**Supplementary Material**

14C dating of paired samples at 374 and 446 cm

Two bulk sediment samples of approximately 10 g each were taken at 374 and 446 cm and submitted to Beta Analytic Inc., in Miami, Florida, for AMS 14C dating. Both samples were derived from within the peat section where the organic matter content of the sediment was 60-70%. The samples were first dispersed in deionized water and then progressively sieved from 250 μm to 180 μm and then to 125 μm. The sieved sediment in the 125-180 μm size fraction was labeled as the fine organic (FO) fraction, and the >180 μm fraction was labeled as the coarse organic (CO) fraction.

Figures S1A and S1B are photos of the FO and CO fractions sieved from the 374 cm sample, and Figures S2A and S2B are the FO and CO fractions sieved from the 446 cm sample, respectively. It is clear that the CO fraction in both samples contained predominantly elongated plant fibers that resembled rootlets or root hairs, which must have intruded downward from plants growing on the overlying land surface during a later time.

The FO fraction was then acid leached with 0.5 to 1.0N HCl (hydrochloric acid) solution at near boiling temperatures (70-90oC) for 4 hr to remove carbonates, and then dried for 8-12 hr in a 70oC oven. The dried sample was then homogenized and inspected under a 45× binocular microscope before being analyzed for 14C activity.

Other than the acid treatment described above, the >180 μm CO fraction was additionally treated with an alkali solution of between 0.5% to 2.0% at near boiling temperature for 2-4 hr to remove humic acids, leaving only decayed plant remains behind. Obvious larger roots were removed before and after the sample were dried down, but it was impossible to remove all finer intrusive materials such as rootlets or root hairs before the 14C measurement.