



**HAL**  
open science

## Regional and local vegetation reconstructions-applications for revealing biodiversity dynamics

D Fredh, Florence Mazier, L Zillén, M. Rundgren, P. Lageras, A Broström

► **To cite this version:**

D Fredh, Florence Mazier, L Zillén, M. Rundgren, P. Lageras, et al.. Regional and local vegetation reconstructions-applications for revealing biodiversity dynamics. 2nd Nordic Network of palaeoclimatology conference, Sep 2008, Hoor, Sweden. hal-02007868

**HAL Id: hal-02007868**

**<https://hal.science/hal-02007868>**

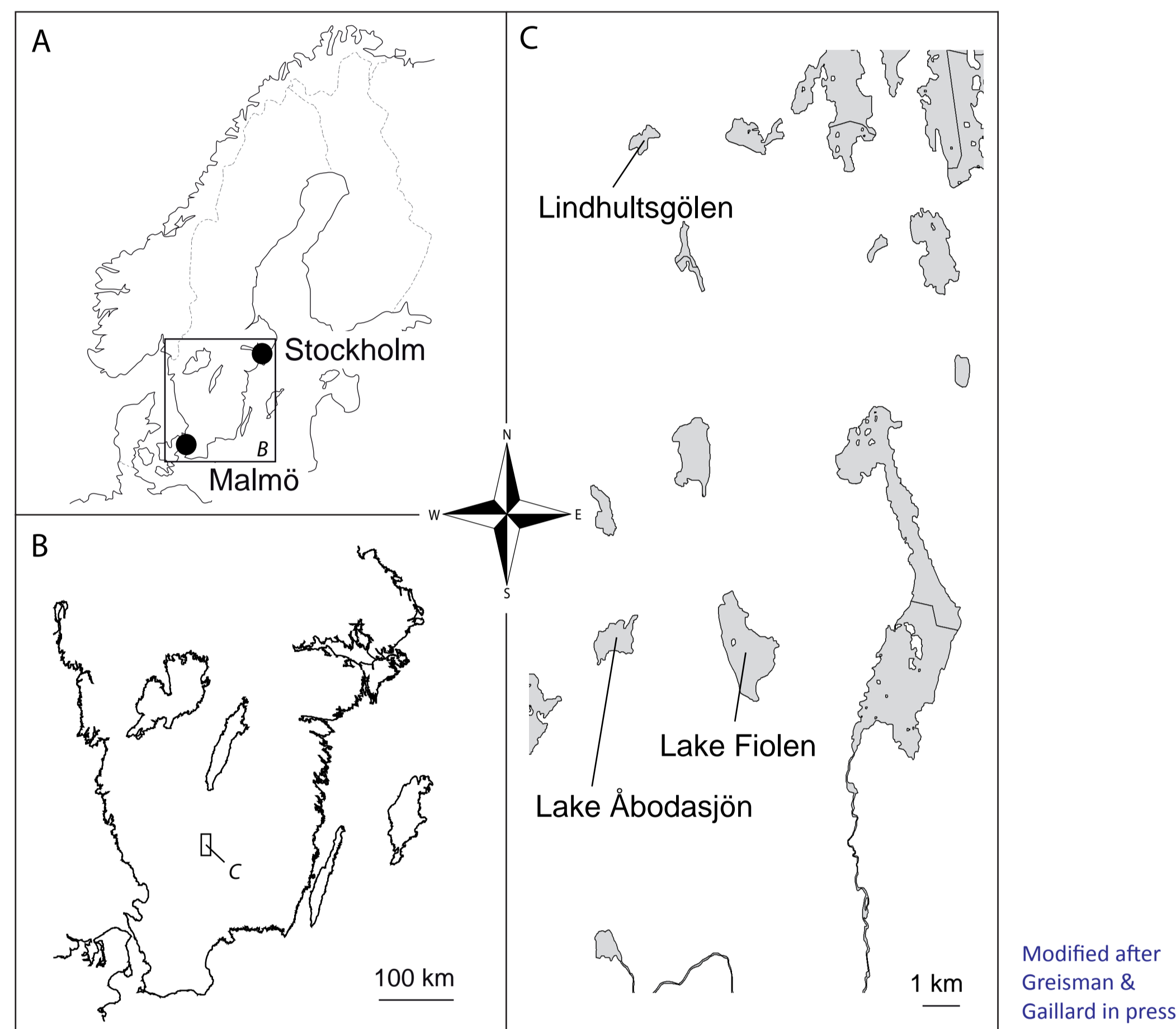
Submitted on 5 Feb 2019

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

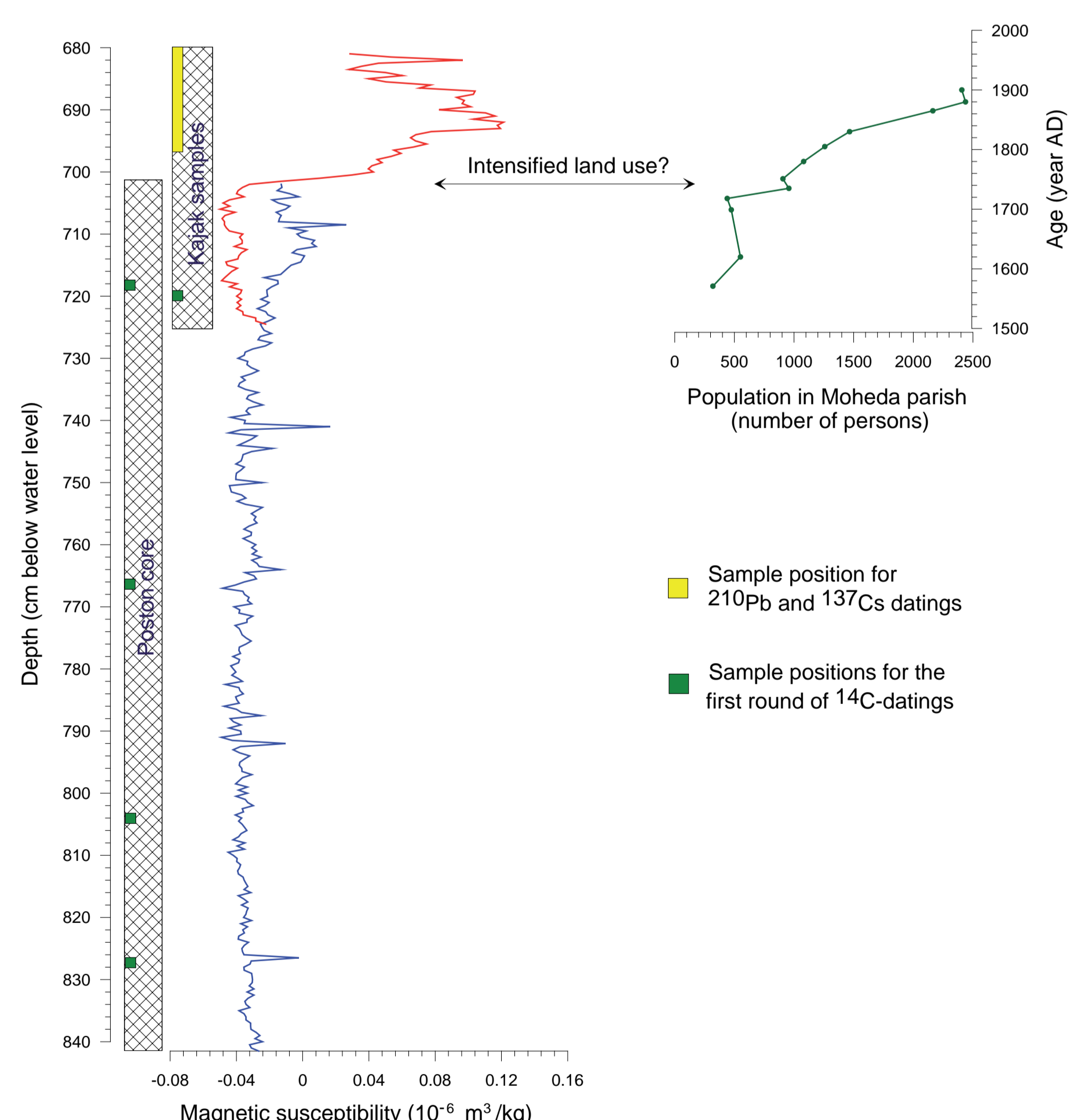
## Introduction

How has land use and land cover changed on different temporal and spatial scales, and how have these changes influenced biodiversity during the last 3000 years? Our working hypothesis is that biodiversity is favoured by variations in intensity and frequency of human activities such as clearing of forests, increased grazing and abandonment caused by population reduction due to e.g. epidemics or wars. To test the hypothesis, it is crucial to obtain records of vegetation changes with detailed time resolution and, moreover, to be able to set the spatial scale.



Our study area is located in Småland in southern Sweden, and high resolution pollen analyses of sediment cores from large and small lakes are used for quantitative reconstruction of past land cover. Here we present our project and the primary methods that will be used. We also present some preliminary results and the following steps in the project.

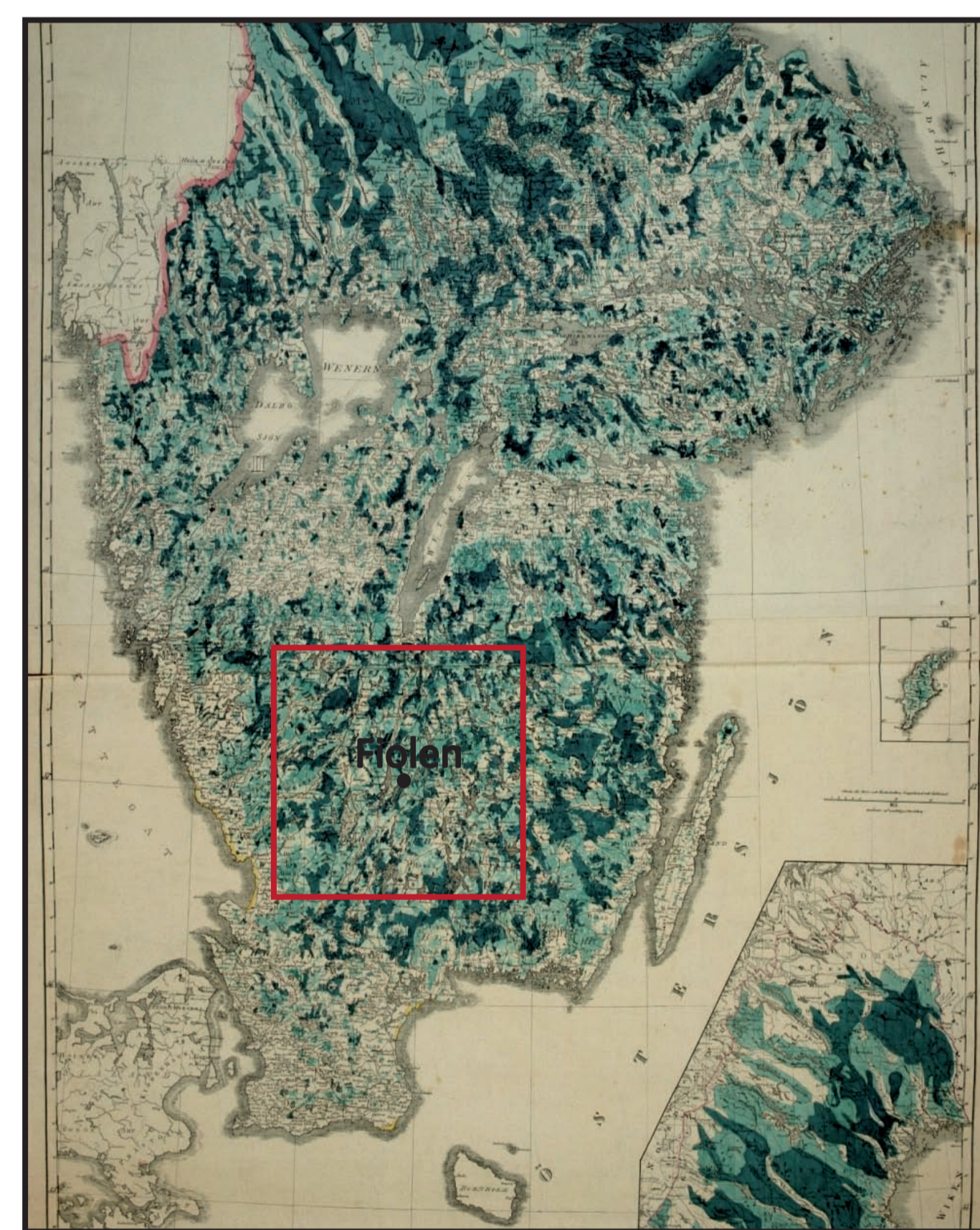
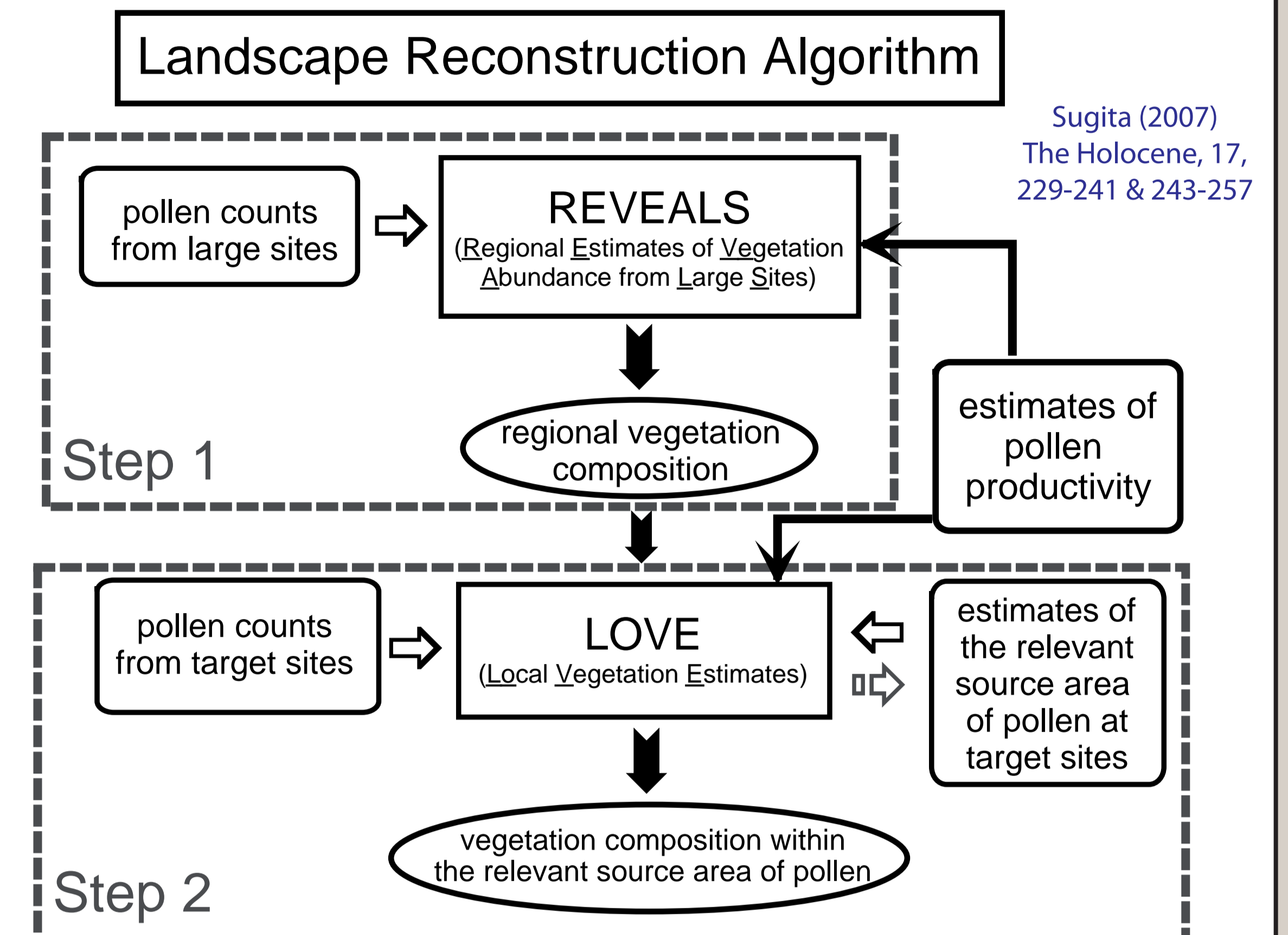
## Preliminary results



Magnetic susceptibility measurements from Lake Fiolen indicate increased erosion due to intensified land use, suggested by higher magnetic mineral content in the upper part of the sediment sequence. An intensified land use could possibly correspond to a population increase during the latest centuries in the parish where Lake Fiolen is situated, tentatively matched until good chronology is obtained. However, the increase in magnetic susceptibility could also be explained by bacterial magnetism. The mineral magnetic variations are used for correlation between the sediment cores and, together with radioisotope dating ( $^{210}\text{Pb}$ ,  $^{137}\text{Cs}$  and  $^{14}\text{C}$ ) will enable construction of a detailed chronology.

## Regional and local vegetation reconstructions

The Landscape Reconstruction Algorithm (LRA) will be used to set the spatial scale. LRA includes two separate models, REVEALS and LOVE, to estimate vegetation abundance from fossil pollen data at regional ( $10^4$ - $10^5$  km<sup>2</sup>) and local (2-20 km<sup>2</sup>) scale, respectively. It relies on the demonstration that pollen loadings from large sites (>100 ha) do not vary significantly between sites within a region and consequently represent regional vegetation. On the other hand, differences in pollen loading among small sites (<10-100 ha) represent differences in plant abundance within a given distance from the site shore at individual sites.



For different time-windows, regional vegetation composition for Småland area will be derived by the REVEALS model using pollen counts from Fiolen and available relative pollen productivity (Broström et al. 2004 and Nielsen 2004) as inputs. The high resolution data will enable a decadal comparison with known historical events, such as epidemics, wars and agricultural development. The pollen source area corresponds to approximately 100 km<sup>2</sup> around Lake Fiolen and is shown in the figure to the left. Regional historical maps, such as Prince Carl's forest map from 1845, can be used to test the modelling results.

Prince Carl's forest map 1845



Land division map 1858

The LOVE model will use estimates of regional vegetation composition, estimates of relative pollen productivity, and pollen counts from smaller-sized sites (i.e. Åbodasjön and Lindhultsgöl, see poster by Petra Bragée et al.) to quantify the vegetation proportions of constituent taxa within the relevant source area. Historical records, such as land division maps from the 18<sup>th</sup> and 19<sup>th</sup> century that indicate the land use at specific years, as well as archaeological data (e.g. changes in ancient cultures and remains), will be compared to the LRA output. The changes in palynological richness will be related to the land use change to reveal some biodiversity dynamics.

## Next steps

- Construct a detailed chronology from radioisotope datings ( $^{210}\text{Pb}$ ,  $^{137}\text{Cs}$ ,  $^{14}\text{C}$ ) and mineral magnetic measurements.
- Perform high resolution pollen analysis from large and small lakes from Småland, southern Sweden, with focus on the latest 3000 years.
- Quantitative reconstruct regional and local vegetation using Landscape reconstruction algorithm.
- Compare the LRA output to historical and archaeological data.
- Relate the palynological richness to land use to reveal biodiversity dynamics.

## References

- Broström, A., Sugita, S. & Gaillard, M.J., 2004: Pollen productivity estimates for the reconstruction of past vegetation cover in the cultural landscape of southern Sweden. *Holocene* 14, 3, 368-381.
- Nielsen, A.B., 2004: Modelling pollen sedimentation in Danish lakes at c. AD 1800: an attempt to validate the POLLSCAPE model. *JOURNAL OF BIOGEOGRAPHY* 31, 10, 1693-1709.
- Sugita, S., 2007a: Theory of quantitative reconstruction of vegetation I: pollen from large sites REVEALS regional vegetation composition. *Holocene* 17, 2, 229-241.
- Sugita, S., 2007b: Theory of quantitative reconstruction of vegetation I: all you need is LOVE. *Holocene* 17, 2, 243-257.

Contact  
Daniel Fredh  
Department of Geology  
Lund University  
Sölvegatan 12, 223 62 Lund, Sweden  
E-mail: daniel.fredh@geol.lu.se

