Environmental conditions round a Lateglacial lake facilitated Late Palaeolithic activity in the coversand area near Eindhoven, The Netherlands

hut van mie pils

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Figure 1 Photographs from the excavation pits, showing the lake-fill and coversand stratigraphy and cryoturbation structures which are present below the lake-fill.

Introduction and research approach

At a coversand ridge near Eindhoven in the southern Netherlands, Late Palaeolithic hunters and gatherers were locally repeatedly or continuously present as evidenced by numerous archaeological artefacts at and above the so-called *Usselo* soil horizon (Allerød-Younger Dryas; fig 1). A depression filled with organic sediments adjacent to the sand-ridge testifies to the presence of prehistorical hunting and fishing camps along the downwind shores of a former lake. This study aims to investigate human activity in relation to environmental change by means of reconstructing local landscape and vegetation developments over the Weichselian to Holocene transition.

The local lithostratigraphy, lake-fill distribution and palynological (pollen) record was studied by means of:

- ca. 200 borings
- 2 excavation pit studies
- 5 cross-sections across the lake
- 1 detailed lake-shore cross-section
- 4 cores: pollen, lithology and LOI

Awaiting ^{14}C dating results, local chronology has been inferred from biostratigraphic correlation with the well-dated Lateglacial pollen zonation scheme of the Netherlands (Hoek 1997).

Lateglacial lake-fill stratigraphy

The lake-fill stratigraphy starts with lightbrown very fine detrital loamy gyttja at the base, directly on top of the coversand substrate. The lower part of this facies has a laminated character due to the intercalation of clastic layers (fig 5). At the upper end, a sharp interface exists with a darkbrown peat layer (LOI 40-50%). On top of that lies a darkbrown loamy gyttja layer with a higher organic content than the lower gyttja unit (~12% vs ~5%). The stratigraphy ends with a sandy peat layer (blackish; fig 1,2). In this region, lithological changes can be explained in terms of changing intensities in local reworking of sediments (mainly wind- and surface-runoff-driven) and organic productivity.

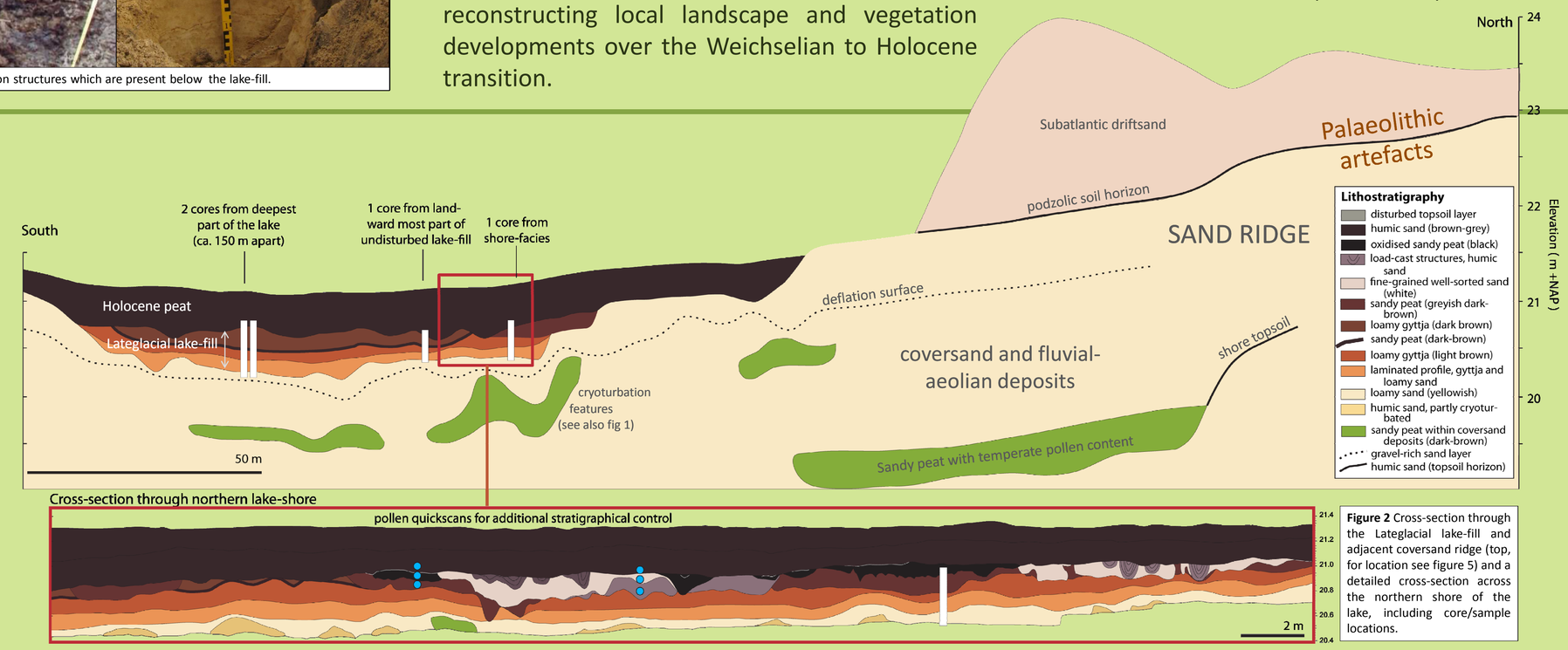


Figure 2 Cross-section through the Lateglacial lake-fill and adjacent coversand ridge (top, for location see figure 5) and a detailed cross-section across the northern shore of the lake, including core/sample locations.

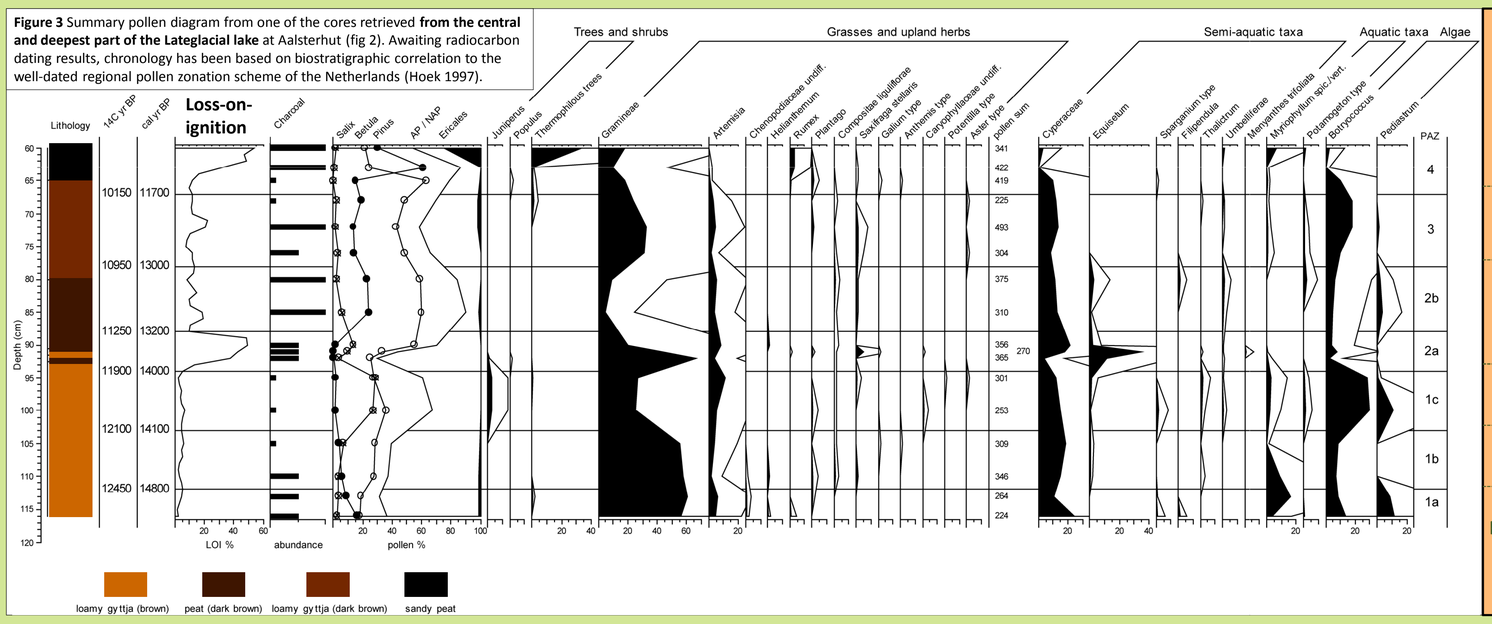
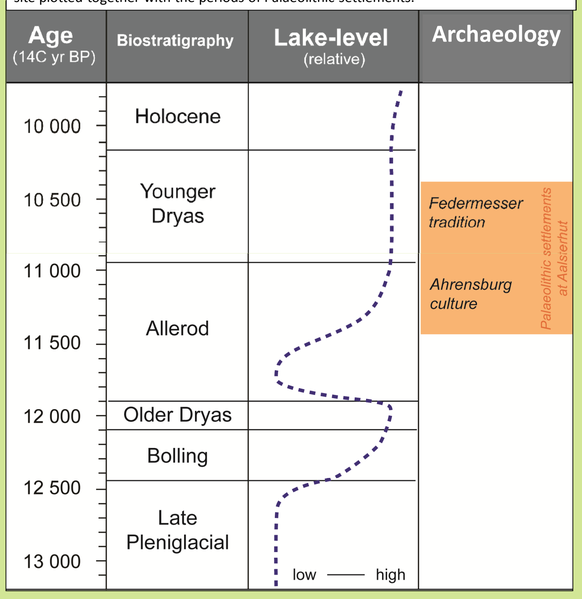


Figure 3 Summary pollen diagram from one of the cores retrieved **from the central and deepest part of the Lateglacial lake** at Aalsterhut (fig 2). Awaiting radiocarbon dating results, chronology has been based on biostratigraphic correlation to the well-dated regional pollen zonation scheme of the Netherlands (Hoek 1997).

Vegetation development based on four records, including the one shown here

	Upland	Local
Holocene	establishment of a dense mixed forest, including thermophilous tree species	onset of *Sphagnum* peat formation
Younger Dryas	opening of the mixed birch-pine forest, favouring herbs, grasses and crowberry	a relative low number of taxa along the shores as well as within the lake
Allerød	expansion of birch tree and lateron pine, resulting in an open forest structure with a continues dominance of birch	massive expansion of a horsetail-cypergrass communities at the expense of aquatic species, followed by the opposite trend
Older Dryas	open landscape, expansion of willow	well-developed wet-meadow vegetation fringing the lake supporting a rich aquatic flora
Bølling	open landscape with abundant heliophilous herbs and some birch trees, willow and juniper	onset of organic accumulation; pioneer vegetation with a dominance of (cyper-)grasses
Late Pleniglacial	scarce vegetation cover	scarce vegetation cover

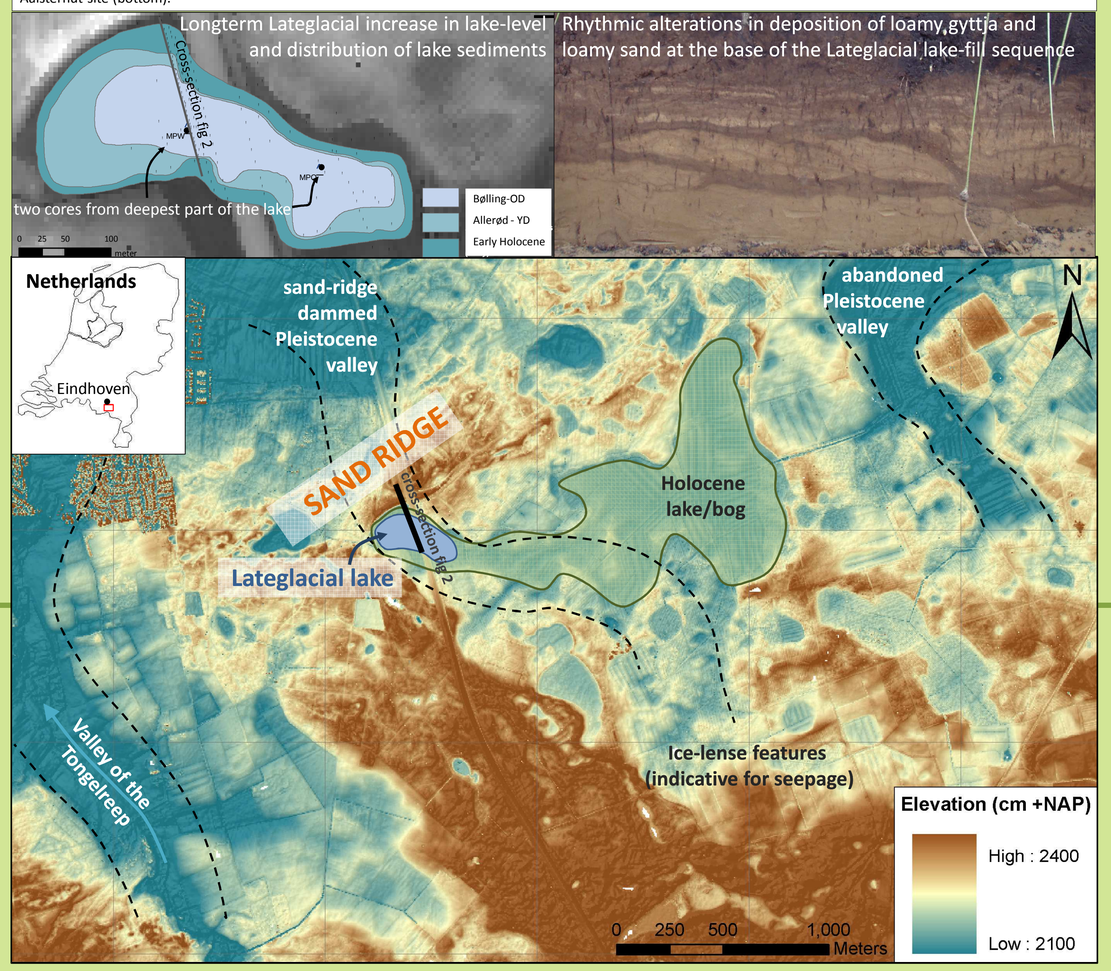
Figure 4: Reconstructed lake-level history over the Lateglacial period for the Aalsterhut site plotted together with the periods of Palaeolithic settlements.



Landscape development

The combined picture shows that a shallow lake was initially formed during the Bølling interstadial at times of first postglacial climatic warming and vegetation recovering (loamy gyttja). During the early stage of the Allerød, relative lake-level lowering caused Palaeolithic settlements to be located northeast of a swamp or very shallow lake (peat formation). Under influence of a rising groundwater table a lake setting became re-established in the course of the Allerød and continued to exist during the entire Younger Dryas. Enhanced clastic input recorded in the loamy gyttja unit evidence stadial climatic conditions and a more open landscape during the Younger Dryas, however, does not indicate large-scale aeolian coversand reworking. Cryoturbation features indicate deep-seasonal frost to have occured during Younger Dryas times.

Figure 5 Map showing the lateral distribution of different lithostratigraphic units, providing a reconstruction of changes in lake dimensions in time (top left). Photograph showing alterations in deposition of loamy gyttja and loamy sand during the phase of initial lake formation (top right). Digital Elevation Model image of the area around the Aalsterhut site (bottom).



Conclusions

- Initial lake formation around onset Bølling
- Longterm increase in groundwater/lake level over the Lateglacial period
- Temporal (relative) early Allerød lake-level drop
- Relative stable Younger Dryas vegetation cover and landscape, inhibiting large-scale sediment reworking
- Birch dominant over pine during whole Lateglacial
- Lake-level reconstruction likely shows local phenomena (e.g. permafrost melt) rather than a climate signal as concluded from inconsistency with other lake-level reconstructions from the Netherlands
- High lake levels attracted Late-Palaeolithic cultures to settle on the dry sand ridge