

# Appendix F: Paleoecological Analysis of Late-Holocene Pollen Records from the HuuZii Bog, Diana Island, B.C.

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## Introduction

The interaction among climate, landscapes, and people is intrinsically woven through millennia. On the west coast of Canada, First Nations people have occupied the land since the ice retreated at the end of the Fraser glaciation. Abundant maritime resources and impressive timber such as western redcedar provided the resources necessary for a complex and thriving society. With this said, the west coast of Canada is a dynamic place where earthquakes have been common and relative sea levels have fluctuated as a result of retreating glaciers and tectonic activity. Understanding the interplay of people and the landscape is critical to both ecological and archaeological researchers as very few landscapes evolve without some level of human influence (Vale 2002).

Coastal British Columbia-based research integrating paleoecological analysis with archaeological investigation has been shown to be a useful method when interpreting the interplay between natural and human-induced environmental change (Hebda et al. 2005; Lacourse et al. 2007). The relationship between humans and the landscape has also been observed in paleoenvironmental studies that investigated climate change and fire history (Pellatt et al. 2001, 2007). This paper presents preliminary paleoecological results related to an archaeological investigation at the site of HuuZii, on Diana Island in the Deer Group Islands of Barkley Sound, on the west coast of Vancouver Island. The results of archaeological investigation reveal two periods of occupation: about 4800 to 2900 cal BP and 1500 to 400 cal BP based on radiocarbon dating of organic materials from site sediments. It was felt that an understanding of the paleoecology of the site would help elucidate the environmental conditions of the island during these periods of occupation. Pollen analysis on a radiocarbon-dated peat core was undertaken in order to achieve this goal. The results are reported below.

## Study Site

A Livingstone piston corer was used to recover pollen assemblages representative of local forest conditions from a small bog behind the archaeological site of HuuZii on Diana Island. This low swampy area was situated immediately inland from the raised terrace at the back of the site near its eastern end (see site map in the main body of this report). The raised terrace contained the early component archaeological materials from HuuZii, which significantly predate those recovered from the house row along the front of the site. Behind this raised terrace, the low area that contains the bog extends eastward to the rocky coastline of Diana Island, suggesting that at one time this was a salt water channel providing access to this portion of the HuuZii site. The core from the bog consists of peat for a length of 65 cm. At the base of the peat the corer encountered gravel, presumably from an early beach that existed when this area was an open marine channel.

HuuZii is situated in the temperate Coastal Western Hemlock biogeoclimatic zone (Mudry and Green 1976), which consists of temperate forest dominated by *Tsuga heterophylla* (western hemlock) and *Thuja plicata* (western redcedar). Average annual precipitation exceeds 300 cm per year, mostly in the form of rain (Mudry and Green 1976). Temperatures are moderated by the oceanic influence, with cool summers and mild winters (mean monthly temperatures range between 5 and 14°C; Mudry and Green 1976).

## Methods

### *Pollen Analysis*

One-millilitre subsamples from the HuuZii peat core were removed at selected intervals to be processed for pollen. Volumes were determined by displacement in water, using a 10 ml graduated cylinder, and a known concentration

of marker spores ( $10,679 \pm 191$  *Lycopodium* – Batch # 938934) was added to the subsamples before processing. The pollen extraction protocols followed those suggested in Berglund and Ralska-Jasiewiczowa (1986). Identification of pollen and spores was aided by published keys (McAndrews et al. 1973; Moore et al. 1991). Routine counting was carried out using a Leitz DMRBE binocular compound microscope at 400X magnification, and critical identifications were made under oil immersion at 1000X. A simplified pollen diagram was constructed using a basic pollen sum composed of terrestrial pollen (Fig. 1). Zonation is based on a dendrogram produced by the clustering routine CONISS in the TILIAGRAPH program.

AMS radiocarbon dating of peat at the base of the core provided a conventional age of  $3490 \pm 50$  BP ( $3530 \pm 50$  BP measured age; 3890 to 3640 cal BP [1940 to 1690 cal BC] at 2 sigma; Beta-242279). Linear interpolation of sediment age is based on the depth of the core and the basal  $3530 \pm 50$  BP radiocarbon date.

## Results

### *Pollen Zone I (3530 BP to 2430 BP; 65 to 45 cm)*

This pollen zone consists of two samples and is dominated by *Tsuga heterophylla*, *Picea*, and *Alnus rubra*. These pollen types are typical of a temperate western hemlock dominated ecosystem representative of the study site. Herbaceous species are lower in numbers than in the following zone.

### *Pollen Zone II (2430 to 1350 BP; 45 to 25 cm)*

This pollen zone experiences a decline then recovery of *Tsuga heterophylla* pollen and the beginning of a *Picea* decline. *Alnus rubra* begins to increase and shrubs and herbaceous pollen types appear (Cyperaceae, *Salix*, Rosaceae, *Rubus*, and *Sparganium/Typha*) or increase (Poaceae, Cyperaceae, and Rosaceae). There is also an increase in *Sphagnum* moss spores.

### *Pollen Zone III (1350 BP to Present; 25 to 0 cm)*

Pollen Zone III displays an increase in *Tsuga heterophylla* and decrease in *Picea*, an overall decrease in shrubs and herbaceous plants, an increase in Filicales and *Polypodium*, and a decrease in *Sphagnum*.

## Discussion

The vegetation history based on pollen analysis displays three zones over the past 3500 years (Fig. 1). The changes reflect a shift from a closed western hemlock dominated forest in Zone I to what appears to reflect increasing wetland/bog and herbaceous pollen types in Zone II, from 2430 BP to 1350 BP, likely reflecting local bog development in the low lying depression adjacent to the archaeological site. Zone III displays a decrease in wetland/bog pollen types (Cyperaceae, *Sphagnum*, *Salix*, and Rosaceae) and shows an increase in spores such as Filicales and *Polypodium*. Many of the herbaceous species and some shrubs also decreased during this zone, possibly due to increased human land use reducing local forest understory vegetation.

The peat core, with the AMS radiocarbon date of  $3530 \pm 50$  BP at the base, is underlain by gravel that presumably marks a former beach. Similar old beach gravels underlie the archaeological deposits. This would indicate that prior to ca. 3500 BP conditions were not favourable for bog development, presumably due to regular inundation by seawater. A marine channel likely existed at this time of higher relative sea level, providing direct canoe access to what is today the furthest inland portion of the archaeological site. As the relative sea level dropped and marine inundation of the area ceased to occur, the former channel experienced a transition to a bog/wetland environment.

McMillan and colleagues (see main report) analysed the archaeological deposits from the raised terrace at the back of the HuuZii site, adjacent to the bog cored for the pollen analysis. Six radiocarbon dates from excavated wood charcoal were analysed. The calibrated radiocarbon ages range from approximately 4800 BP at a location just above the sterile old beach gravels at the base of the archaeological deposit to 2900 BP near the surface. The dates correspond well with Zone I of the pollen diagram.

A later period of occupation is documented by archaeological excavation at the front of the site, within the outline of House 1, the largest house platform in a row of houses evident on the site surface. Nineteen radiocarbon dates were analysed from excavated wood charcoal. The calibrated radiocarbon ages range from 1500 to 400 cal BP, corresponding well to Zone III of the pollen record.

Huu7ii Bog  
Vancouver Island, British Columbia

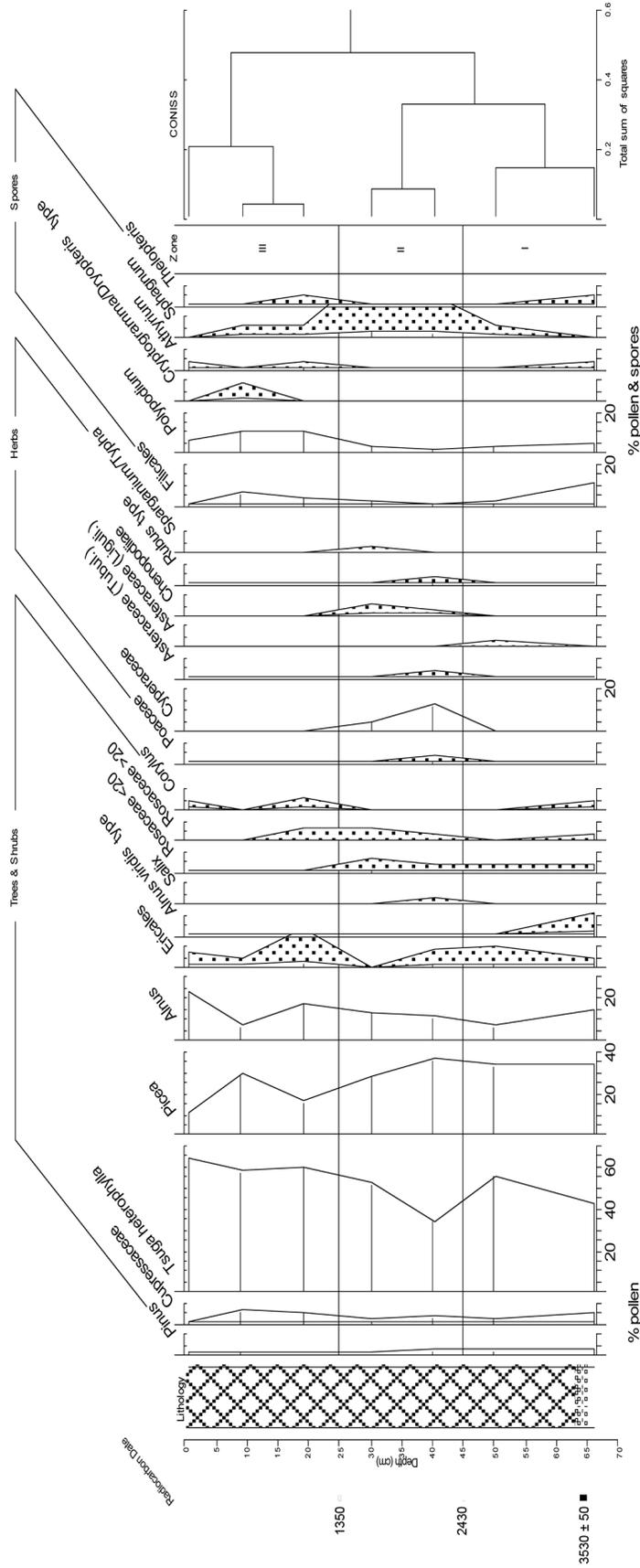


Figure 1. Percentage pollen diagram for the Huu7ii bog study site. Stipple represents 10X exaggeration curve. Zones are based on constrained cluster analysis.

## Conclusion

A close relation is observed between the pollen zones for the HuuZii bog site and the periods of occupation documented by archaeological research (McMillan, pers. comm.). Pollen analysis indicates that an increase in freshwater wetland and bog species developed in the channel as inundation, likely by seawater, ceased as relative sea levels dropped. The archaeological investigation did not reveal evidence of continuous occupation and it seems quite likely that there was a significant hiatus at the site between the two clusters of dates. Pollen Zone 1 corresponds to the earliest occupation at the back of the present day site, corresponding to a time of higher relative sea levels. Pollen Zone II may well have been a period when the site was not in use, as indicated by an increase in herbaceous plants and bog species. Pollen Zone III corresponds nicely with the main period of occupation, in which the houses evident today by the row of surface platforms along the front of the site were inhabited. The latter period would have involved fairly large-scale clearing of any trees on this part of the site. Increased alder and decreased western redcedar and spruce with increased Ericales (likely salal or red huckleberry), Filicales and *Polypodium* spores indicate tree removal and a more open environment. Further radiometric dating, plant macrofossil analysis, and confirmation of basal marine sediments should be undertaken to strengthen the inferences made from the pollen record at this site.

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