceae.

Carex brunnescens (Pers.) Poir. Sedge. Map 4.

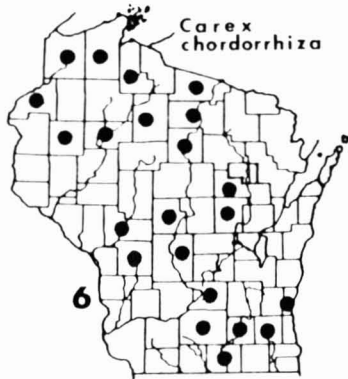
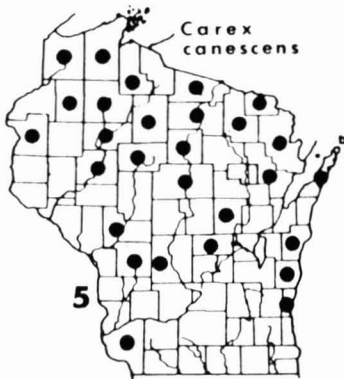
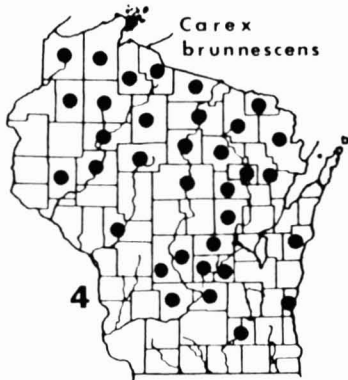
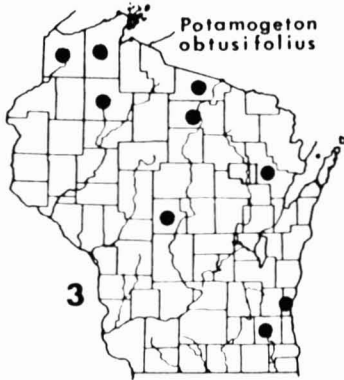
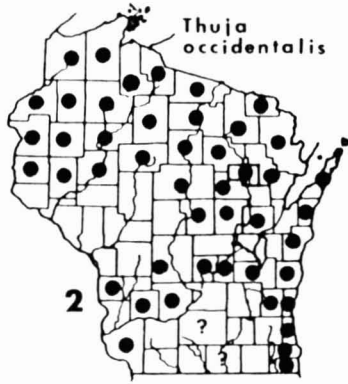
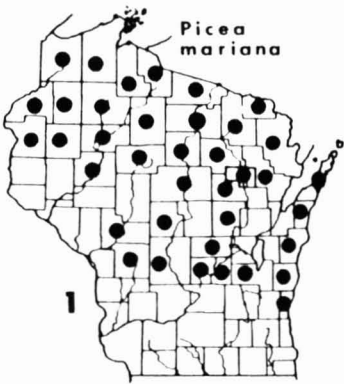
Ranges from Greenland to Alaska, s. to N. J., O., Mich., and Minn., s. in the mountains to N. C., in the west to Col. and Ore., also in Eurasia. By far most common in northern Wisconsin and along Lake Superior, it grows there in a great variety of low or rarely upland woods and in bogs. In the south it is found only in tamarack bogs. The Jefferson County collection is from Hope Lake Bog.

Carex canescens L. Sedge. Map 5.

Ranges from Greenland to Alaska, s. to Va., O., Minn., Col. and Cal., also in Eurasia. Usually found in sphagnum bogs and older tamarack and cedar stands, it also grows on pond and stream margins and in alder thickets.

Carex chordorrhiza L. f. Sedge. Map 6.

Ranges from Lab. to n.w. Canada, s. to Me., N. Y., Ind. and Ia.; also in Eurasia. This species is found only in open sphagnum bogs. It is common northward, but in the South, it is known from only single locations in each county: Rock Co., Lima Bog; Jefferson Co., Hope Lake Bog; Waukesha Co., Gold Lake. In Cedarburg Bog it is found in dense sphagnum mats west of Long Lake.



Carex disperma Dewey. Sedge. Map 7.

Ranges from Que. and Nf. to Alaska s. to Pa., Ind. and Minn. and in the West to N. M. and Cal. in the mountains; also in Eurasia. Grows in shady, damp, cool woods especially white cedar and tamarack. It is common northward and local southward: Rock Co., Lima Bog; Walworth Co., tamarack swamp in the Township of Sugar Creek; Racine Co., Wind Lake Bog.

Carex limosa L. Sedge. Map 8.

Ranges across the continent at high latitudes, in eastern N. Am., s. to N. J., O. and Ia., widely distributed in n. Eurasia. It is chiefly found in bogs, including marly, calcareous ones, often in the open bog mat. The Jefferson Co. locality is Hope Lake Bog; in Walworth Co. it is found in the calcareous marsh and sedge meadow around Lulu Lake. It is found only in the string bog areas of Cedarburg Bog.

Carex Pseudo-Cyperus L. Sedge. Map 9.

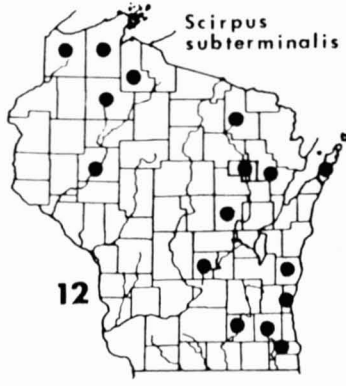
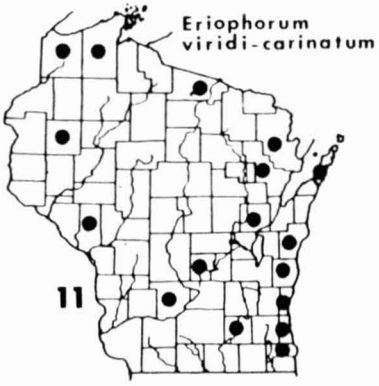
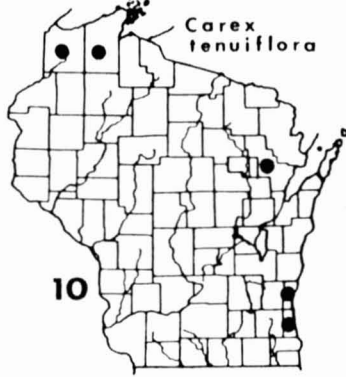
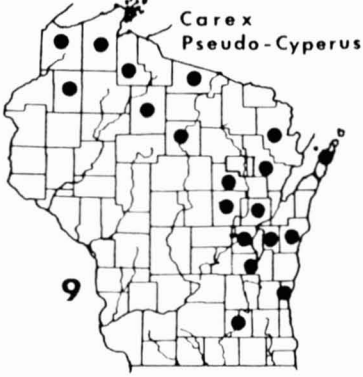
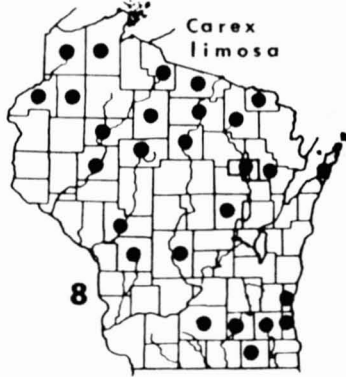
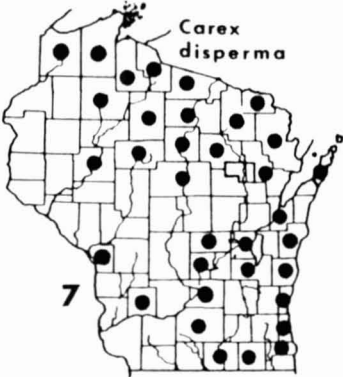
Ranges from Nf. to Sask., s. to Pa., n. Ind. and Minn. The species is found in a wide variety of wet habitats, marshes, ditches, lake shores, edges of streams, cedar swamps and bogs. The lone locality in Jefferson Co. is Red Cedar Lake.

Carex tenuiflora Wahl. Sedge. Map 10.

Ranges from Nf. to Alaska, s. to Me., N. Y., Mich. and Minn.; also in Eurasia. The species grows in sphagnum bogs and bog forests. It is apparently rather local but Voss (1972) notes that it is "easily overlooked, especially since it grows intermixed with C. disperma and C. trisperma." The Milwaukee Co. collection is a very old one with no locality. The species may no longer exist south of Cedarburg Bog.

Eriophorum viridi-carinatum (Engelm.) Fern. Cotton-grass. Map 11.

Ranges from Nf. to B. C., s. to Conn., n. O., n. Ind. and Minn. It is found in bogs, conifer swamps, especially in open areas and clearings and open boggy or marshy ground. In Cedarburg Bog, it grows in the string bog.



Scirpus subterminalis Torr. Bulrush. Map 12.

Ranges from Nf. to B. C., s. to Va., Ind., and Ore. This emergent aquatic grows in cold or soft water, up to 1m deep, in n.w. and n.e. Wisconsin. It can grow on substrates of sand, marl, muck or peat. In southeast Wisconsin it is very local and found in Eagle Springs L., Waukesha Co.; Rockland L., Racine Co., and Red Cedar L., Jefferson Co. In Cedarburg Bog it is found in Mud Lake.

Smilacina trifolia (L.) Desf. Three-leaved False Solomon's Seal (Liliaceae)
Map 13.

Ranges from Nf. and Lab. to Mackenzie and B. C., s. to N. J., O., Mich. and Minn., also in n. Asia. It grows in bogs and conifer swamps, usually along brooks, springs and wet areas.

The family Orchidaceae is second to the Cyperaceae in the number of species that are near the southern margin of their range in Cedarburg Bog. The following seven species are Orchids.

Arethusa bulbosa L. Arethusa, Dragon's mouth. Map 14.

Ranges from Nf. to Minn., s. to N. J. and n. Ind. and in the mountains to N. C. Usually rare throughout its range, it grows in open bog mats and conifer swamps often near open water. In marl bogs, it is often found where peaty materials collect. There are no recent collections from any of the southern counties. The last collections for Cedarburg Bog date from the 1920's and 30's. Case (1964) notes that "blooming populations fluctuate considerably...suggest [ing] that it may be short-lived, depending upon heavy seed production for population maintenance." The species may no longer grow in southern Wisconsin and may also be extinct in Cedarburg Bog.

Cypripedium acaule Ait. Moccasin Flower. Map 15.

Ranges from Nf. and Que. to Alta., s. to N. J. and n. Ind., and along the mountains and coastal plain to S. C. and Ala. Common northward in a variety of

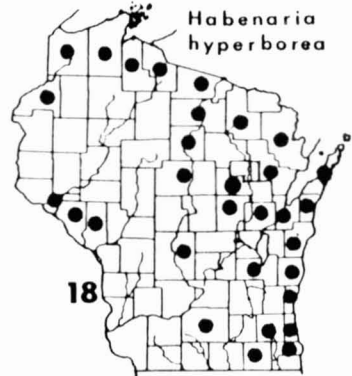
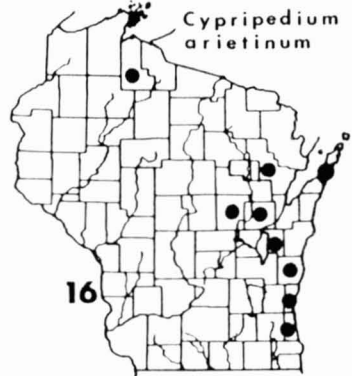
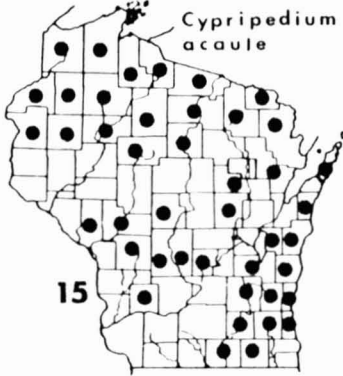
acid, somewhat sterile soils in s.e. Wisconsin, it is found only in tamarack and cedar bogs. Fuller (1933) notes that the roots are always found in super-acid soil. "In all parts of the state, when the root horizon has been tested, the soil has had a pH of 4 - 5." In Cedarburg Bog, it grows on hummocks at the base of cedar and tamarack trees in the dense woods west of Long Lake.

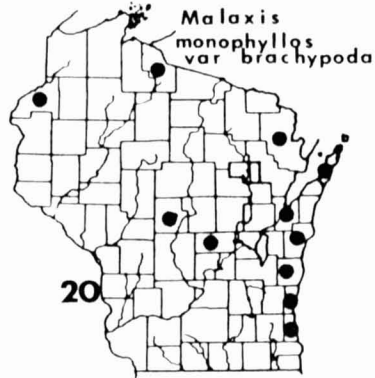
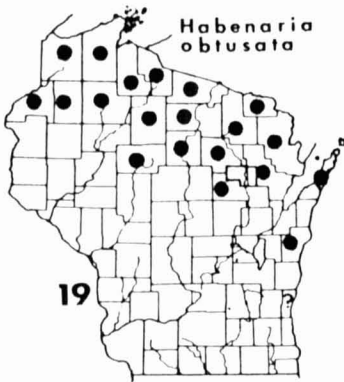
Cypripedium arietinum R. Br. Ramshead Ladyslipper. Map 16.

Ranges from Que. to Man., s. to Mass., N. Y., Mich., and Minn. It usually grows in moist, acid soils of conifer woods. Cool soils are essential for growth. In the southern parts of its range, it is found only in cold bogs and cool bluffs in subacid or neutral soils. This plant is probably closer than any other to extinction in Wisconsin. All of the marked localities are old collections except for the Ridges Sanctuary in Door County, which may be the only extant population in the state (Wisconsin Scientific Areas Preservation Council files). The last Cedarburg Bog collection was in 1931 at the "south end". The forest at the southern end of the bog was largely destroyed by flooding in 1960 (Farley and Salamun 1973). Fuller (1933) notes that in Cedarburg Bog "this species grows on hummocks under the tamaracks in mediacid soil and associated with the pink Moccasin Flower, Three-leaved False Solomon's Seal (Smilacina trifolia), Dwarf Raspberry (Rubus pubescens) Star Flower (Trientalis borealis), the Bog Bishop's Cap (Mitella nuda), Yew (Taxus canadensis) and Juniper (Juniperus communis var. depressa). During spring 1981, this orchid was not sited after an intensive search. It may no longer grow in the bog, however, further searches will be made.

Habenaria dilatata (Pursh) Hook. Tall White Bog Orchid. Map 17.

Greenland to Alaska, s. to e. Mass., N. J., n. Ind., and Minn., in the West to Col. and Cal. It grows in many kinds of moist, often marly ground, especially in open areas and openings in cedar and tamarack swamps. In Cedarburg Bog it is found in the string bog. According to Case (1964) it is "less tolerant of habitat variation than the Tall Green Bog Orchid." They occasionally grow together and where they do, they hybridize.





Habenaria hyperborea (L.) R. Br. Tall Northern Bog Orchid. Map 18.

Ranges from Greenland and Iceland to Alaska, s. to R. I., Pa., Ind., and Neb., and in the West to N. M. One of the most widespread American orchids, it grows in a wide variety of wet soils, bogs and wet woods. According to Case (1964) H. hyperborea and H. dilatata (which hybridize) have different habitat preferences. "H. dilatata grows mostly in open, marly clearings in cedar bogs or in marly meadows and on lake margins; H. hyperborea grows mainly in wooded thickets and swamps or on stream banks where H. dilatata does not grow." From 1930 to 1938 there were four collections of this orchid from the Cedarburg Bog. Although it has not been collected recently, there are reports of its occurrence and it probably still grows in the bog.

Habenaria obtusata (Pursh) Richards. Blunt-leaf Orchid. Map 19.

Ranges from Lab. and Nf. to Alaska, s. to N. Y., Ont., Mich., and Minn., in the West to Col. and B. C.; also Norway. It grows in cold, dark, wet evergreen forests. A 1935 collection by H. Teter is labeled "Ozaukee Co., Cedarburg Bog." However, a confusing remark on the same specimen, "nr. Presque Isle River below P. I. Lake" casts some doubt on the validity of the locality. If it is found in the bog, the population represents a true southern outlier.

Malaxis monophyllos var. brachypoda (Gray) F. Morris. White Adder's Mouth.

Map 20.

Ranges from Nf. and Que to Man. s. to Pa., Mich. and Minn.; also in Eurasia. Local or spotty throughout its range, it inhabits cold, wet, usually shaded soils that are mainly neutral in reaction. Often found in very wet pools around the roots of old cedars. The last collection from the bog was in 1928. P. Salamun (pers. comm.) has located the species in the bog in recent years. There are no recent collections from Milwaukee Co.

CONCLUSIONS

Two species of Gymnosperms and 18 Monocotyledons are near the southern edge of their geographic range in the Cedarburg Bog. Of these, 6 species may actually reach a boundary of their range there: Picea mariana, Carex canescens, Carex tenuiflora, Cypripedium arietinum, Habenaria obtusata and Malaxis monophyllos var. brachypoda. These plants are all characteristic of the northern wet forest community, although some of them (e.g., Picea mariana and Carex canescens) are also found in open bog vegetation. Most of the marginal species which are principally found in open bogs are also known from a small number of localities (bogs) still further south than the Cedarburg Bog. Thus, the northern wet forest vegetation of Cedarburg Bog seems in some ways to be more marginal geographically than the open bog community.

Four orchids, which were once near the margins of their range in the Cedarburg Bog, may now be extinct in the bog: Arethus bulbosa, Cypripedium arietinum, Habenaria obtusata and Malaxis monophyllos var. brachypoda. Habitat destruction as a result of the artificial flooding of the southern end of the bog around 1960 may have caused the extinction of one or more of these species. Further search for these species is necessary. If these plants are not relocated, the Cedarburg Bog would be an ideal location to reintroduce the species in southern Wisconsin.

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