GUSSOW 2026
CRACKING THE CRETACEOUS CODE
October 13-15 | Banff, AB

Sedimentology and stratigraphy of the St. Mary River Formation exposed along the Oldman River, Southwestern Alberta

Speaker: Kendal Courchaine, Department of Earth Sciences, University of Manitoba

Co-Authors: Caleb Brown, Curator of Dinosaur Systematics, Royal Tyrell Museum of Paleontology | Paul Durkin, Department of Earth Sciences, University of Manitoba

ABSTRACT

Studies of Upper Cretaceous fluvial systems in the Alberta Foreland Basin have focused largely on medial to distal deposits, whereas proximal equivalents remain comparatively understudied. This reflects the extensive, relatively undeformed exposures of down-dip successions across the Alberta plains compared with structurally deformed but well-exposed up-dip deposits in foothills river valleys. Despite these challenges, proximal strata are essential for basin-scale correlations, reconstructing source-to-sink sediment routing, and refining models of Late Cretaceous paleogeography. The Campanian–Maastrichtian St. Mary River (SMR) Formation, exposed along the Oldman River in southwestern Alberta, represents the proximal equivalent of the Horseshoe Canyon Formation and contains recently discovered dinosaur body fossils and trackways whose stratigraphic and paleoenvironmental contexts remain poorly constrained. Here, we integrate sedimentology, stratigraphy, geochemistry, ichnology, and digital outcrop mapping to reconstruct SMR depositional environments, establish a high-resolution stratigraphic framework, contextualize fossil discoveries, and improve source-to-sink reconstructions of the Upper Cretaceous Alberta Foreland Basin.

During the spring of 2026, we measured a 65-m-thick stratigraphic section of the SMR east of Highway 22 at Maycroft. The section was logged for lithology, grain size, sedimentary structures, bedding contacts, and biogenic structures, including dinosaur footprints. Structural measurements of bedding and paleocurrent measurements from trough cross-stratification were collected to resolve deformation and paleoflow directions, respectively. Samples were collected at 0.5-m intervals for total organic carbon (TOC) and $\delta^{13}C$ analyses. A regional digital outcrop model was constructed using remotely piloted aircraft system (RPAS) structure-from-motion photogrammetry to characterize stratigraphic architecture and support regional mapping.

The SMR at Maycroft comprises seven recurring lithofacies grouped into three facies associations representing channel belt, crevasse-splay, and fine-grained floodplain deposits that collectively record deposition in a proximal fluvial system. Dinosaur footprints are preserved as molds on the bases of sandstone beds overlying mudstones and are interpreted to represent predominantly ceratopsidae, with several isolated, in situ and ex situ tracks that are theropod. TOC values are generally low (<1%) but increase to as much as 4% within organic-rich mudstones. Collectively, these data indicate that the SMR succession records a crevasse-splay-dominated fluvial system in the proximal Alberta Foreland Basin that supported diverse dinosaur communities. Ongoing work will refine paleoenvironmental reconstructions, evaluate regional stratigraphic correlations using the $\delta^{13}C$ record, and integrate the SMR into source-to-sink models linking proximal foreland deposits with their down-dip equivalents in the Horseshoe Canyon Formation.

CEGA