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The Botany Department attracted many notable faculty members and students. Distinguished faculty, in addition to Cain and Friesner , included John E. Potzger, a forest ecologist and palynologist, Willard Nelson Clute, co-founder of the American Fern Society, Marion T. Hall, former director of the Morton Arboretum, C. Mervin Palmer, Rex Webster, and John Pelton. Some of the former undergraduate and master's students who made active contributions to the fields of botany and ecology include Dwight. W. Billings, Fay Kenoyer Daily, William A. Daily, Rexford Daudenmire, Francis Hueber, Frank McCormick, Scott McCoy, Robert Petty, Potzger, Helene Starcs, and Theodore Sperry. Cain, Daubenmire, Potzger, and Billings served as Presidents of the Ecological Society of America.

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THE VEGETATION OF ROUND ISLAND (STRAITS OF MACKINAC), MICHIGAN

By J. E. POTZGER

The vegetation of Round Island was studied briefly during the summers of 1935 and 1936 while an extensive survey was in progress on Mackinac Island (5). Round Island is 0.5 miles southeast of Mackinac, separated from it by the Straits of Mackinac. It comprises several hundred acres of land surface (1.5 by 0.75 mile) most of which consists of a thin layer of soil over a limestone substratum. The central part of the island is considerably higher above lake level than the outer rim, but perhaps not exceeding 50 feet. Several ancient beaches are in evidence along the shore but they are not so extensive as on Mackinac. The present beach is wide and strewn with abundant granite and quartzite boulders. The peninsula-like northern tip is evidently subjected to extreme wave action, hence has a sparse vegetation.[1]

CULTURAL INFLUENCES

While Round Island is uninhabited except for the keeper of the lighthouse and his family, it has not been spared the destructive influence of civilized man. The entire central hardwoods stand was cut for firewood by citizens of neighboring islands, as the small stem sizes and abundance of trees in table II well reflect. The coniferous forest fared better in the past in this respect than the hardwoods.

OBSERVATIONS

The distributional features of the forest are almost a counterpart of those found on Mackinac, viz. an outer belt of coniferous forest composed primarily of *Picea glauca, Abies balsamea* and *Thuja occidentalis* surrounding a central stand of northern hardwoods. Thuja has highest abundance of all species in the peripheral zone, except at a rather low lying upper beach along the northern shore.

[1] Sincere appreciation is expressed to Mr. C. R. Nennert of Indianapolis for assistance given in the field work.

Here *Pinus resinosa, P. strobus,* associated with *Abies balsamea* are chief contenders for control in the crown cover. A large number of woody species participates in the association of the coniferous forest, i.e. 18 (table I) over against 8 in the broadleaved forest (table II). It is a striking feature that Abies is the only conifer represented among the tree species constituting the broadleaved forest.

Along the wide rock beach, reproduction of woody species is prolific. In a sample quadrat, five by ten meters, was found the following representation: *Picea glauca* 62 (7 stems one to two inches DBH.), *Thuja occidentalis* 21 (3 stems one to two inches DBH.), *Pinus strobus* 2, *Larix laricina* 13, *Abies balsamea* 4, *Populus tacamahacca* 1, *Hypericum kalmianum* 56, *Prunus pumila* 1, *Shepherida canadensis* 6, *Potentilla fruticosa* 12, a total of 180 stems.

Three samples of surface soil along the shore gave a range in pH of 6.72 to 8.21 which, also, is similar to the soil on Mackinac Island. The representative sample plot on reproduction in bare areas further bears out that succession is short, or perhaps it were better to say, is wanting, for the seedlings of the dominants become established immediately. The 84 species of plants, involving 29 families, collected during two days in the month of August are perhaps less than half the total number present during the various seasonal aspects.

LIST OF SPECIES

Aceraceae: *Acer pennsylvanicum* L., 7306.* *A. saccharum* Marsh, 7206, *A. spicatum* Lam., 6558.

Betulaceae: *Betula papyrifera* Marsh, 7294. *Corylus cornuta* Marsh, 7270. *Ostrya virginiana* (Mill.) K. Koch, 7305.

Campanulaceae: *Campanula rotundifolia* L., 6537.

Caprifoliaceae: *Virburnum trilobum* Marsh, 7306a.

Compositae: *Anaphalis margaritacea* var. *intercedens* Hara, 7280. *Artemisia caudata* Michx., 6563. *Aster pilosus* var. *pringlei* (Gray) Blake, 6540. *Coreopsis lanceolata* L., 7269. *Eupatorium maculatum* L., 7273. *Rudbeckia hirta* L., 7272. *Solidago altissima* L., 6541. *S. gilmani* (Gray) Steele, 6564. *S. graminifolia* (L.) Salisb., 6548. *S. hispida* Muhl., 6542. *S. ohioensis* Riddell, 6549.

Cornaceae: *Cornus canadensis* L., 6559. *C. stolonifera* Michx., 7263. *C. rugosa* Lam.

Cyperaceae: *Scirpus validus* Vahl., 7261.

Elaeagnaceae: *Shepherdia canadensis* (L.) Nutt., 7258.

Ericaceae: *Arctostaphylos uva-ursi* var. *coactilis* Fern., 7262.

Fagaceae: *Fagus grandifolia* Ehrh., 7304.

*The numbers refer to the author's field collection records.

Gentianaceae: *Gentiana procera* Holm., 6565. *Halenia deflexa* (Sm.) Griseb., 6544.

Geraniaceae: *Geranium Robertianum* L., 7253.

Gramineae: *Agropyron repens* (L.) Beauv., 7286. *Agrostis alba* L., 7288. *A. scabra* Willd., 6539. *Calamagrostis canadensis* (Michx.) Beauv., 7274. *Cinna latifolia* (Trev.) Griseb., 7301. *Deschampsia caespitosa* (L.) Beauv., 7285. *Elymus canadensis* L., 7283. *Hystrix patula* Moench, 6567. *Milium effusum* L., 7298. *Panicum tennesseense* Ashe, 6554. *Phalaris arundinacea* L., 7287. *Poa compressa* L., 7290. *palustris* L., 7281.

Hypericaceae: *Hypericum kalmianum* L., 6552. *H. perforatum* L. 7282.

Juncaginaceae: *Triglochin palustris* L., 7264.

Labiatae: *Satureja glabra* (Nutt.) Fern. 6551.

Liliaceae: *Clintonia borealis* (Ait.) Raf., 6557. *Smilacina stellata* (L.) Desf., 7275. *Streptopus roseus* Michx., 7279. *Zygadenus glaucus* Nutt., 6543.

Lobeliaceae: *Lobelia kalmii* L., 6538.

Lycopodiaceae: *Lycopodium annotinum* L., 6556. *L. lucidulum* Michx., 7303.

Ophioglossaceae: *Botrychium virginianum* (L.) Sw., 7299.

Orchidaceae: *Goodyera pubescens* (Willd.) R. Br., 7291.

Pinaceae: *Abies balsamea* (L.) Mill., 7254. *Juniperus communis* var. *depressa* L., 7277; *J. horizontalis* Moench, 7256. *Larix laricina* (DuRoi Koch, 7255. *Picea glauca* Voss, 7293. *Pinus strobus* L., 7267. *P. resinosa* Ait. *Taxus canadensis* Marsh, 6546. *Thuja occidentalis* L., 7257.

Polypodiaceae: *Adiantum pedatum* L., 7300. *Cystopteris bulbifera* (L.) Bernh., 7297. *Dryopteris marginale* (L.) Gray, 7295. *Dryopteris spinulosa* (O. F. Muell.) Ktze., 6568.

Primulaceae: *Primula farinosa* var. *armericana* Torr., 7289. *Trientalis borealis* Raf., 6560.

Ranunculaceae: *Anemone multifida* Poir., 6566.

Rosaceae: *Amelanchier canadensis* (L.) Medic., 7268. *Physocarpus opulifolius* (L.) Maxim, 7259. *Potentilla anserina* L., 7278. *P. fruticosa* L., 6553. *Sorbus americana* Marsh, 6562.

Salicaceae: *Populus tacamahacca* Mill., 7307. *P. tremuloides* Michx., 7260. *P. grandidentata* Michx.

Saxifragaceae: *Mitella nuda* L., 6561.

Scrophulariaceae: *Castilleja coccinea* (L.) Spreng., 6550. *Gerardia tenuifolia* Vahl., 6547. *Linaria vulgaris* Hill., 7277. *Melampyrum lineare* Lam., 6545.

DISCUSSION

Vegetation on the smaller islands in the Great Lakes, located within the center of the lake forest climax region, shows plainly the stress between the replaced boreal forest and the recently invading northern hardwoods. The more rigorous microclimate along the periphery of islands limits invasion and replacement of boreal forest complexes by the broadleaved southern species to the more pro-

tected central parts of small land masses, as Mackinac (5) and Round Island demonstrate. This sharp segregation into the two associations along sharply defined limits, with the absence of the intermediate pine association, becomes mode modified on larger islands, as shown by Darlington (2) for Beaver Island. Here one finds distribution of forest types with merging characteristics like those of the mainland of Michigan, i.e. pine constituting the chief forest cover on sandy soil, northern hardwoods, associated with Tsuga, dominating in habitats where soil is clay or loam; while Abies, Picea, Larix, and Thuja express the more hydrophytic bog and swamp habitats, as described in detail by Gates (3, 4) for the Douglas Lake region.

This makes it difficult at times to define the climax status of an area, for two climax formations on small islands are sharply separated along narrow geographical lines. However, the author agrees with Cooper (1) that *Acer saccharum* demands climax control wherever it occurs, as is well shown by the central section of Round Island (table II), and the peripheral association of conifers must be considered post-climax. The two forest types are much more sharply separated on Round Island than on Mackinac (5). In the latter location conifers constitute 25% of the trees in the broadleaved forest while on Round Island only Abies has a small representation in the seedling stem sizes (table II). The writer is, however, now more firmly convinced than in 1941 (5) that Acer-Fagus is the climatic climax and conifers are post-climax for Mackinac also, in spite of the fact that Fagus and Acer there are suffering from rigors of the climate, and that conifers still occupy a prominent place under the poorly developed crown cover of the northern hardwoods association.

On Round Island as well as on Mackinac we are without doubt dealing with calciphilous ecotypes of certain phenotypes, for Thuja, *Picea glauca, Abies balsamea, Larix laricina, Potentilla fruticosa* reproduce readily in alkaline soil, while on the mainland of lower Michigan they are typical bog species (See Gates, 4). The general alkalinity of soil is also shown by the total absence of shrubby ericads and *Pinus banksiana.*

For the final determination as to whether the coniferous or broadleaved forest expresses microclimatic control one must perhaps consult pollen records as to great successional tendencies during past

ages. The record from Douglas Lake by Wilson and Potzger (6), 30 miles south of the Straits, shows an early undisputed dominance by *Picea glauca* and Abies which was in turn replaced by Pinus, and this again gave way to broadleaved complex, so that we must define maple or beech-maple as climax for Round Island with coniferous forest as post-climax, the latter maintained by the more rigorous microclimate along the periphery of the island habitat.

SUMMARY

1. Presented in this paper are data of an ecological survey of the forest on Round Island, Michigan.

2. The central part of the island is controlled by northern hardwoods, primarily by an Acer consociation, and the periphery by spruce-fir-arbor vitae.

3. A partial list of species (84) constituting the vegetation is given, and while it is fairly complete for woody species, the record favors the summer phase of the herbaceous plants.

4. The soil along the exposed beach is highly alkaline.

5. Ericads are represented only by Arctostaphylos.

6. Tree species in the central hardwoods area with highest F. I. are: *Acer saccharum,* 100; *Betula papyrifera,* 40; *Populus tacamahacca,* 40; *Abies balsamea,* 60.

7. Tree specias with highest F. I. in the fringing belt of conifers are: *Thuja occidentalis,* 92; *Abies balsamea,* 92; *Picea glauca,* 85; *Betula papyrifera,* 46; *Amelanchier canadensis,* 61.

8. Species with greatest abundance in the hardwoods are: *Acer saccharum, Populus tacamahacca, Betula papyrifera, Abies balsamea.*

9. The association of species is more simple in the hardwoods than in the coniferous forest.

10. It is concluded that hardwoods are climax for Round Island and conferous forest post-climax, maintained by a more rigorous microclimate along the periphery of islands.

LITERATURE CITED

1. Cooper, W. S. The climax forest of Isle Royale, Lake Superior, and its development. Bot. Gaz. 55: 1-44; 115-140; 189-235. 1913.

2. Darlington, Henry Townsend. Some vegetational aspects of Beaver Island, Lake Michigan. Papers Michigan Acad. Sci., Arts, and Letters 25: 31-37. 1940.

3. GATES, FRANK C. Plant succession about Douglas Lake, Cheboygan County, Michigan. Bot. Gaz. 82: 170-182. 1926.
4. ——— ———. The bogs of northern lower Michigan. Ecol. Mon. 12: 213-254. 1942.
5. POTZGER, J. E. The vegetation of Mackinac Island, Michigan: An ecological survey. Amer. Midland Nat. 25: 298-323. 1941.
6. WILSON, IRA T. AND J. E. POTZGER. Pollen study of sediments from Douglas Lake, Cheboygan County and Middle Fish Lake, Montmorency County, Michigan. Indiana Acad. Sci. Proc. 52: 87-92. 1943.

TABLE I

Abundance by size classes and F. I. of woody species participating in the forets complex of the northern hardwoods in the central part of Round Island, Michigan. Based on five 100-square-meter quadrats.

Species	Below 1 inch	1-2 inches	3-5 inches	6-10 inches	11-15 inches	16-20 inches	Total stems over 1 in.	F. I.
Abies balsamea	24	4					4	60
Acer saccharum		11	17	18	2		48	100
Betula papyrifera				3	6		9	40
Acer spicatum	28	9					9	40
Amelanchier canadensis	7							40
Sambueus sp.?	4							20
Populus taeamahaeca					5	2	7	40
Sorbus americana				1	1		2	20
Taxus canadensis	2							20

TABLE II

Abundance by size elasses and F. I. of woody plants partieipating in the forest along the outer rim of Round Island, Michigan. Based on 13 100-square-meter quadrats.

Species	Below 1 inch	1-2 inches	3-5 inches	6-10 inches	11-15 inches	16-20 inches	Total stems 1 in. or over	F. I.
Abies balsamea	57	43	40	11			94	92
Picea glauca		8	24	13	2		47	85
Thuja occidentalis	21	52	115	56	6		229	92
Amelanchier canadensis	14	32	6				38	62
Larix laricina	3							8
Betula papyrifera		2	10	5			17	46
Pinus resinosa		3	8	7	1	1	20	31
Pinus strobus		1	1	4	1		7	15
Acer saccharum		1	2	3			6	23
Populus grandidentata			[illegible]	4			7	31
Acer spicatum	1	1					1	8
Taxus canadensis	22							38
Corylus cornuta	39							38
Populus tacamahacca	5							8
Cornus rugosa	9	1					1	8
Viburnum acerifolium	2							8
Cornus stolonifera	1							8