INTERPRETATION OF THE DEGLACIAL SEDIMENT SEQUENCE OF EDGER BOG, SOUTHWEST OHIO

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INTRODUCTION

The Laurentide Ice Sheet extended into Ohio approximately 25,000 yr B.P., achieving maximum extent near Cincinnati about 19,000 yr B.P. (Lowell, 1995) As the climate warmed and the ice margin retreated a variety of geomorphic features including moraines, kames, and kettles were deposited. Edger Bog is one such feature. This closed basin has accumulated sediment since the ice sheet retreated from southwest Ohio.

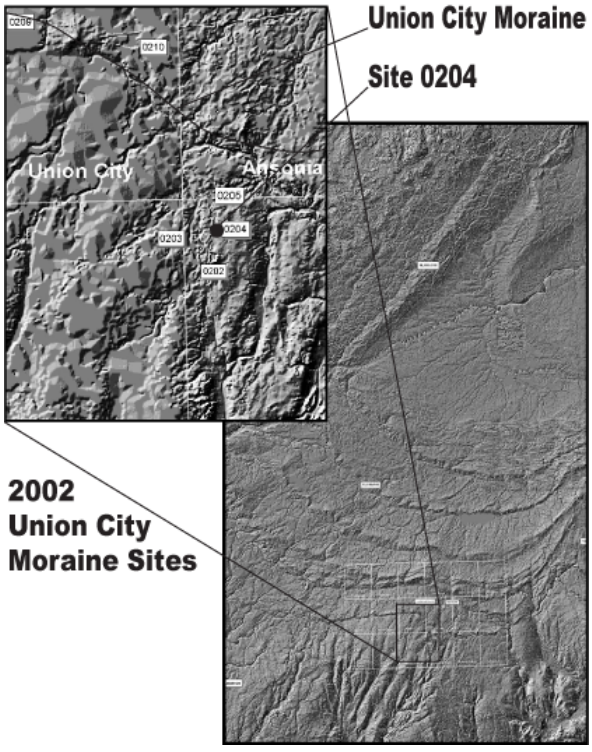

Figure 1: Site Map for Union City Moraine Cores.

The goal of this study is to breakdown the sediment sequence of Core 0204 from Edger Bog using multiple analytical techniques including grainsize, magnetic susceptibility, loss-on-ignition and observed physical stratigraphy to develop an understanding of the environmental history of the Edger Bog. The research team cored nine bogs included sites both on the proximal (northern) and distal (southern) sides of the Union City Moraine. The Union City Moraine was deposited by the Miami Sublobe of the Eire Lobe of the Laurentide Ice Sheet (Figure 1). The interpretation of this bog boosts the understanding of the late-glacial history of the Laurentide Ice sheet. Cores 0202 and 0203 in this document display basal ^{14}C dates of 15,869±91 yr B.P. (Lab# AA53419), and 16,400±170 yr B.P.(Lab# AA53425) respectively. Although there are no basal ^{14}C dates for Edger Bog, it is probable that the till-silt transition at the base of Edger bog would reflect a similar age.

METHODS

Field Methods

Coring was performed with a 2-inch diameter modified Livingston manual piston corer. Sites were cored until refusal at a till base. Site 0204, at Edger Bog, was chosen due to its proximity to the southern, distal side of the Union City Moraine. At Edger Bog, 2 overlapping thrusts were taken in close proximity to one another in order to extract a full, undisturbed stratigraphy for the basin. Core A was augured down to 200cm while

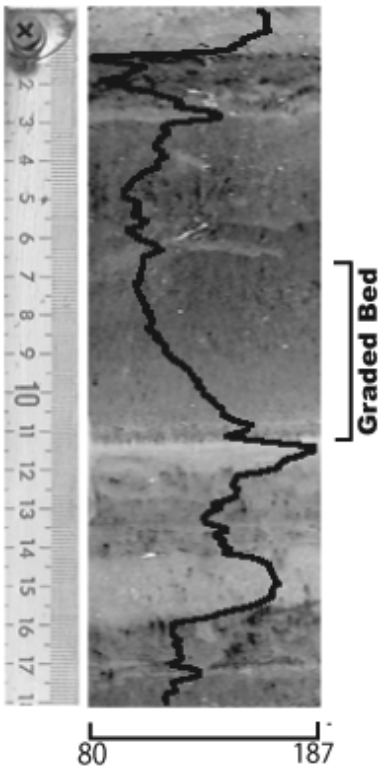

Figure 2: Optical density curve over core photo. This section displays a graded bed as well as laminar stratification.

core B was augured down to 250cm. Approximately 4.5 meters of sediment were extracted. Each meter deep thrust observed, photographed, wrapped in plastic wrap and stored in PVC pipe for preservation and transportation.

Laboratory Methods

Each Core was split and a detailed observation taken as quickly as possible after extraction to minimize the effects of oxidation. After each core was observed, a series of pictures were taken of each core. These pictures were digitally compiled in a composite image using Adobe Photoshop and the composite photos for each thrust were assembled into a photographic version of each core. Using sedimentary features, these composites were vital in correlating the A and B cores for Edger Bog.

Magnetic Susceptibility was recorded using a Barington Magnetic Susceptibility Meter at 4 cm intervals. Three readings at each depth were taken and averaged.

Loss-on-ignition (LOI) samples were taken every 4 cm. Samples were first dried at 100˚C and then weighed. They were then processed in a 550˚C oven to burn off all organic material, weighed again, processed in a 1000˚C to burn off any carbonate material and a final weight measurement was taken.

To measure grainsize, 1 cm_ samples were taken at 4 cm intervals. Each sample was desiccated, crushed with a mortar and pestle until disaggregated. The powder was poured in 500mL of deionized water and suspended. 1mL was removed and diluted in 100mL of deionized water. This beaker was cleaned and placed in a PC-2000 Spectrex Laser Particle Counter. The samples were diluted to such a degree to ensure the laser was not striking multiple grains simultaneously.

Optical Density

The optical density was measured by averaging the color density (a grayscale continuum varying from 0 (black) to 255 (white) in pixel wide columns across the core image. Each column average is plotted as one point on the density plot. An example of an optical density curve is Figure 2. This process aided in interpreting the stratigraphy, adding a quantitative aspect to qualitative observation.

RESULTS

Magnetic minerals are generally denser than non-magnetic minerals. Accordingly, they tend to drop out of the stream load as the competence of the stream decreases distally from the source. This fits the magnetic susceptibility data in Edger Bog, which displays generally higher magnetic susceptibility readings from the base of the core to a depth of 400cm, when the Laurentide Ice Sheet was nearest Edger Bog.

Zone 1

From the base of the core to a depth of 500cm the sediment is characterized by generally larger grainsize, with higher amplitude fluctuation and consistently high carbonate content and graded beds varying from 1cm-9cm in thickness. This indicates the clastic

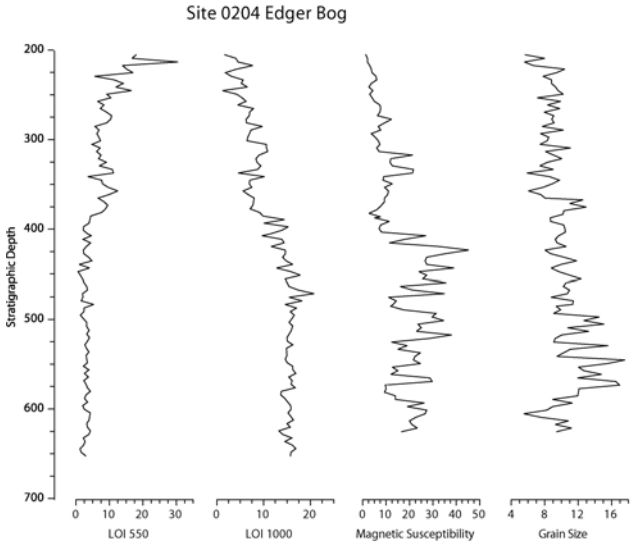

Figure 3: LOI Organics, LOI Carbonates, Magnetic Susceptibiltiy and Grainsize with respect to depth.

dominated, event based environment of a proglacial lake.

Zone 2

Above 500cm depth there is a transition to light and dark laminated stratigraphy with intermittent regions of mottling. Mottling occurs in regions varying from 5cm-10cm thick from a depth of 445cm-385cm. Mottling is a product of burrowing fauna. The mottles are differentiated from their surroundings only by oxidation state, as indicated by their quick oxidizing and assimilation to the same color as the surrounding sediments upon being exposed to air. Mottles indicate a shift to a more stable environment with lower deposition rates that was able to support a biologic community.

Table 1: Stratigraphic Zones of Edger Bog

Zone 1	Base- 500cm	Graded beds; event based deposition.
Zone 2	500cm-345cm	Laminated beds, intermittent mottling.
Zone 3	345cm-315cm	Massive with subtle laminations; higher MS readings
Zone 4	315cm-200cm	Laminated light-dark beds, transition to peat

Zone 3

From a depth of about 345cm to 315cm there is a jump in magnetic susceptibility readings. This correlates to a massive light gray section with faint, wavy laminae. This section of core represents a sequence of rapid clastic deposition. The lack of organic black layers and higher magnetic susceptibility readings indicates little to no incipient soil growth during this period. This is perhaps an indicator of a cold climate shift as discussed by Levesque et al. (1994) and Shane and Anderson (1993) correlated to the Younger Dryas interval, 12,000-10,000 ^{14}C yr B.P. ^{14}C dates will constrain this correlation.

Zone 4

Above 315cm depth the core displays hundreds of fine laminar beds varying in thickness from 1mm to 10mm. These beds show dramatic black oxidized layers and indicate a return of organic material being introduced to the bog. The organic content increases gradationally to the top of the core as seen in Figure 3. Two meters of organic rich peat were removed. This section not recorded in the data is indicative a shift to the present temperate and climate of the North American mid-continent. The stratigraphy of Edger Bog is outlined in Table 1.

CONCLUSIONS

Data collected from Edger bog supports a de-glacial sequence and climate reversal corresponding to the European Younger-Dryas interpreted from previous research (Yu et al. 2001 and Shane et al., 1993), although an absolute chronology can not yet be determined due to lack of ^{14}C dates.

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