

THE DISTRIBUTION OF GREAT LAKES SHORE PLANTS AROUND INLAND LAKES

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Botany 790
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OK-

4 August 1972
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Some plants are found only along the Great Lakes shores in Michigan. Is there something peculiar to this habitat that these plants need to survive or are they simply not dispersed to other localities? Some plants such as Ammophila breviligulata have adapted special features to fit the unique sand dune habitat. Its ability to grow vertical rhizomes means that it can grow out on the unstable areas of the dunes where the height is constantly shifting. ¹ Perhaps other plants crowd it out along inland shores where the sands are not as shifting; it has only one known inland location. There is probably another sort of plant however. It is likely that there are plants that are found only along the dunes (perhaps in more settled areas than those Ammophila breviligulata inhabits) but that would flourish if transported to inland shores. They are not often found at these locations because their means of dispersal do not carry them to other shores.

It has been noted that islands which were under the ancient waters of Lake Algonquin have very few species of *shoreline-restricted* plants. ² This could be due to special features of the islands themselves but it is more likely due to the (great) dispersal of ^{these} plants during the times of Lake Algonquin. This hypothesis can be tested by going to lake shores which were once part of Lake Algonquin and searching for plants that are usually thought of as being restricted to Great Lakes shores. If such plants are found only along inland lakes that were once part of Lake Algonquin and not along other inland shores it is likely that the plants were dispersed during the times of Lake Algonquin and not since. If plants are found along more recent

*Are there any more
can you argue from negative evidence?*

lake shores as well as old lake shores the possibility that they were dispersed recently must be considered.

As much more thorough study would be necessary to determine decisively whether or not shore plants were dispersed during Lake Algonquin times. Dispersal patterns of present lake plants would have to be studied to see if its possible for them to have spread long since Lake Algonquin. Plants could be transplanted to low islands to see if its possible for them to grow there once they get there. If the conditions on the islands are such that they are not favorable for shore plants that would have to be considered a major reason for not finding them there. In this case the low islands would not tell one much about dispersal. Since shorelines have changed since Lake Algonquin it is possible that inland shores went through a stage unfavorable to shore plants so that one would not now see them even though they could now grow in the places and had been there during the Lake Algonquin stage. A study of the geological history since Lake Algonquin might thus be helpful. Searching for Great Lakes shore plants along inland lakes once part of Lake Algonquin is only a first step. The results of such a study could indicate what things would be interesting and important to do next.

Though other things were thought of only one hypothesis was actually tested. Plants usually found on Great Lakes shores only were looked for around two inland lakes that were part of Lake Algonquin. The two lakes were Mud Lake and Spring Lake; both are very near Petoskey and were part of a water channel across northern Michigan. ^{with last rising time} Now they are separated from Lake Michigan and Lake Michigan drainage by a large sand dune. Much of Mud lake is marshy; Cattails and reeds reach out into the water.

Spring Lake has more areas of sandy beach with beachpools so it was covered more thoroughly. This was easy to do because there are no houses around Spring Lake.

The method of search used was to walk around the shores of the lakes looking for specific plants (those listed by Dr. Voss that this investigator has seen around the Great Lakes). All unknown plants were collected as well as some that were most abundant. Spring Lake was studied first so any plants at Mud Lake that were duplicates of the other lake were not listed. The list for Mud Lake therefore is comprised of those plants not found at Spring Lake. This was considered adequate because the purpose of the project was not to compile a complete list of the flora of either lake.

PLANTS FOUND ALONG THE SHORE OF SPRING LAKE

Equisetaceae

Equisetum arvense

Polypodiaceae

Thelypteris palustris

Cupressaceae

Thuja occidentalis

Typhaceae

Typha latifolia

Sparganiaceae

Sparganium chlorocarpum

Alismataceae

Sagittaria cuneata

Graminae

Elymus canadensis
Panicum sp.
Phalaris arundinacea
Poa compressa

Cyperaceae

Carex aurea
C. exilis
C. hystericina
C. lacustris
C. lasiocarpa
C. pseudo-cyperus
C. vulpinoidea
Dulichium arundinacea
Eleocharis erythropoda
Scirpus atrovirens

new to Canada?
E. paniculata?
(you had specimens)

Lemnaceae

Lemna minor

Juncaceae

Juncus balticus
J. nodosus

Salicaceae

Salix bebbiana
S. alba fragalis
S. discolor
S. lucida
S. petiolaris

Nymphaeaceae

Nuphar variegatum

Ranunculaceae

Anemone cylindrica

Cruciferae

Nasturtium officinale
Rorippa obtusa → ? *Erucastrum gallicum*
new to Michigan

Rosaceae

Rubus pensylvanicus

Hypericaceae

Hypericum denticulatum — *new to Mich.*
H. perforatum

*Hypericum
sibiricum?*

Elaeagnaceae

Shepherdia canadensis

Onagraceae

Oenothera rhombipetala ? *new to this region*

Cornaceae

Cornus stolonifera

Asclepiadaceae

Asclepias incarnata

Labiatae

Lycopus sp.
Dracocephalum parviflorum — ? *new to region*

Caprifoliaceae

Lonicera villosa X

Compositae

Cirsium vulgare
(S)

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PLANTS FOUND AT MUD LAKE BUT NOT AT SPRING LAKE

Myricaceae

Myrica gale

Umbelliferae

Cicuta bulbifera

Ericaceae

Vaccinium myrtilloides

V. lamarkii

V. ~~sp.~~

Scrophulariaceae

~~sp.~~

Melampyrum lineare

It is certainly possible that some of the above plants not found at Spring Lake were there but not collected the time it was visited because they were known not to be shore plants.

If this is a complete survey of the plants that grow around these lakes then the original hypothesis needs revising. For these are all plants that grow in general habitats like this one. They would be found around a small lake or in almost any wet hollow regardless of the situation ten thousand years ago. The plants that are found at these two lakes are plants that have some means of distributing themselves over land from one wet place to another. They are widespread. If any shore plants were once found here they have been replaced by plants that could adapt to this environment.

The lack of shore plants around inland lakes could be explained by the lack of distribution to these lakes. But that does not seem to be the explanation most easily supported. If many shore plants had been found around inland lakes once part of Lake Algonquin and not around other lakes then it

might be that distribution was the reason that shore plants are restricted to the shores. But if this were so it would mean that there were continuous plant populations between Lake Michigan and Mud Lake ten thousand years ago, but since then the two populations have been separate. If conditions remained the same then it is likely that the two separated populations would still be the same, there being no new factors that would make a certain individual variance adaptively superior. But conditions probably did not remain the same. The two habitats are now different, the Great Lakes being less sheltered, more exposed to wind, to shifts in the water level, and to shifting sands, whereas the inland habitat is sandy and moist but much less subject to great fluctuations. It is likely that the receding waters of Lake Algonquin and the uplift effected the two habitats in different ways. Lack of distribution might explain why certain plants are found only along the Great Lakes, but it is more likely that these plants are found there because they are specifically adapted for this habitat. If there was one plant that grew in both places during Lake Algonquin times it is likely that the plant evolved differently in the two places so that they would now be two different species. Ten thousand years might be thought not such a long time for much speciation to take place but it must be remembered that speciation depends more on changes in environment than it does on the actual number of life-cycles passed through.

There has been a record of Primula mistassinica from Mud Lake.³ Does this destroy the above explanation? Certainly it is evidence that things cannot be explained simply with complete answers. However it would seem more probable that this plant or colony of plants is something that was transported there by

chance long after the times of Lake Algonquin. If it were otherwise it would seem that more specimens would be found. As it is Primula mistassinica is probably a misfit just barely hanging on at the Mud lake site. The same may be said of other shore species found in only a few places inland, though if there are too many of them it is dangerous to pass off so much data as due to chance. Change is always taking place so it could be that some shore plants are now, recently moving inland and adapting to the slightly different environment. Of course some plants could have been there since Lake Algonquin times and not changed, the microhabitat in the two places being identical. These plants are probably the exceptions.

Can the speculations of the previous section be tested? They fit the small amount of data gathered but more importantly follow general patterns established by evolutionary theory. A first step in testing these ideas would be to collect similiar species from the two environments and study the adaptations they have made to their habitats. Perhaps it could be determined about when the two branched. If this were done for alot of plants and it seemed possible that the branch occurred when the inland lakes were separated from Lake Michigan then the hypothesis is supported. Shore plants could be transplanted to inland lakes and observed. If they flourished it would seem that distribution means were after all an important factor. If they did not do well it could be assumed that this was because they were adapted for a different, specialized habitat and did well only in that habitat. These investigations would give one a better understanding of the problems but it is possible

that there are no tests that can be run to prove for once and for all what has happened with ~~more~~ plants in the past ten thousand years.

An inland lake, once part of Lake Algonquin was searched for Great Lakes shore plants. None were found so it was hypothesized that the environments were different enough so that different species would have evolved since Lake Algonquin even if the species were then identical. Some ways of testing this idea were mentioned but none of them were thought would give conclusive evidence either way. The question is a complex one that cannot be easily solved, however the initial hypothesis that shore plants identical to Great Lakes shore plants would be found was overturned. There were [^]aparently too many changes since Lake Algonquin for the same species to survive in both places. It is unknown whether the plants were all the same along the shores of Lake Algonquin or not. The one part of the original statements that has not encountered conflicting evidence is that concerning the paucity of species on islands that were under the surface of Lake Algonquin. Distribution across waterbodies is a different thing so it is still possible that low islands do not have the numbers of plants simply because they have not been introduced. This would still have to be investigated to determine whether the island habitats are enough like the mainland one in spite of the big difference that the plant neighbors would be different.⁴

Impressive time (± 5000 yr. B.P.) more important in your case, what about unfavorable climate eliminating spp. since then?

Footnotes

1. Kenneth Squire and Edward Voss "Distributions of *Asplenium* Sensitive Plants in the Great Lakes Region" The Michigan Botanist March 1962
2. stated by Dr. Voss in Botany 510
3. Fellas, Charles W., and Charles H. Swift. 1918. A List of Plants Found in Emmet and Cheboygan Counties, Michigan. Unpublished manuscript of Dr. Swift.
4. Dr. Voss and Larry Blumer helped with the identification of some of the plants.

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