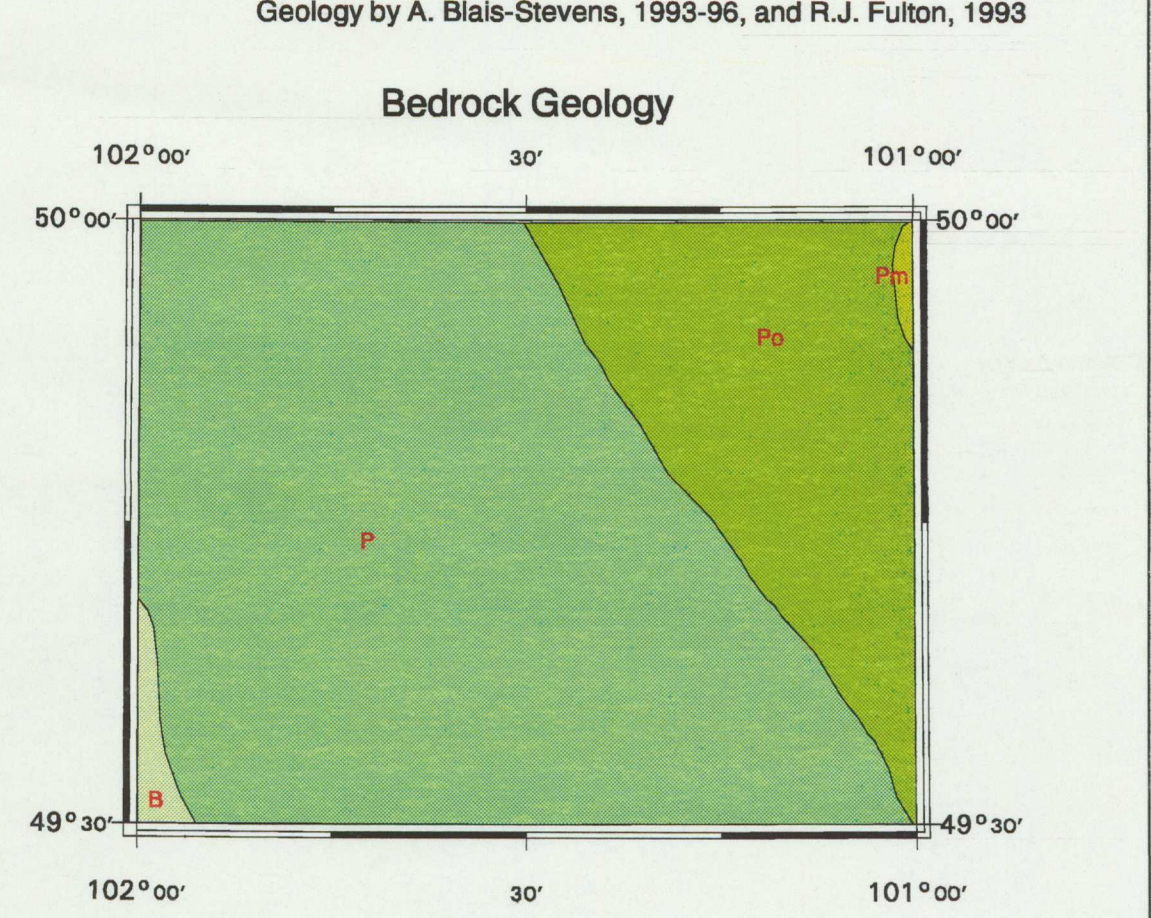


SURFICIAL GEOLOGY, PIPESTONE CREEK, MANITOBA - SASKATCHEWAN (62F/NW)

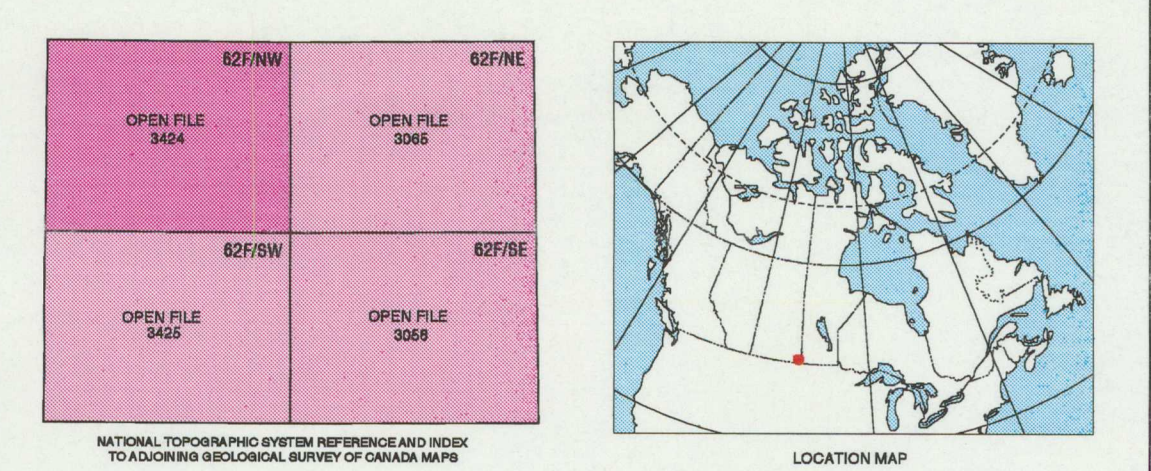
- SURFICIAL MATERIALS**
CENOZOIC
Quaternary
Holocene
- COLLUVIAL DEPOSITS:** silty to clayey diamicton occurring as slope and slump deposits derived largely from till but in places from lacustrine deposits and shale.
- Ch** Slope Failure Deposits: Silty to clayey diamicton and shale slabs and blocks; occur as irregular hummocks, ridges and steps on slopes, and as ridges and hummocks within valleys; formed by slumping and slope failure; <10 m thick.
 - Co** Colluvial Complex: Silty to clayey diamicton; veneers, blankets, aprons, and fans of colluvial debris occurring on and at the base of steep slopes; complex of colluvial materials which can include areas of till, washed till and locally may contain small inclusions of alluvial plains and terraces; <5 m thick.
 - Ad** Modern Floodplain Sediments: silt, clay, and sand with minor gravel and organic muck and organic-rich silt and clay; poorly sorted and stratified; occurs as gently undulating plains containing swales and abandoned stream channels; locally swampy; unit thickness <5 m in most areas.
Late Wisconsinan
 - GLACIOFLUVIAL DEPOSITS:** sand and gravel in ridges and hummocks, underlying benches well above present stream level, and underlying broad flat to undulating plains; coarse clast composition variable and in many places dominated by shale; deposited as glaciofluvial materials in contact with melting ice, as glacial outwash plains and deltas, as catastrophic flood deposits, and as terraces and flats in glacial outlet channels.
 - Gt** Glaciofluvial Terrace Sediments: sand, gravel, and bouldery gravel; well washed and sorted; occurs as benches 5-40 m above modern valley floors; remnants of glaciofluvial outwash plains, and terraces in glacial outlet channels; <5 m thick.
 - Gp** Glaciofluvial Plains Sediments, Gently Undulating: sand, gravel, and bouldery gravel; well washed and sorted; gently undulating plain marked by low ridges and abandoned scour channels with relief 2-5 m; coarse clast composition variable and generally high in shale; trains of outwash occupying meltwater channel bottoms and deltaic deposits formed at the margin of glacial lakes; <10 m thick; gGp - dominantly gravel.
 - Gh** Glaciofluvial Hummocky and Ridged Gravels: gravel, and gravely diamicton with minor sand and silt; poorly sorted; in most places the coarse clasts are dominantly shale; occurs as mounds, hummocks, and ridges with 2-20 m relief and deep potholes and lakes; formed as ice contact glaciofluvial deposits; <15 m thick.
 - Gv** Glaciofluvial Sediments, Veneer: sand and bouldery gravel; thin to discontinuous layer of glaciofluvial materials overlying rock; glaciofluvial component thickness <1.5 m.
Gv/T - glaciofluvial veneer overlying till.
 - MORAINAL DEPOSITS:** till (diamicton), in many areas overlain by a surface layer (<1 m) of massive, sparsely pebbly, clayey silt; in places includes variable amounts of sorted glacial deposits, and minor veneers of postglacial alluvial and eolian silt and sand, and organic-rich silt and clay; till generally is a sandy, clayey, silt diamicton having a minor content of pebbles and variable content of boulders; morainal deposits are the direct deposits of glacial ice; till layers of different ages commonly underlie the surface but stratigraphy and thickness can be assessed only by drilling; a discontinuous layer of large (<1.5 m diameter) faceted boulders lies at the base of the surface till layer in many places; thickness varies from as little as 1 m where a single till sheet overlies bedrock, to 120 m in buried valleys and where multiple till units are present.
 - T+r** Till Plain, Eroded: till, gravel, boulders, sandy silt, sand, and muck; consists of till, in many places with an overlying discontinuous lag of gravel, sand, and boulders; includes muck and silty sediments in poorly drained valley floor locations; occurs as flat plains, on benches in valley bottoms, and on slopes at the margins of meltwater channels; patchy gravel and sand occurring as part of this unit is in places <2 m thick.
 - Tl** Till Plain, Flat: till and minor sorted sediments, in many places overlain by massive clayey silt <1.5 m thick; nearly flat (level) to very gently undulating with relief <2 m in the form of low rises and shallow depressions; locally includes low mounds which generally consist of massive, pebbly, silty sand or sandy gravel;
Tl+r - flat till plain including scattered low ridges 100 m to 5 km in length, generally consisting of massive, pebbly, silty sand.
 - Tu** Till Plain, Gently Undulating: till and minor sorted sediments; gently undulating areas of low rises and shallow depression (relief 2-5 m), locally includes low mounds which generally consist of massive, pebbly, silty sand or sandy gravel;
Tu+r - gently undulating till plain including rim ridges (arcuate ridges in part outlining shallow depressions);
Tu+r - gently undulating till plain including scattered low ridges 100 to 1000 m in length, generally consisting of massive, pebbly, silty sand or sandy gravel.
 - Tr** Till Plain, Ridged: till with variable inclusions of sorted sediment; generally occurs as broad (50-175 m), moderate relief (2-10 m), ridges which are 500 m to 2 km long and spaced at intervals from 0.5 to 2 km; ridges developed by ice thrusting and various ablation related processes during melting of the glacier.

- Features and Symbols**
- Geological boundary
 - defined
 - approximate
 - assumed
 - Abandoned meltwater channel
 - large
 - small
 - Fluvial escarpment
 - Esker
 - Minor moraine ridges, rim ridges
 - Ice flow direction from striations on boulder pavement
 - Gravel pit
 - Palaeocurrent direction
 - Ground observation
 - Till analysis site
 - Borehole log site
 - locality only
 - locality available



- BEDROCK UNITS**
- B** EASTEND, WHITEMUD, AND BATTLE: sandstone containing minor clay and siltstone, largely poorly consolidated.
 - P** PIERRE FORMATION (Bearpaw Formation in Saskatchewan): shale, soft greenish brown bentonitic, hard grey siliceous, and buff silty that have been subdivided into several members (McNeil and Caldwell, 1981).
 - Pm** PIERRE FORMATION UNDIFFERENTIATED: Mainly hard siliceous Odanah member and soft shales and silts of the upper "unnamed member".
 - Od** ODANAH MEMBER: Shale, siliceous and hard, <150 m thick.
 - Pm** MILLWOOD MEMBER: Shale, soft, greenish brown and bentonitic, <100 m thick (includes undifferentiated Gammon Ferruginous and Pembina members at its base).

Source of bedrock geology information:
McNeil, D.H. and Caldwell, W.G.E. 1981: Cretaceous rocks and their foraminifera in the Manitoba Escarpment; Geological Association of Canada, St. John's, Newfoundland, Special Paper 21, 453 p.
Whitaker, S.H. 1974: Geology and groundwater resources of the Weyburn area (62E-62F); Saskatchewan Research Council, Map No. 21, (scale 1:250,000).



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