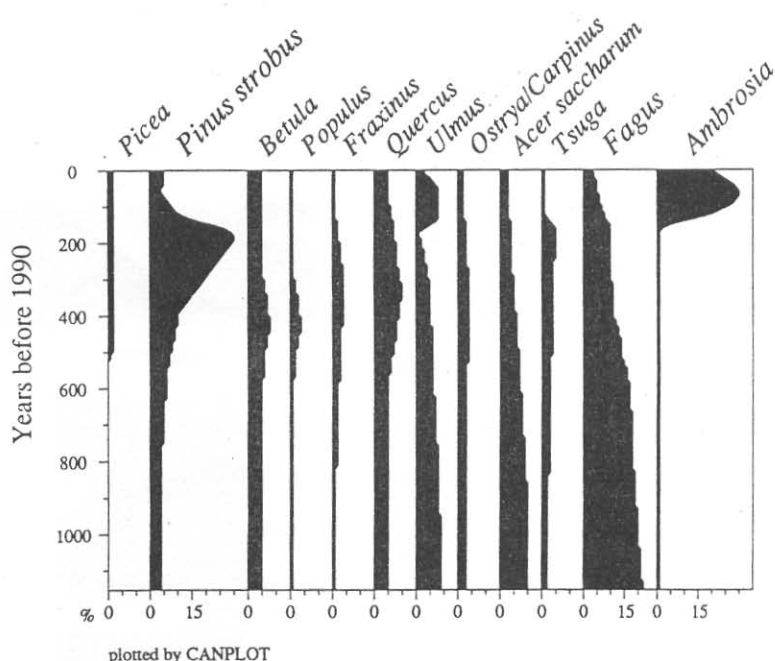


## Synthetic Southern Ontario Pollen Diagram



**Figure 1.** Synthetic Southern Ontario pollen diagram for the period A.D. 850-1990. (Note: an increase in ragweed [*Ambrosia* sp.] marks the beginning of EuroCanadian disturbance ca. 1850 throughout the region [Anderson, 1974]).

The natural forest of southern Ontario is dominated by beech and sugar maple (*Acer saccharum*), of which beech has the more southerly distribution, reaching its limit near Lake Nipissing (Fowells, 1965; Rowe, 1972). An increase in the mortality of beech in Southern Ontario would cause an increase in the rate of canopy gap formation, allowing early- and mid-successional species to temporarily increase in abundance. White pine, which reaches peak abundance in Ontario at the latitude of Lake Nipissing, would increase to the south of Lake Nipissing, where it is an early mid-successional species. Further north, where it is subclimax, it would decline. This would allow red pine, jack pine, and

spruce to increase in abundance north of Lake Nipissing. Because these are the dynamics observed in the regional pollen diagrams, climate change rather than Iroquoian horticulture is the likely cause (Campbell and McAndrews, 1991).

If the Iroquoians did not cause the increase in white pine, what explains the apparent coincidence of white pine and Iroquoian sites? The answer appears to be that Iroquoians and white pine both prefer similar edaphic conditions in parts of Southern Ontario.

Location Quotients compare the frequency of Iroquoian village sites linked with particular phenomena to the frequency of those

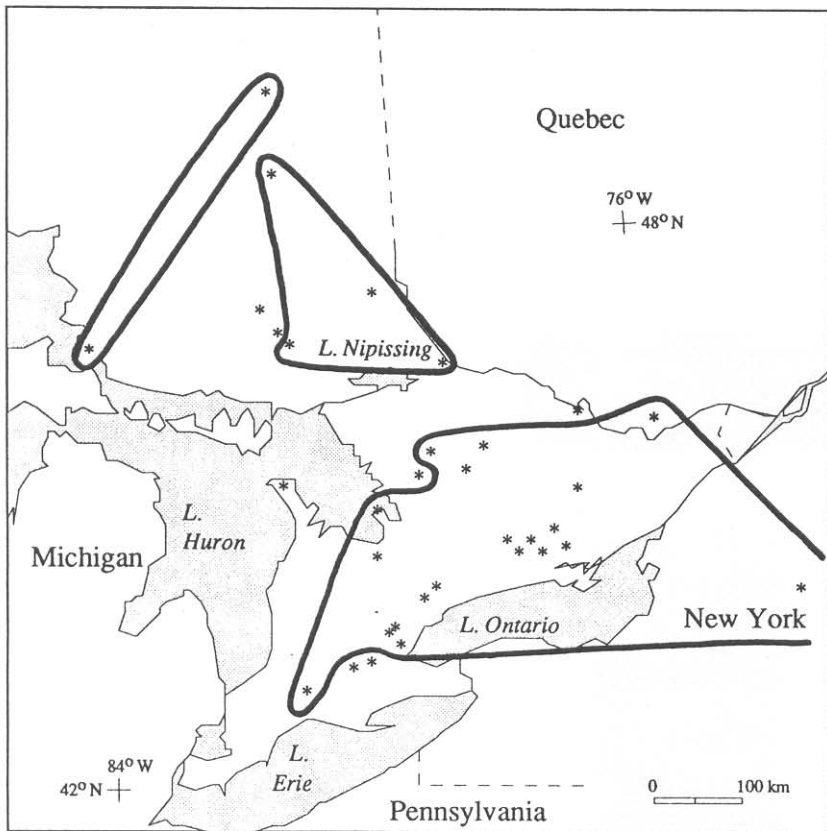


Figure 2. Cluster analysis of Ontario pollen diagrams shows all of Southern Ontario as a coherent region of similar forest dynamic over the 1000 years prior to A.D. 1850, with no separation between areas with and without dense Iroquoian occupation (Campbell and McAndrews, 1991). Beech (*Fagus grandifolia*) declines and white pine (*Pinus strobus*) increases throughout the southern cluster; the two northern clusters are defined largely in the dynamics of red pine (*P. resinosa*), jack pine (*P. banksiana*) and spruce (*Picea* spp.). \* indicates the locations of pollen cores used in the analysis.

phenomena within the study area (Campbell, 1991; Campbell and Campbell, 1992). For example, the location quotient for clay is:

$$\text{Location quotient for clay} = \frac{\% \text{ of sites on clay}}{\% \text{ of study area with clay}}$$

Location quotients greater than 1 indicate attraction; that is, those phenomena were chosen more frequently than would be expected if the choices were random.

Location quotients below 1 indicate aversion to the phenomena.

Location quotients were calculated for various edaphic parameters for the 333 prehistoric and protohistoric Iroquoian agricultural village sites (ca. AD 900 - 1550; Figure 3), and the probable minimum duration of the frost-free season nine years in ten (Table 1). Clearly, the Iroquoians had a strong preference for sandy, well-drained soils, with moderate relief

(Campbell, 1991; Campbell and Campbell, 1992). They also seem to have found areas with fewer than 90 or more than 130 frost-free days nine years in ten unattractive. These preferences were likely the result of the combination of the requirements of their staple crop (Maize), their horticultural technology (digging sticks and no irrigation or drainage ditches), and the physiography and climate of Southern Ontario (Campbell, 1991).

The strains of maize grown by the Iroquoians required at least 90 frost-free days to grow to maturity (Campbell, 1991). With maize contributing as much as 58% to 65% of their diet

(Heidenreich, 1971; Moncton, 1990), the Iroquoians would have selected only those sites with a reasonably low frequency of killing frosts during the growing season; hence they would have selected sites having 90 frost-free days or more in most years. They preferred sandy soils both for their drainage, since maize requires good drainage, and for ease of digging, since they used only digging sticks made of wood, bone, or hafted stone. The aversion to clay soils is likely the result of this technological limitation, as well as the poor drainage often associated with clay soils. The aversion to low relief is also likely due to the poor drainage associated with such sites (Campbell, 1991; Campbell and Campbell, 1992). The apparent aversion to sites with very long frost-free seasons is due to the coincidence of low relief and clay soils throughout most of the warmest part of Southern Ontario (Campbell, 1991; Campbell and Campbell, 1992).

Since white pine is less shade tolerant than

beech or maple, it requires sites in which beech and maple can not compete, or in which large canopy gaps are frequent. Beech and maple both prefer mesic sites, while white pine prefers dry soils (Fowells, 1965). Furthermore, moderate to steep slopes encourage gap formation by increasing the instability of roots. Hence, within the region of overlap between the range of white pine and the Iroquoians, both would tend to occur on similar sites with well-drained soils and at least moderate relief.

The only study to seriously test this association

on a regional scale did not find one; instead, large white pine stands were found to have no archaeological sites, while areas with only scattered pines were densely populated by prehistoric Iroquoians (Heidenreich, 1971). This study was conducted near the northern limit of Iroquoian villages in Ontario, in an area where white pine is abundant. That archaeologists perceive an association between white pine and Iroquoian sites is likely a result of these

similar edaphic preferences in relatively small areas densely populated by Iroquoians, primarily further south along the north shore of Lake Ontario where white pine is frequent but forms large stands only on the most favourable sites. In this area, white pine stands may indeed be a reasonably good predictor of archaeological sites, but out of coincidence rather than out of a causal relationship.

Prehistoric swidden horticulture is neither a sufficient nor even a necessary explanation for the observed forest successions, while climatic

Table 1. Location quotients demonstrate a strong correlation between Iroquoian village sites and light-textured, well-drained soils with more than 90 frost-free days nine years in ten (Campbell 1991).

Soil Texture	Location Quotient
Sand	0.
Sandy Loam	2.2
Loam	1.3
Silt loam	0.9
Clay and clay loam	0.5
Relief	
Depressional to Level	0.
Very gently undulating	0.3
Undulating	1.7
Moderately Rolling to Rolling	1.2
Hilly	0.2
Drainage	
Good	1.5
Imperfect	0.9
Poor	0.3
Very poor	0.1
Minimum Frost-free season, nine years in ten (in days)	
0 - 89	0.
90 - 109	0.7
110 - 129	1.4
130 - 149	0.6
150 +	0.7

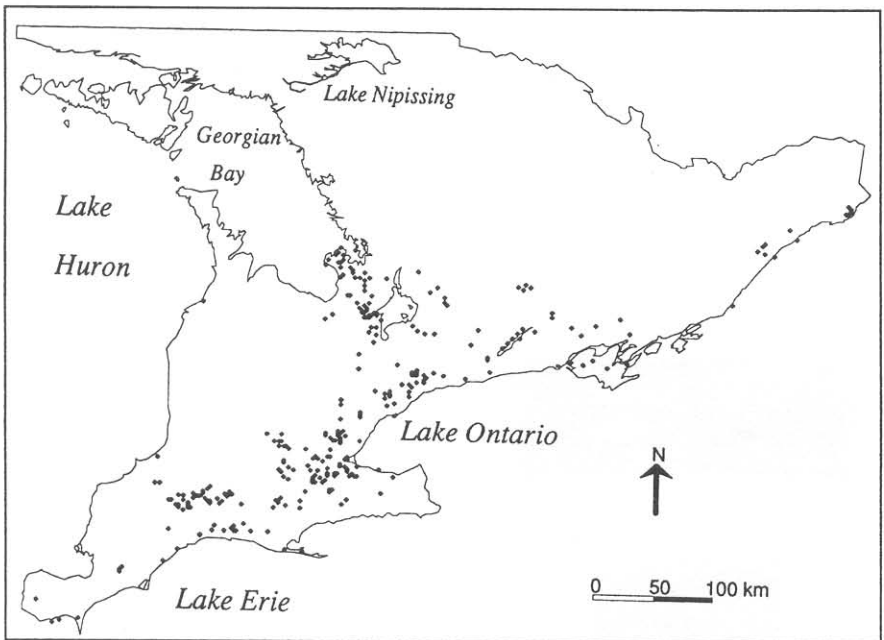


Figure 3. 333 prehistoric Iroquoian sites from A.D. 600 - 1550 (Campbell, 1991)

cooling is both sufficient and well-supported. The beech decline and pine rise found in pollen diagrams of the region are likely due to the Little Ice Age. Furthermore, despite the relatively high density of swidden horticulturalists, the Iroquoians do not seem to have seriously affected their environment.

This study leads to two conclusions of more than regional importance. Firstly, forest ecotones, like the mixed forest region of Southern Ontario, may respond both rapidly and strongly to relatively minor climatic changes. Secondly, low intensity swidden horticulture, such as that practised by the Iroquoians, is unlikely to have a significant regional impact on the forest, even over several hundred years.

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- Acknowledgements
- We would like to thank Conrad Heidenreich and Jock McAndrews. ■
- continued from page 40*
- marked "moved". The Society's Constitution Article XVI.3 requires every member to advise any change of address, and that notice sent to the last known address constitutes sufficient service. Please be advised that if this mailing is returned to the Society similarly marked "moved", your Life Membership will be suspended and mailings to you will cease.
- 1992 OAS ANNUAL REPORT
- Just a reminder that the Society's Annual Report for 1992 is available in the office and by mail postage paid to any member.
- VOLUNTEER SERVICE AWARDS
- The five members nominated by the Society for provincial Volunteer Service Awards in 1993 received their pins and certificates in a ceremony held in the Metro Convention Centre, Toronto, April 22nd. Congratulations go to Annie Gould and Jane Sacchetti (each ten-year pins), Greg Pural, Duncan Scherberger, and Geoffrey Sutherland (five-year pins).
- Returned Mail
- This month's missing members are below. Returned mail awaits them at the office. Somebody and respective Chapters must know these people and where they are. Please help us find them.
- CREWE, Nola, Toronto "moved"
- HUNTEN, Janet, London
- SINCLAIR, Mary Jane, Ottawa "address incomplete"
- WILLIS, Jay & Carolyn, Ottawa ■