

# An Early Paleocene Microflora from Turtle Mountain, Southwestern Manitoba

Mackenzie W. Desautels<sup>1\*</sup>, Cathy L. Greenwood<sup>1</sup>, Arthur R. Sweet<sup>2</sup>, David R. Greenwood<sup>1</sup>, and James D. Bamburak<sup>3</sup>  
<sup>1</sup> Environmental Science Laboratories, Brandon University ; <sup>2</sup> Geological Survey of Canada; <sup>3</sup> Manitoba Geological Survey

\* presenter.

## Background

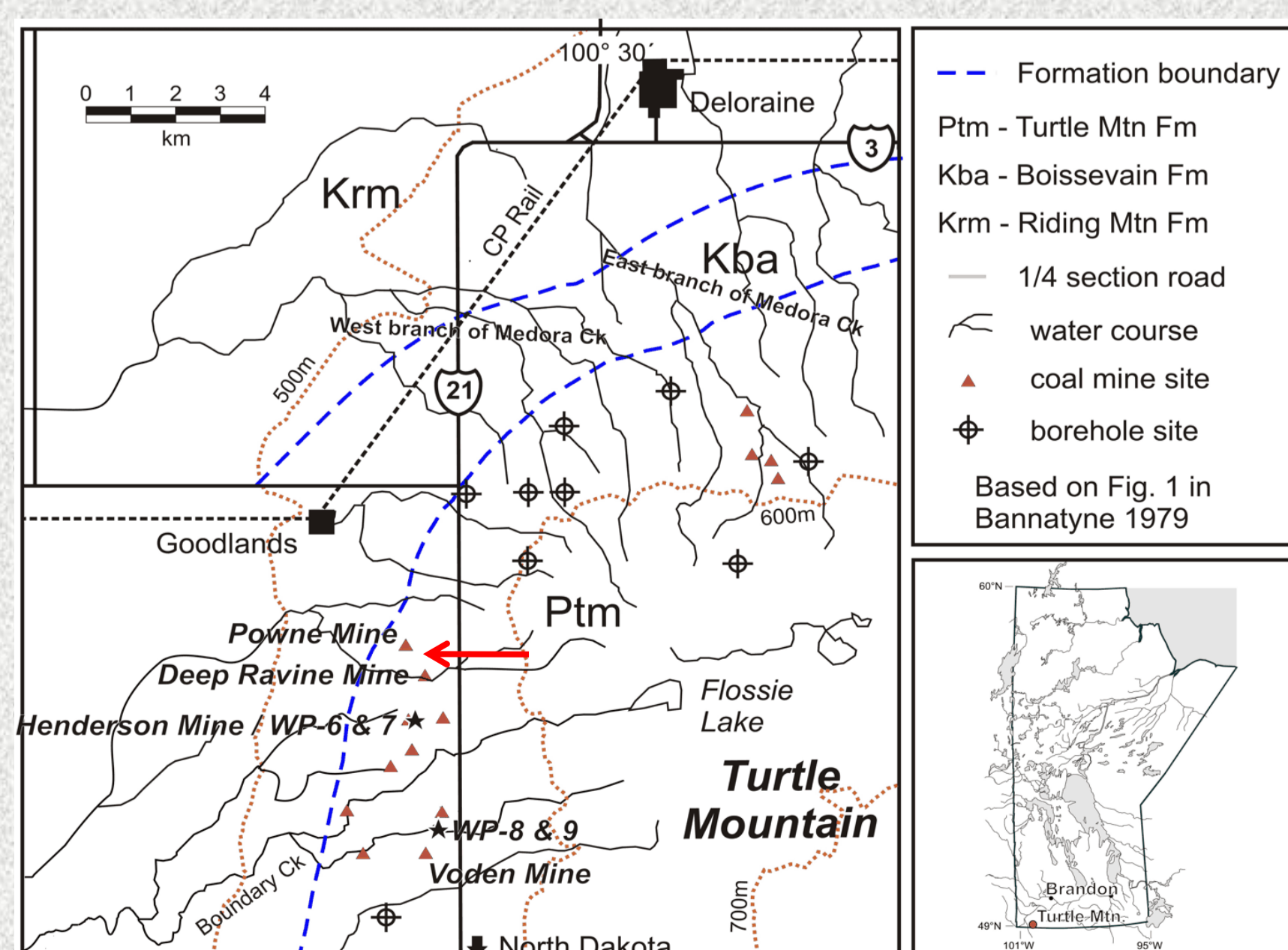
The spore and pollen flora of the Early Paleocene Goodlands Member of the Turtle Mountain Formation is reported from west of Turtle Mountain in southwestern Manitoba (Fig. 1) from *in situ* lignite and mudstone from stream-bank outcrops (Fig. 2), and from spoil heaps of abandoned coal mines. Ongoing research on these sediments will include samples from core-holes drilled as part of previous investigations by the Manitoba Geological Survey and the Geological Survey of Canada (Fig. 1). Presented here are a brief overview of the geological setting and preliminary findings on the palynology of these sediments.

## Geological Setting

The Turtle Mountain area is a plateau, 90 m to 120 m above the surrounding countryside and contains Manitoba's only Cenozoic sediments found in outcrop. Stream-banks and ravines on the western flank of Turtle Mountain have exposed these sediments from the small overburden of Tertiary tills and soils (Fig. 2). The Early Paleocene marine shales and terrestrial mudstones are distinguished by the presence of diagnostic dinoflagellates (McIntyre, 1999; Braman et al., 1999). The rare occurrence of fossil leaves from the Peace Garden Member along the North West flank of Turtle Mountain suggest shallow near shore facies grading to transient terrestrial swamp environments at the margins of the intercontinental seaway (Bamburak, 1978).



**Fig. 3** – Representative pollen grains (original pictures taken at 400x, resized here) including; 1. *Sphagnum steroideis* [(Potonié and Venitz) Martin and Rouse 1966]; 2. *Azolla cretacea* (Stanley 1961); 3. *Baculatisporites* sp.; 4. *Syncolporites minimus* (Leffingwell 1970); 5. *Wodehouseia fimbriata* (Stanley 1961); 6. *Foveosporites* sp.; 7. Pinaceae; 8. *Polotricolporites rotundas* var. *pumilis* (Sweet, 1986); 9. *Aquillapollenites attenuatus*? (Srivastava 1969); 10. *Sequoiapollenites largus*? (Manum 1962) 11. T-C-T; 12. Betulaceae; 13. *Ginkgo* sp.; 14. *Kurtzipites* sp.; 15. *Cyathidites* sp.; 16. *Momipites leffingwellii* (Nichols and Ott 1978); 17. *Momipites microfoveolatus* [(Stanley) Nichols, 1973] 18. *Ulmoideipites undulosus*? (); 19. *Erdtmanipollis procumbentiformis* [(Samoilovitch) Krutzsch 1966]; 20. *Tricolporites anguloluminosus* (Anderson, 1960) 21. *Myrtipites granulatus* (Norton and Hall 1969); 22. *Tricolporopollenites kruschii*? [(Potonié) Thomson and Pflug 1953]; 23. *Alnus trina* (Stanley, 1961); 24. *Schizea triangula* (Stanley 1961); 25. *Aquillapollenites delicatus* (Stanley 1961); 26. Dinoflagellate; 27. *Cranwellia subtilis* (Sweet 1986); 28. *Tricolporopollenites kruschii* [(Potonié) Thomson and Pflug 1953]. Some images have been digitally cropped to remove adjacent debris.



**Fig. 1** – Map of Turtle Mountain area showing old coal mines, boreholes and our sample site (arrow).



**Fig. 2** – Creek bank exposure of a bench of coal.

## Preliminary Work & Project Goals

The pollen slides were prepared by the GSC Palynology Laboratory in Calgary using standard palynological procedures (Sweet, 2005; Traverse, 2007). The presence of *Momipites microfoveolatus*, *Tricolporopollenites kruschii* (= *Margocolporites cribellatus*) (Fig. 3-28), and rare occurrences in some samples of *Wodehouseia fimbriata* (Fig. 3-5) in the palynoflora are consistent with an Early Paleocene age (Braman and Sweet, 1999). Some samples were assignable to the late Early Paleocene *Tricolporopollenites kruschii* Zone. The Turtle Mountain microflora represents a record of Early Paleocene vegetation from northeast of the Williston Basin of Montana, North Dakota and Saskatchewan. The microflora is dominated by grains of T-C-T conifers (e.g. Fig. 3-11), but also contains a diverse suite of other gymnosperms (rare *Ginkgo*, *Sequoia*, and Pinaceae), angiosperms (e.g., Betulaceae, Juglandaceae and Ulmaceae), and both moss and pteridophyte spores (Fig. 3)(Sweet, 2005). Some samples were rich in bisaccate conifer grains (e.g. Fig. 3-7).

Current research towards an Honours thesis by M. Desautels involves identification and counts of the microflora from multiple samples to reconstruct the coal-swamp vegetation across the Early Paleocene landscape. These results will be contrasted to the analysis of the Early Paleocene coals from the Estevan coal mine, SK (Frank and Bend, 2004).

## Acknowledgements

We thank Peter Adamo and Rong-yu Li (BU) and the 2005 and 2007 Brandon University undergraduate paleobotany classes for assistance with field sampling. This project is funded by a NSERC grant to D.R. Greenwood and additional funding from Brandon University. Additional support from CFI for facilities at BU is acknowledged. We would like to thank all co-authors for their time and personal communications and especially to Jim Bamburak for sharing his knowledge of the study area.

## References

Bamburak, J.D. 1978. Stratigraphy of the Riding Mountain, Boissevain and Turtle Mountain formations in the Turtle Mountain area, Manitoba. *Province of Manitoba, Dept. Mines, Resources & Env. Mgt., Geological Report 78-2*.  
Bannatyne, B.B. 1979. Lignite in Manitoba. *Manitoba Mines & Energy, Educational Series E579-1*. 7 pp.  
Braman, D.R. & Sweet, A.R. 1999. Terrestrial palynomorph biostratigraphy of the Cypress Hills, Wood Mountain, and Turtle Mountain areas (Upper Cretaceous-Paleocene) of western Canada. *Can. J. Earth Sci.*, 36: 725-741.  
Braman, D.R., Sweet, A.R., & Lerbekmo, J.F. 1999. Upper Cretaceous – lower Tertiary lithostratigraphic relationships of three cores from Alberta, Saskatchewan, and Manitoba, Canada. *Can. J. Earth Sci.*, 36: 669-683.  
Frank, M.C. & Bend, S.L. 2004. Peat-Forming History of the Ancestral Souris Mire (Paleocene), Ravenscrag Formation, Southern Saskatchewan, Canada. *Can. J. Earth Sci.*, 41: 307-322.  
McIntyre, D. 1999. Campanian to Paleocene dinoflagellate assemblages from the Turtle Mountain core hole, Manitoba, western Canada. *Can. J. Earth Sci.*, 36: 775-789.  
Sweet, A.R. 2005. Applied research report on 4 Early Paleocene samples from Turtle Mountain Formation outcrops located on the west flank of Turtle Mountain, (NTS62F/02), south western Manitoba. *GSC Report 12-ARS-2005*.  
Traverse, A. 2007. *Paleopalynology*. Springer Verlag, 732 pp.