

calcium and hydrogen-ion concentration in water collected in various regions of eastern Quebec illustrate the striking difference in chemical nature between calcareous and acidic rock formations.

Porsild (1955) also refers several of the discontinuous distributions of Arctic species to soil factors: "A glance at maps showing the distribution of certain North American species will at once disclose that many obligate calciphiles are absent from the acid Archaean rocks of the Laurentian Shield area (e.g., *Braya humilis* and certain other species in the *Cruciferae*) but are found on the younger and largely Palaeozoic sediments around the periphery of the Shield. On the other hand, a large number of typically oxylophytic species, notably among the *Ericaceae* and among ferns and fern-allies, may be ubiquitous on the acid rocks of the Shield but absent on the surrounding calcareous sediments. Edaphic discontinuity is even more pronounced in the Arctic, where, because of climatic conditions, such as low temperatures and low precipitation, organic soils in the form of humus, turf, or peat bogs are either lacking or at best feebly developed. . . ."

"In the Arctic, the problem of edaphic discontinuity is further complicated by the fact that warmth-loving plants near the northern limits of their ranges tend to become facultative calciphiles, often confined to stony, calcareous soils. The reason may be that these soils alone afford them optimal physical conditions of temperature, water supply, and aeration." Further elaboration of this and other aspects of arctic ecology is given in papers by Griggs (1914; 1934) and Raup (1941).

A noteworthy characteristic of the rare eastern limestone floras is their variability in species from one station to another, in contrast with the more or less uniform old-established flora to be expected on the basis of the nunatak theory. As noted by Wynne-Edwards, this would result from the relatively short time during which recolonization of the scattered stations has been in progress, or, in some cases, from reduction to the last and coolest habitats. He also believes that the presence of endemics in the arctic-alpine flora of eastern North America offers no positive evidence in support of the nunatak theory. Rather than indicating great age of the flora, this phenomenon can be better correlated with the specialized soil preference of the plants. Their invasion of an area must progress by leaps from one suitable habitat to another, and a station may sometimes be colonized by the progeny of a single seed, an ideal condition for the segregation of different types. Palmgren (1929), in a paper entitled *Chance as an Element in Plant Geography*, writes, "It depends in a high degree on chance whether a plant will succeed in gaining a foothold in time, before the vegetation becomes closed and a more or less effective obstacle to the entering of new elements is established. . . . A rare species may be found on a certain spot, but is wanting in other quite similar places in the neighbourhood". This is supported, in the case of the rare plants of the Gaspé Peninsula of Quebec, by a table constructed by the writer (Scoggan, 1950, p. 24) noting the occurrence (presence) of 125 calciphilous species in 10 typical sea-cliff and 10 typical river-gravel habitats. Almost half of the 109 sea-cliff species were found in only one or two of their ten stations and over a third of the 80 river-gravel species were found in only one or two of their stations. Over half of the total of 125 species were found in not more than four of the 20 stations. This is in sharp contrast to more stabilized and crowded communities such as those of the climax forest or the heath bog. The uniform ericaceous flora of heath bogs has been noted in the discussion of the Boreal Forest Floral Region. In such a habitat, ground coverage is practically 100 p.c. and the ability to colonize is possessed by a specialized flora able to withstand strong competition and a highly acidic substratum.

It was Palmgren who introduced the concept of 'minimum area' into phytogeography, a concept that has since played an important part in the statistical analysis of vegetation. Its basic tenet is that, for a particular plant association, a certain minimum area is required before that association can comprise the requisite number of different species by which it is distinguished from other plant associations. Obviously, for the heath bog association, this minimum area will be relatively small. Most or all of the typical bog species will probably be found on any tenth of an acre tested. 'Presence' is high, each species occurring in nearly all sample stands of the community. 'Fidelity' is also high,