Palaeofire record of Lincolnshire in the late Holocene

INTRODUCTION:

- Wildfires are an increasing concern with anthropogenic climate change and are predicted to increase in the future with negative impacts on the environment, climate and humans.
- Equally the North Atlantic Oscillation (NAO) is an important hydroclimatic driver in Lincolnshire and will be important for landscape management.
- However, predicting and understanding impacts of future fires is difficult from an observation perspective. Therefore, understanding long-term fire trends and their impacts can help us predict future fires and manage environments that have been or may experience fire.
- To analyse long term fire trends we can use macroscopic charcoal preserved in natural archives (Last et al., 2002). Macroscopic charcoal analysis from natural archives is widely used for reconstructing past biomass burning on ecosystems (Courtney et al., 2014).

AIM:

- With little to no records of palaeofire of Lincoln in the late Holocene, the aim of this project is the address the gap in palaeoclimate work, particularly fire histories, within the East Midlands.
- This project will address the following: 1. whether macroscopic charcoal presence aligns with historic climate events and 2. if we see similar patterns in charcoal with NAO.

SITE:

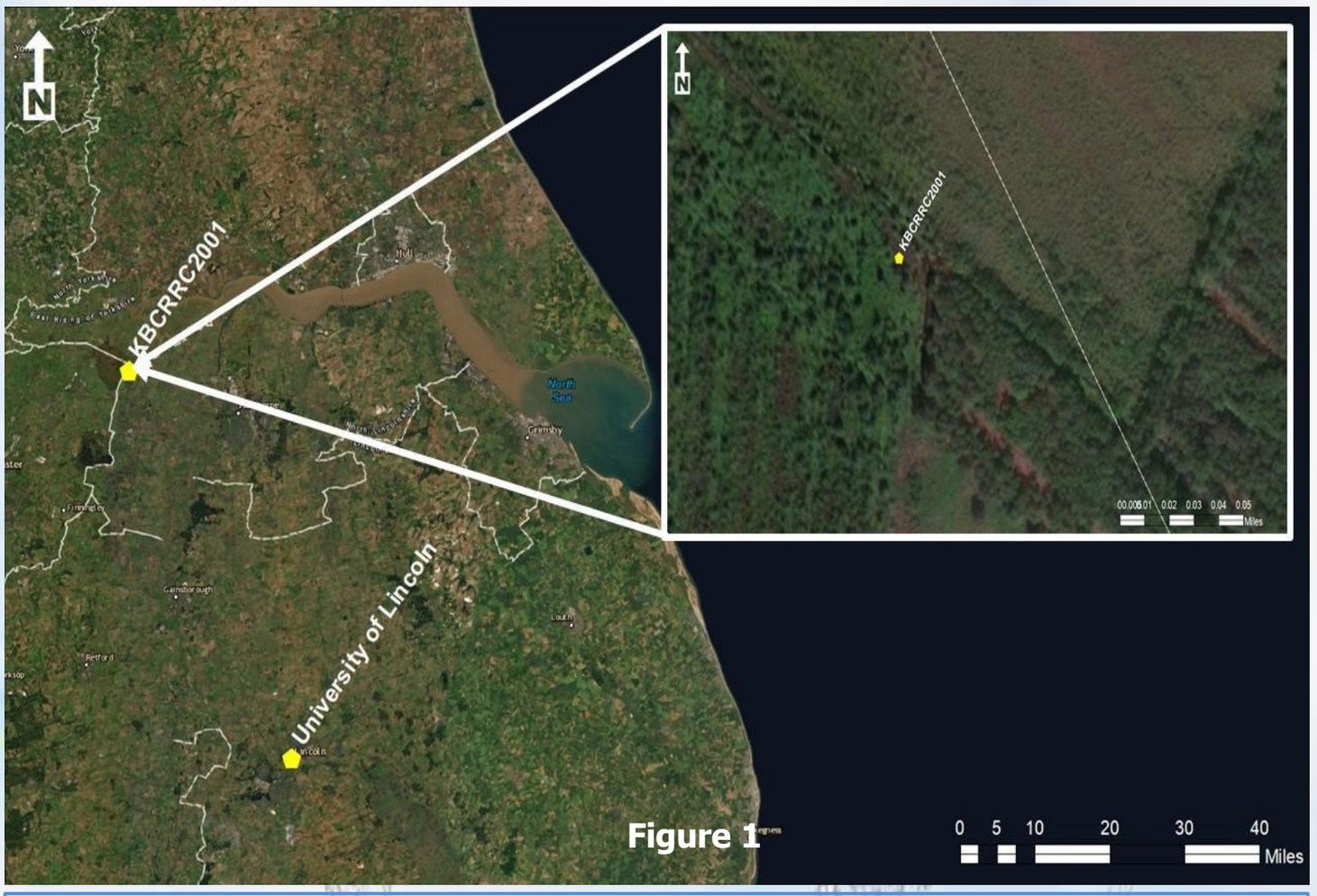

Figure 1

- Figure 1 is a site map of Crowles Moor in comparison to the University of Lincoln.
- The UK is heavily influenced by the NAO. The NAO has a substantial effect on the European climate by controlling the position of the storm tract over the North Atlantic, subsequently controlling changes in precipitation levels and temperature (Wade et al., 2015).
- A negative NAO period indicates a wet and mild winter over the southern and eastern parts of Europe and dry winters over the northern parts of Europe.

METHODS:

- Charcoal preserves in natural archives can be used to determine historic fire events. These preserves, small vs. large fractions of charcoal, can inform us about local vs. regional fires.
- A core (344cm) was extracted from Crowle Moor (53.6302788,-0.8624871) (Figure 1) and later subsampled and processed. Figure 2 demonstrates the charcoal processing methodology. The chronology here was developed from another core at Crowle and inferred based on the trends in the charcoal peaks.

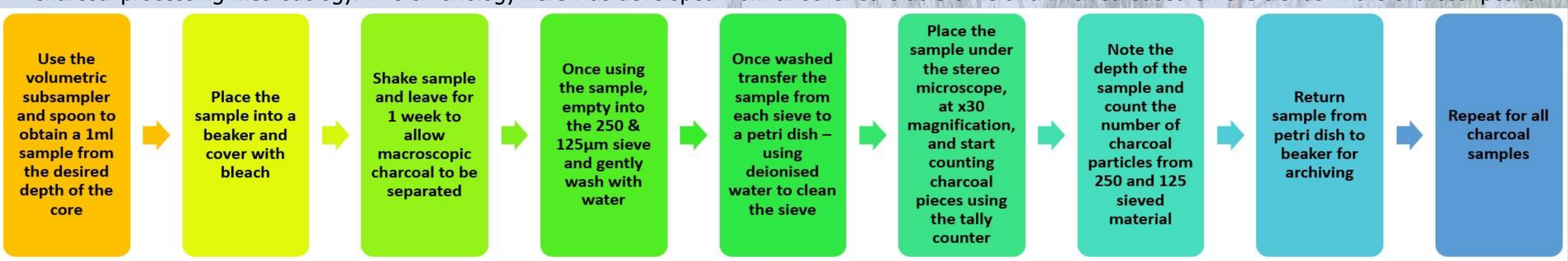

Figure 2: Demonstration of the process of sub-sampling, processing and counting charcoal

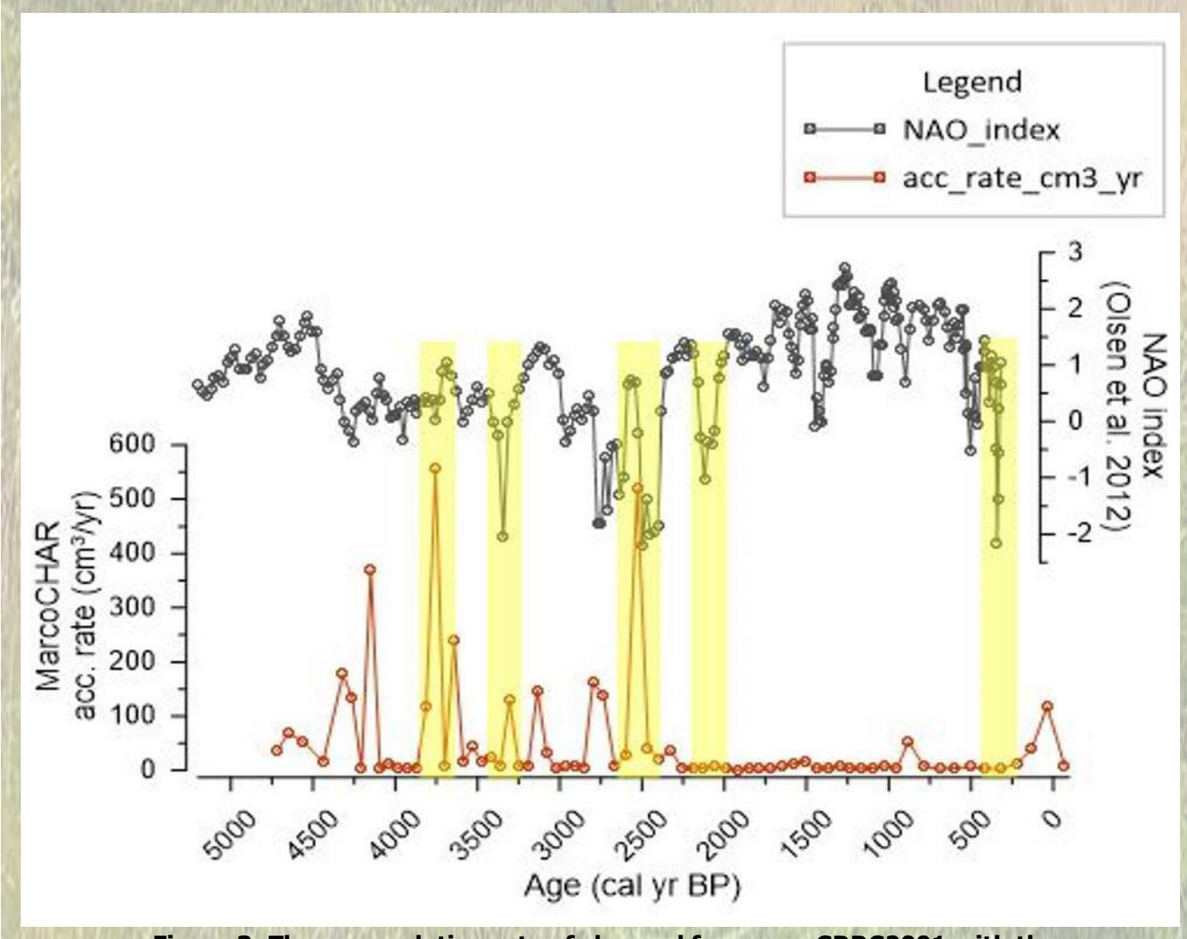

Figure 3: The accumulation rate of charcoal from core CRRC2001 with the corresponding age (cal yr BP). Addition of NAO data to compliment charcoal findings. The yellow boxes highlight interesting peaks of either NAO below 0 or high charcoal accumulation and the potential relationship.

DISCUSSION & CONCLUSION:

- From figure 3, more charcoal peaks can be seen from 2500 yr BP with two main peaks around 2600 & 3800 yr BP. Figure 3 also indicates a small peak around 4200 yr BP, aligning to the 4.2 ka event.
- The charcoal patterns appear to reflect a negative NAO period as the data suggests that the charcoal peaks are associated with a negative NAO period, subsequently causing dryer periods in Lincolnshire.
- This record saw more positive NAO periods meaning less dryer periods in Eastern England, indicated by the NAO index from figure 3. There are four particular occasions where NAO data peaks below 0 (3500 – 250 yr BP). 50% of those occasions saw high correspondence with charcoal peaks. However, during this time, 2250 yr BP to today, NAO data appeared to indicate wetter conditions.
- To conclude, the charcoal at Crowle Moor follows closely with negative NAO patterns likely driven by past dry conditions.

References:

1.Courtney Mustaphi, C. and Pisaric, M. (2014). A classification for macroscopic charcoal morphologies found in Holocene lacustrine sediments. Progress in Physical Geography, p.1.
2.Last, W., Smol, J. and Birks, H. (2002). Tracking environmental change using lake sediments. 3rd ed. Dordrecht: Kluwer Academic, p.75.
3.Wade et al. (2015). Developing H++ climate change scenarios for heatwaves, droughts, floods, windstorms and cold snaps, p.98

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