A compact history of peat in the Cumberland Marshes river delta

S. van Asselen and E. Stouthamer*

BACKGROUND

- Peat is most compressible of all natural soils.
- Many Holocene deltas comprise thick peat layers.
- Compaction of peat leads to substantial amounts of subsidence.
- Subsidence leads to:
  - relative sea level rise (land inundation, coastal wetland loss)
  - damage to construction works
  - creation of accommodation space for fluvial deposition

QUESTIONS

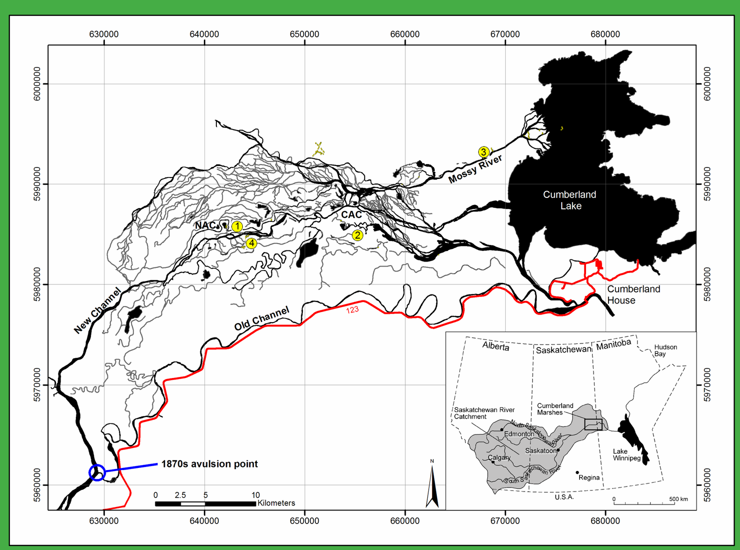
- What are the amount and rate of peat compaction that occurred in our study area over short timescales?
- Which factors influence peat compaction?
- How does peat compaction affect fluvial deposition patterns?

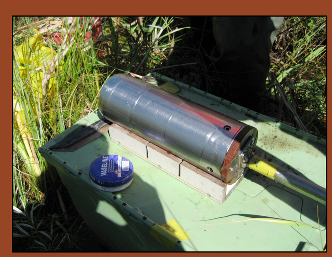
- …and ultimately: How does peat formation and compaction influence avulsion, and hence delta evolution?

FIELDWORK – METHOD & RESULTS

STUDY AREA

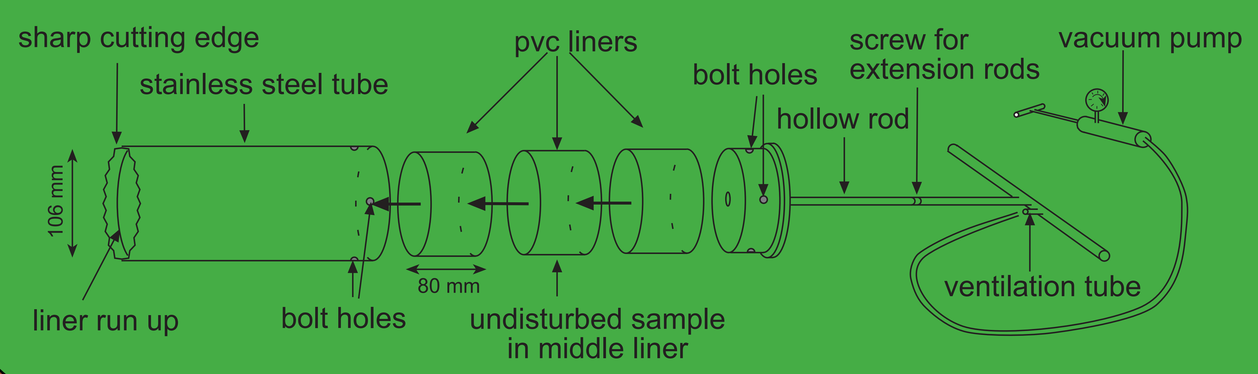
The Cumberland Marshes (Canada). A former peatland is invaded by rivers following an avulsion in the 1870s.





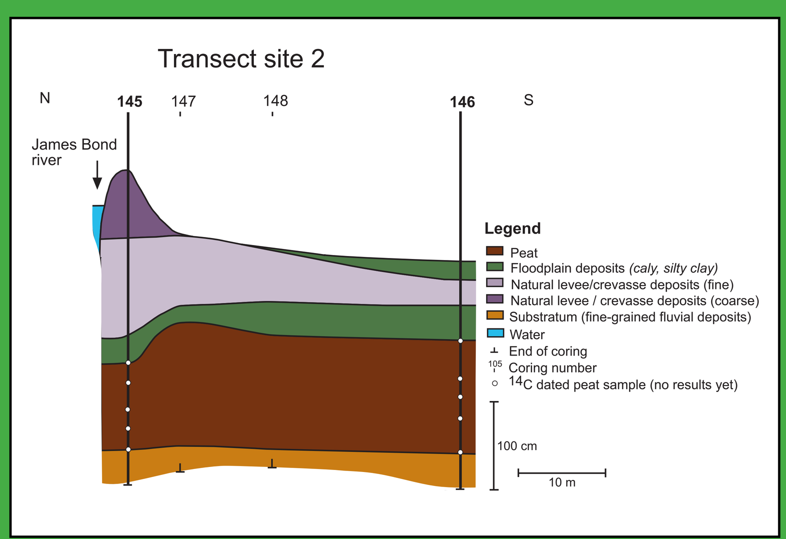
NEW PEAT CORING DEVICE

A device was developed that allows un-disturbed sampling of uncompacted peat.



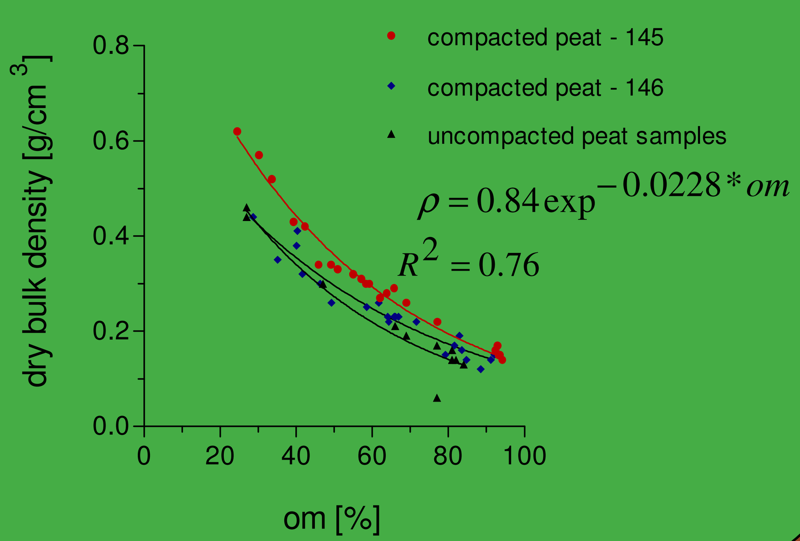
CROSS SECTIONS

At each study site cross sections are constructed perpendicular to the main flow direction.



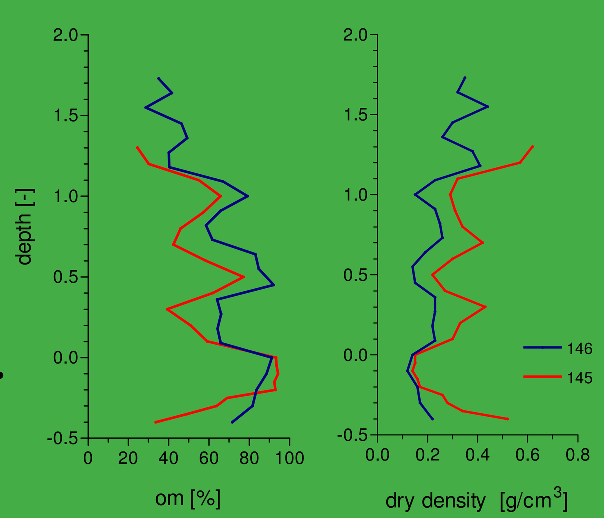
DRY BULK DENSITY

Calculating the uncompacted dry bulk density of compacted peat.



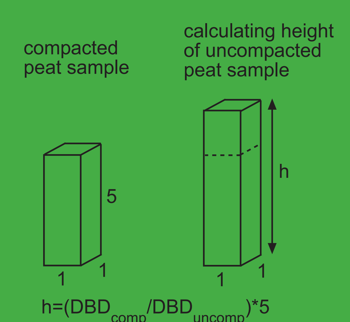
SUBSAMPLING PEAT CORES

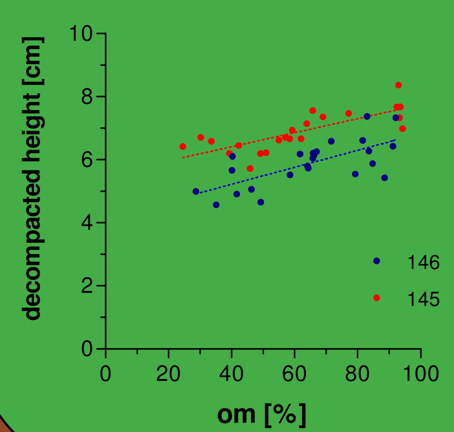
Peat cores were sampled at a 5 cm interval to determine dry bulk density and organic matter content.

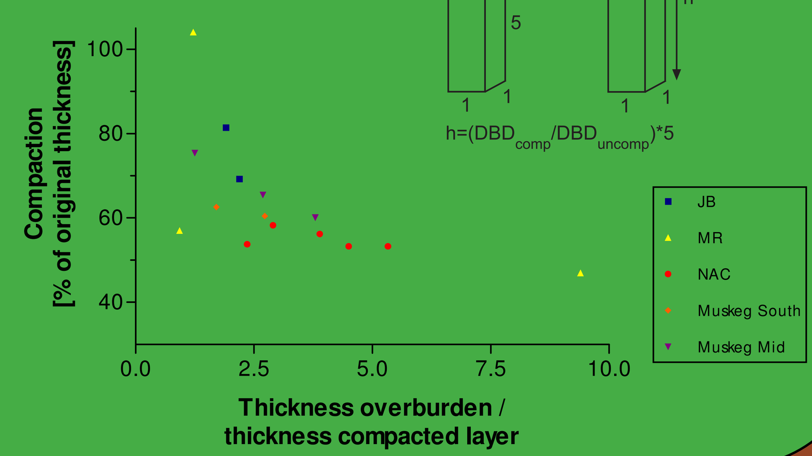


DECOMPACTION

Calculating decompaction height per 5 cm.







CONCLUSIONS

1. In our study area peat layers are compacted up to 53% of their original thickness in decades time (shortly after start of loading!).
2. Most important factors influencing peat compaction are: a) thickness of peat layer, b) thickness of overburden, c) peat type (especially organic matter content) and d) time since start of loading.
3. Peat compaction leads to relatively thick natural levees and crevasse-splay deposits.
4. Peat compaction enhances vertical aggradation which results in channel belt geometries with low width/depth ratios.
5. Based on our study we suggest that on short timescales peat compaction fixes river channels and hence inhibits avulsion.

Universiteit Utrecht

*Corresponding author: s.vanasselen@geo.uu.nl. Department of Physical Geography, Faculty of Geosciences, Utrecht University, P.O. Box 80.115, 3508 TC Utrecht, The Netherlands. Tel.:+31(0)30 2532779. Website: www.geo.uu.nl/fg/palaeogeography.