Identifying the buried dikeland soil in a restored Bay of Fundy salt marsh

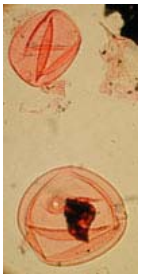
John Lusby Marsh, located on the Cumberland Basin just west of Amherst, Nova Scotia, is the largest continuous tract of salt marsh remaining in the upper Bay of Fundy. The 1020-acre marsh was diked by Acadian settlers about 300 years ago and farmed until the late 1940's, when dike neglect led to a series of breaches that began restoration to salt marsh conditions. Since that time, regular tidal inundation with sediment-laden waters has buried much of the former agricultural land surface beneath about 1 m of sediment.

Although sediment is being deposited all over the marsh surface, wave action is eroding the seaward marsh edge. This photo was taken at the site of a wharf that was built on the dikeland in 1906 and was buried after the dikes breached. Erosion may soon remove all evidence of this anthropogenic feature as materials from within the sediment sequence are being reworked and removed (materials in foreground). Note the presence of red bricks and metal hardware (follow arrows) that clearly identify this as an anthropogenic layer. (To the upper left of the photo is a red knapsack for scale.)

The research aim is to determine if palynological and stable carbon isotope techniques can be used to identify a buried dikeland soil where exposures such as these are not available.

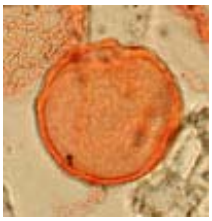
A modern analogue of a dikeland pollen assemblage is being developed using dikeland soil samples from nearby Nappan Experimental Farm, part of Agriculture Canada. As part of her M.Sc. thesis, Beth Beecher developed a modern analogue of salt marsh pollen assemblages. We hope that these analogues will distinguish key dikeland and salt marsh indicator pollen and pollen assemblages, the presence, absence or relative proportion of which in a sedimentary sequence will allow the identification of a buried dikeland soil. Some key pollen types include:

Dandelion

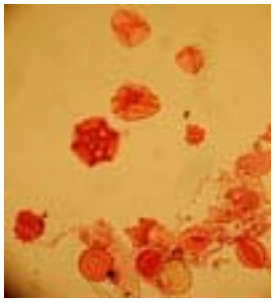


Grasses of different sizes

Aster Type with charcoal indicating past fire



Plantago



Pollen mix with grass, dandelion, Cheno-Am, anthemis, and more

The work will also investigate the utility of stable carbon isotopes in identifying buried dikeland soils. *Spartina patens* and *Spartina. alterniflora* are important and locally abundant salt marsh grasses that use the C-4 photosynthetic pathway, whereas most terrestrial vegetation, including most agricultural crops and weeds, use C-3 photosynthesis. Each of these pathways causes different amounts of carbon-13 to accumulate in plant tissues, and these differences can be detected in soil organic carbon; hence, the analysis of carbon-13 content in soil organic matter from a vertical salt marsh soil profile may distinguish periods of agricultural activity.