WETLAND HISTORY ALONG THE ESCARPMENT: TWO SWAMPS NEAR CRAWFORD LAKE

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Abstract: *Kilbride Swamp occupies a 150-metre diameter kettle basin located 5 km south of Crawford Lake; it lacks streams. Red maple and black ash partly dominate the swamp. A 410-centimetre long core had 50-cm clay overlain by 330-cm marl; only the upper 20-cm was peat. Rife Swamp occupies a bedrock basin (ca. 100 m x 30 m) about 4 km west of Crawford Lake; it is along an intermittent tributary to Bronte Creek. Silver maple, white cedar, white pine and yellow birch dominate the swamp forest. A 234-centimetre long core bottomed on bedrock. Three centimetres of clay overlie marl to 100 cm depth; the upper metre is peat.*

Pollen zones that have been dated elsewhere show that for a few hundred years after glaciation about 13,000 years BP, Glacial Lake Whittlesey deposited clay. When the lake drained, marl ponds formed and the vegetation shifted from tundra to spruce woodland. At 10,000 years BP, pine-dominated boreal forest surrounded the ponds. Swamp peat appeared earlier at Rife (9,000 years BP) than at Kilbride (7,500 BP) when climate change caused a decline in ground water and succession from pond to swamp.

INTRODUCTION

Wetlands along the Niagara Escarpment include swamps, bogs and marshes. We are presently investigating wetlands in the Crawford Lake area in the Municipality of Halton. Our interests lie in the late Pleistocene geological events that created their basins and their vegetation and climate history during the Holocene, the last 10,000 years. We report here on Kilbride Swamp and Rife Swamp. Similar studies in this area are Crawford Lake (McAndrews and Boyko-Diakonow 1989, Yu et al. 1998), Twiss Pond (Yu and Eicher 1999) and Crawford Bog and Lake Medad (Karrow 1984).

SETTING

Kilbride Swamp occupies a 150-metre diameter kettle basin derived from the delayed melting of an ice block covered with glacial drift: there are no surface inlet or outlet streams. It is presently covered with cattail, sedges and willow with red maple and black ash growing around its margin. Rife Swamp (ca. 100 m x 30 m) is located in bedrock about 4 km west of Crawford Lake: it is the source of an intermittent tributary to Bronte Creek. Silver maple, white cedar, white pine and yellow birch dominate the swamp. Islands of peat supporting tree stumps indicate water level fluctuations within the basin.

FIELD AND LABORATORY METHODS

The deepest point of each swamp was determined by probing with rods before we lifted a core of sediment using a Livingstone Corer (Wright 1967). Samples from the core were taken at 5-centimetre levels for pollen analysis and loss on ignition (Dean 1972). Fossil pollen grains were concentrated from the sediment by sieving followed by digestion with HCl and KOH. The pollen-rich concentrate was preserved in glycerin. Over 200 pollen grains were identified at each level. White pine pollen was identified by the presence of distal verrucae (belly warts) and jack pine was separated from red pine pollen by its small size (McAndrews et al. 1973).

OBSERVATIONS

Three kinds of sediment were recovered. The upper levels were woody peat of partially decomposed plants, which indicates alternating wet and dry conditions. Although it is rich in macrofossils such as seeds and wood fragments, it contains poorly preserved pollen. Below the peat was marl, which is mostly calcium carbonate, deposited in shallow water; it is rich in molluscs and well-preserved pollen grains. The basal layer was clay with sparse pollen.

RIFE SWAMP

In the fall 2000, we lifted a 223-centimetre long core that bottomed on bedrock. Results from loss on ignition analysis and pollen analyses are shown on Figure 1. The bottom 3-cm was clay with pollen of sedges and arctic birch indicating tundra surrounded the basin. The next zone (levels 220 cm - 160 cm) was marl containing high spruce pollen with herbs that indicates boreal woodland. The third zone (levels 160 cm - 45 cm) contained in both marl and peat is dominated by jack pine pollen that indicates boreal forest. Elsewhere this zone is bracketed by radiocarbon dates of 10,000 and 9,000 years ago. At the 100-centimetre level, the marl changes over to a non-woody peat followed by woody peat at 45 cm. This woody peat contains poorly preserved pollen of hemlock, beech and maple indicating a warm climate mixed forest. The lack of the usual transition between boreal and mixed forest zones indicates a gap in time when no peat accumulated, perhaps as much as 8,000 years. The uppermost 15-cm contained pollen from ragweed and European-introduced weeds, which indicate sediment deposition over the last 150 years.

KILBRIDE SWAMP

In the winter of 2001, a 400-centimetre long core of sediment was removed from the centre of the Swamp (Figure 2). The basal gravel was overlain by 60 cm of clay that contained pollen of tundra sedges, grasses and shrubs. High spruce pollen in the next 80 cm (340 cm - 260 cm) indicated boreal woodland. The complete boreal forest zone, which lasted over 2000 years, occupies levels 270 cm - 22 cm. It begins as a cool-climate jack pine forest that was replaced by a white pine forest as climate warmed. The uppermost marl (10 cm - 22 cm) contains white pine and some

sugar maple, hemlock and beech pollen indicating mixed forest. This pollen was deposited around 7,000 years ago and therefore the marl-peat contact at 10 cm represents a 7000-year hiatus similar to the one found in Rife Swamp. The upper 10-cm of the swamp is peat with poorly preserved pollen of ragweed and other European herbs deposited in the last 150 years.

Figure 1. Pollen diagram from Rife Swamp showing selected pollen types. The pollen sum is 200 tree pollen grains. On the left are the sediment components determined by loss on ignition.

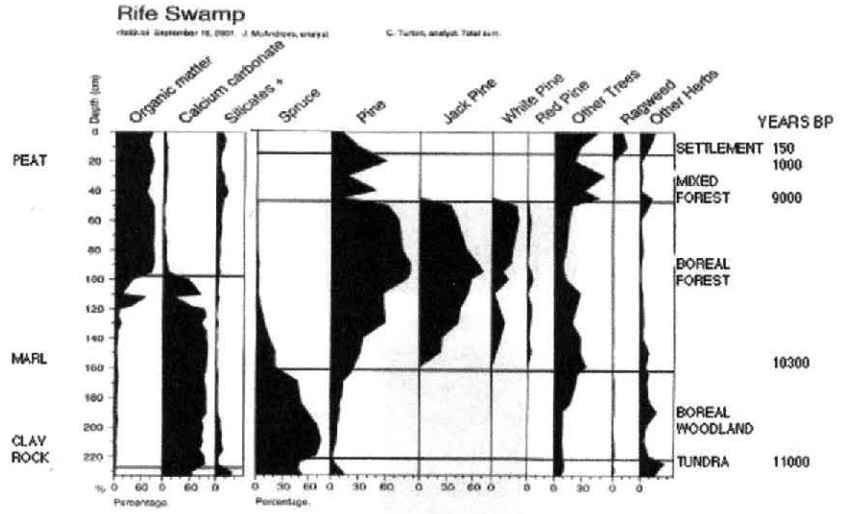

FIGURE 1. Pollen diagram from Rife Swamp showing selected pollen types. The pollen sum is 200 tree pollen grains. On the left is the sediment component determined by loss on ignition.

Figure 2. Pollen diagram from Kilbride Swamp showing selected pollen types. The pollen sum is 200 tree pollen grains. On the left are the sediment components determined by loss on ignition.

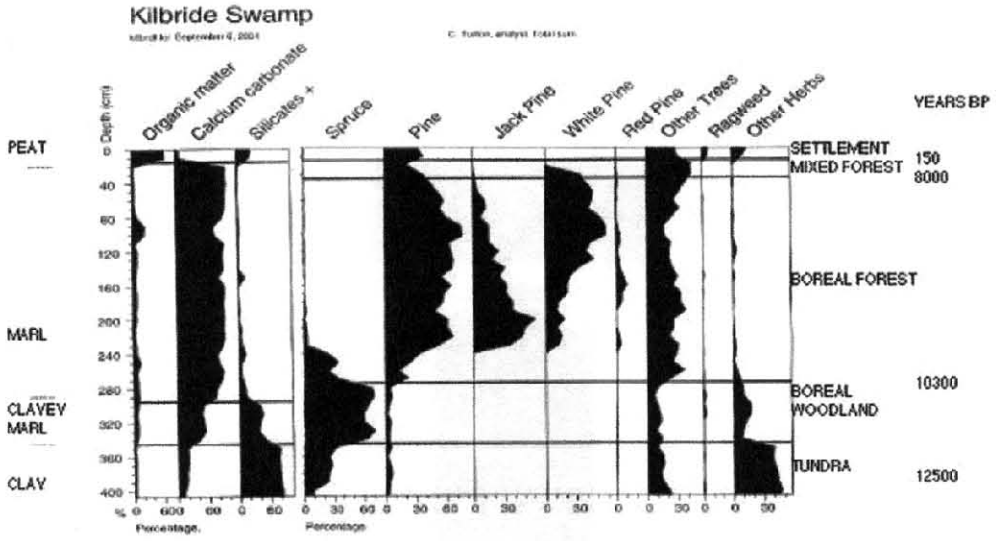

FIGURE 2. Pollen diagram from Kilbride Swamp showing selected pollen types. The pollen sum is 200 tree pollen grains. On the left is the sediment component determined by loss on ignition

DISCUSSION

Kilbride Swamp began as a marl pond in a kettle basin on an outwash deposited following glacier retreat from the Waterdown Moraine ca. 13,000 years BP (Karrow 1984). For 4,000 years this pond with no inlet or outlet reflected a high water table. With a combination of basin filling and climatic warming, the pond went dry to become a peat-accumulating swamp. Alternating dry and wet periods have left this swamp in equilibrium. In wet periods, small amounts of peat accumulated only to be oxidized during dry periods when the ground water was relatively low.

In contrast, Rife Swamp began as a bedrock depression in a shallow bay in Lake of Glacial Lake Whittlesey. With the drainage of the lake, the depression became a marl pond contemporary with the Kilbride pond. The Rife pond was not as deep as the Kilbride Pond and therefore filled in first. Periodic wet and dry periods have kept the site as a swamp.

CONCLUSION

Wetlands in the Crawford Lake region owe their origin to the glacial retreat 12,000 years ago. They began as ponds depositing glacial clay first and then marl as the clay source waned and the climate warmed. With continued warming the ponds dried 8,000 to 9,000 years ago. The pattern of clay-marl-peat is consistent with other wetland investigations in Southern Ontario. These swamps appear to have reached equilibrium and will remain swamps unless there is a dramatic change in climate or in man's activities.

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