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# A Boreal Moss Community

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# A BOREAL MOSS COMMUNITY

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It would be interesting to present as vivid a picture as possible of the vegetation of the Taxus Hillside in Pine Hollow, and let the reader guess where such a place must be. It is in the northwestern corner of Dubuque County, Iowa. Pine Hollow is a winding canyon, cut about three hundred feet below the tops of the surrounding hills. The Taxus Hillside consists mostly of the big talus blocks fallen from the cliff above, and lying on a steep slope. The area stretches about 200 yards along the stream, and about 50 yards up the hill from the edge of the water. The slope faces nearly north. About a dozen specimens of Pinus strobus, of medium size, give a 10% cover, and six or eight Betula alba papyrifera add another 5%. The tree cover of 15% would indicate a sunny exposure. But the cliff above, heavily wooded on top, the steep slope of the hillside, and the depth of the canyon give an essentially shaded habitat. A part of the slope is wet with seeping water. The winding canyon reduces air movement almost to zero. We have therefore a cool, mesic habitat, with ample sky-light but little if any direct sun.

Taxus canadensis covers most of the slope with so dense an interlocking stand that one can hardly force one's way through it, and angular rocks three or four feet high are hidden from view. Over and through the branches of Taxus grows a mat of mosses, often suspended a foot or more above the ground. This mat consists mostly of Drepanocladus uncinatus and Radula complanata, with Platygyrium repens, all in fruit. Ptilidium pulcherrimum shares the twigs with Radula. The surface of the rocks between the yews is matted with other mosses: great beds of Hypnum crista-castrensis on the tops, Hylocomium triquetrum on tops and sides, and Calliergon schreberi, all fruiting. All of these interweave with the mat on the Taxus branches forming continuous moss beds.

On a spot too wet for Taxus, but well grown with Chrysosplenium americanum and Viola blanda, Marchantia polymorpha, Conocephalum conicum, Preissia quadrata and Mnium medium grow luxuriantly and fruit freely, and Thuidium delicatulum spreads its feathery sods. Bryhnia graminicolor was in this area. In the margin of the Taxus area is one bed of Lycopodium obscurum dendroi-

deum,[1] the only locality known in the State. On a rotting stump Georgia pellucida fruits copiously. This is the characteristic substratum for Georgia. The only other reports of it in Iowa [2] (specimens from Muscatine and Hardin Counties in our herbarium) have it growing on shaded sandstone rocks! On the bark of trees were found Dicranum montanum (third report), Anomodon tristis, Leucodon julaceus and L. sciuroides, the last three new to Iowa. Of leafy liverworts, Cephalozia connivens and Cololejeunea biddlecomiae deserve special mention. These are first reports for Iowa, though I have Cololejeunea also from Mitchell County.

Other mosses occurring abundantly in the Taxus area are Brachythecium oxycladon (fr.), Eurhynchium hians, Hypnum haldanianum, Mnium cuspidatum, Plagiothecium deplanatum.

Our attention was first called to this region by a paper read by Dr. L. H. Pammel before the Iowa Academy of Science in 1923.[3] In this he mentioned "a Hypnum moss." Early in 1931 I saw this moss, still unidentified, in the herbarium of Iowa State College. It is Hypnum crista-castrensis — a magnificent specimen. Other mosses of Pine Hollow have been announced by Miss L. M. Cavanagh.[2] We have recently given a complete list of all the mosses known from the area.[4] This complete list is a curious mixture of northern and southern forms. So is the list from the Taxus Hillside. For example, Anomodon tristis and Leucodon julaceus, found on bark, are distinctly southern. But on the whole, the facies is that of a boreal community. In this the mosses tally with the flowering plants as listed by Dr. Pammel.

There is as yet very little literature that enables one to correlate the moss flora of one region with that of another. Mere lists are not adequate because they lack sociological data. From Cooper's papers [5] on Isle Royale, Mich., a good idea of the relation of mosses to other vegetation can be gleaned. The area, he states, is within the Northeastern Conifer Forest Region, near the border of the Eastern Deciduous Forest. He describes two forest associations, "upland forest" climax, mostly Abies balsamea, Betula alba papyrifera and Picea canadensis, and a "xerophytic stage" of Pinus

1 Identified for me by Mr. Arthur Lyness of Iowa City, from specimens in the herbarium of Iowa State College.

2 Cavanagh, L. M. in Proc. Iowa Acad. Sci. *36*: 133-135. 1929.

3 Pammel, L. H. The Flora of Pine Hollow, Dubuque County, Iowa. Proc. Iowa Acad. Sci. *30*: 263-277. 1923.

4 Conard, H. S. Mosses of Pine Hollow, Iowa. Bryol. *35*:28-30. 1932 (1933).

5 Cooper, W. S. The ecological succession of mosses as illustrated upon Isle Royale, Lake Superior Plant World *15*: 197-213. 1912.

—— —— A list of mosses collected upon Isle Royal, Lake Superior. Bryol. *16*: 3-8. 1913.

—— —— Seventeen years of successional change upon Isle Royale, Lake Superior Ecol. *9*: 1-5. 1928.

banksiana and Picea mariana. In the latter association the dominant mosses are Thuidium abietinum,[6] Hylocomium triquetrum, H. proliferum, Calilergon schreberi, Hypnuum crista-castrensis and Dicranum undulatum. In portions of the "climax forest" Cooper found "side by side an area with scattered large trees giving moderate shade and with thick growth of mosses [chiefly the "forest mosses Calliergon schreberi, Hylocomium proliferum and Hypnum crista-castrensis"], and a similar area with Ground Hemlock (Taxus canadensis) instead of the [moss]." This sounds remarkably like the conditions we have described above. In the following table the mosses from Cooper's list are checked against the list from Pine Hollow.

Gates [7] has described the vegetation of the Douglas Lake region, Michigan. He lists four original tree associations: Picea-Abies forest (in very small areas), Pine forest on the poorer uplands (P. resinosa and P. Strobus), beech-maple forest on richer uplands (Fagus grandifolia, Acer saccharum), and arbor vitae bogs (Thuja occidentalis). It is not possible to determine what mosses belong to these associations from the lists published by Nichols.[8] But we have checked Nichols's list against the list from Iowa.

In view of these records it seems proper to ascribe the Taxus association of Pine Hollow to the Northeastern Conifer Forest of Cooper. It is only a "fragmentary" association, being a relict from a glacial stage, persisting under conditions that permit the component species to survive. It presents a fragment of a vegetation that was once a climax in northeastern Iowa, and doubtless was much richer in species. Now it is a climax type three hundred miles northeast.

As a further contribution we are checking in the table those species which were represented in a casual collection from Eagle River, Vilas Co., Wis., sent in by a student friend, Miss Elizabeth Olson, on a Thanksgiving vacation, and a collection by Miss Rebecca Conard, Councilor at Camp Arbutus, Grand Traverse Co., Mich. We are also adding to the table some species found on the sunny slope opposite the Taxus Hillside, and some from a pure stand of Pinus strobus near by.

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6 T. abietinum grows on the sunny wooded slope opposite the Taxus Hillside.

7 Gates, F. C. The vegetation of the region in the vicinity of Douglas Lake, Cheboygan County, Michigan, 1911. Rept. Mich. Acad. Sci. *14*: 46-103. 1913.
—— —— Plant successions about Douglas Lake, Cheboygan County, Michigan. Bot. Gaz. *82*: 170-182. 1926.
—— —— Aspen association in northern Lower Michigan. Bot. Gaz. *90*: 233-259. 1930.

8 Nichols, G. E. The bryophytes of Michigan with particular reference to the Douglas Lake Region. Bryol. *25*: 41-58. 1922.
—— —— Ditto — II. l.c. *28*: 73-75. 1925.

| MOSSES OF THE TAXUS HILLSIDE | Isle Royale, Michigan | Douglas Lake, Michigan | Camp Arbutus, Michigan | Eagle River, Wisconsin |
|---|---|---|---|---|
| *HEPATICAE* | | | | |
| *Cephalozia connivens o* | | x | x | |
| *Cololejeunea biddlecomiae o* | | x | | |
| *Conocephalum conicum fr.* | | x | x | |
| *Frullania eboracensis fr.* | | x | | x |
| *riparia n* | | | | |
| *Lepidozia reptans o* | | x | | |
| *Lophocolea heterophylla* | | x | x | |
| *Marchantia polymorpha fr.* | | x | x | |
| *Plagiochila asplenioides* | | x | | |
| *Preissia quadrata fr. n* | | x | x | |
| *Ptilidium puleherrimum n* | | x | x | |
| *Radula complanata fr. o* | | x | x | |
| *MUSCI* | | | | |
| *Amblystegium serpens tenue* | | s | x | |
| *varium* | x | x | | |
| *Anomodon attenuatus* | | x | | |
| *minor* | | x | | |
| *rostratus* | | x | | |
| *tristis o* | | | | |
| *Bartramia pomiformis fr.* | x | x | x | |
| *Brachythecium acuminatum* | | | x | |
| *flexicaule* | | x | x | |
| *oxycladon fr.* | x | x | x | x |
| *rivulare* | | x | x | |
| *salebrosum fr.* | | x | x | |
| *Brachythecium velutinum* | x | x | | |
| *Bryhnia graminicolor* | | x | | |
| HOLZINGERI | | | | |
| *Calliergon schreberi fr. n* | x | x | x | x |
| *Campylium chrysophyllum* | x | x | | |
| *hispidulum fr.* | | x | x | |
| *Climacium americanum* | x | x | | |
| *Didymodon rubellus fr. n* | | x | | |
| *Dicranum flagellare fr. n* | x | x | x | x |
| *montanum n* | | x | x | |
| *scoparium* | x | x | x | x |
| *Drepanocladus uncinatus fr. o* | x | x | | |
| *Encalypta streptocarpa n* | | x | | |
| *Entodon cladorrhizans fr.* | | x | | |
| *Eurhynchium hians* | | | | |
| *strigosum robustum fr.* | s | s | s | s |
| *Georgia pellucida fr.* | x | x | x | |
| *Gymnostomum calcareum* | | | | |
| *Hylocomium triquetrum fr. n* | x | x | | x |
| *Hypnum crista-castrensis fr. n* | x | x | | x |
| *curvifolium* | x | | | |
| *haldanianum fr.* | | x | x | x |
| *imponens n* | x | x | x | x |
| *Leskea obscura* | | | | |

| Mosses of the Taxus Hillside | Isle Royale, Michigan | Douglas Lake, Michigan | Camp Arbutus, Michigan | Eagle River, Wisconsin |
|---|---|---|---|---|
| *Leucodon julaceus o* | | | | |
| *sciuroides o* | x | x | | |
| *Mnium cuspidatum fr.* | | x | x | x |
| *marginatum* | x | x | | |
| *medium fr.* | | x | x | x |
| *Myurella careyana n* | | x | | |
| *Oncophorus wahlenbergii fr. o* | x | x | | |
| *Orthotrichum porteri fr.* | | | | |
| *Plagiothecium denticulatum fr.* | x | x | x | |
| *deplanatum fr.* | | | | |
| *Platygyrium repens fr.* | | x | x | x |
| *Pylaisia schimperi n* | | x | | |
| *Thuidium delicatulum* | x | x | x | x |
| *minutulum o* | | | | |
| *recognitum* | | x | x | |
| *Timmia cucullata* | | x | | |
| Sunny Slope Opposite Taxus Hillside | | | | |
| *Bartramia oederi fr. n* | | x | | |
| *Brachythecium cyrtophyllum fr.* | | x | | |
| *Dicranum viride o* | | x | | |
| *Fissidens cristatus fr.* | | x | x | |
| *Hypnum patientiae* | x | x | | |
| *Mnium stellare n* | | x | | |
| *Swartzia montana fr. n* | x | x | | |
| *Thuidium abietinum* | x | x | | |
| *Tortella fragilis n* | | x | | |
| From Pine Grove | | | | |
| *Dicranella heteromalla* | | x | | |
| *Eurhynchium serrulatum* | | x | | x |
| *Hypnum recurvans o* | | x | x | |
| *Neckera pennata o* | x | x | | |

The letter *n* denotes species known in Iowa only from the northeastern quarter; *o* denotes the only locality reported for the State; *fr.* denotes fruiting; *s* denotes the species, no variety being designated.

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