

# surficial materials

The surficial materials we find in the Peel River watershed today are the result of geologic processes that took place during the Cenozoic Era (Fuller and Jackson, in prep.). Weathering, shattering of rock through frost action, and gradual creep of materials has covered most mid- to high-elevation surfaces with blankets of colluvium (a mixture of weathered rock, soil, and other materials on a slope) while valley bottoms contain thick fans and aprons of alluvium (materials deposited as a result of moving water).

As you can see on the map, a large part of the mountainous region of the Peel Watershed (in the south) is classified as Alpine Complexes, where rock, colluvium and till abound. Till is material that was deposited by glaciers and can consist of clay, sand, gravel and boulders.

Further north, along the lower Peel River, material was deposited as thick and continuous till. Interspersed throughout parts of the watershed is Till Veneer. As the name suggests, these are areas where the till layer is very thin, and rock outcrops occur in extensive areas.

Along part of the Bonnet Plume River and a little section of the Wind River are Glaciofluvial Plains. These plains were created when meltwater streams from the glaciers deposited material directly in front of glacial ice. Alluvial Deposits (materials deposited by running water) are found along the Ogilvie River, the main stem of the extreme upper Peel River, and a little section of the Hart River.

To the east, in the Hart and Blackstone River valleys, the surface material is mainly classified

Extensive glaciofluvial deposits of gravel and sands are due to the most recent glaciation, the McConnell Glaciation, on the lower Snake River. [CA]

as Colluvial Rubble. Colluvial rubble is rubble and silt that is derived from sedimentary rock substrate. Colluvial Blocks occur in a few parts along the Bonnet Plume and Wind Rivers as well as along Rae Creek, a tributary of the Hart River. These are blocks and rubble with sand and silt that is derived from crystalline bedrock, medium grade metamorphic substrate, and cemented sandstone.

Slides can dramatically change the surface features, particularly on steep slopes or in areas where there is permafrost. Several large rock slides, in the 30 to 50 million cubic metre class, have occurred in the Peel Watershed (CPAWS, 2000). This includes the large slide that nearly blocks the upper Bonnet Plume River valley (see map). Another slide has occurred in the upper Snake River valley.

The surface geology of the Peel Watershed shows the effects of repeated glacial advances and retreats. Eroded surfaces and the presence of erratics are a result of the Reid Glaciation of 23,000 years ago, during which ice reached up to the 1630 metre level at Nadaleen Mountain and around Rackla Lake. Numerous rock drumlins, faceted rock exposures, and grooved rock surfaces are the result of the more recent McConnell Glaciation. Most moraines (piles of unsorted rock debris left behind by glaciers) were deposited at this time as well, with till as deep as 45 metres in the major valleys. Along the walls of most large



river valleys, like the Bonnet Plume, Snake and North Rackla, terraced glaciofluvial deposits of gravel and sands attest to the effects of this recent glaciation (Ecological Stratification Working Group, 1998).

Permafrost also affects the surface geology, with solifluction and creep, and polygonal ground apparent on many of the hillside and valley walls. Meanwhile valley bottoms show evidence of patterned ground or cryoturbation. Palsa bogs and pingos are found throughout the mountainous region of the Peel watershed. Ice wedges are common where fine-grained organic-rich sediments occur.

Rock glaciers, both active and inactive, are notable features in the upper Peel watershed, and usually occur in north-facing cirques. In the Werneckes they are also occasionally found on more southerly-facing slopes. Debris covered glaciers as thick as 60 metres occur in cirques with steep, north-facing headwalls.

The rivers of the study area are typically braided, with unstable channels. Dramatic changes in water level after rainstorms, and seasonal flooding after ice thaw are common. Alluvial and colluvial fans show the effects of continuing erosion and channel migration.

**Alluvium:** sediments, including sand, gravel and silt, deposited as a result of moving water.

**Colluvium:** a mixture of weathered rock, soil and other materials deposited on a slope as a result of gravity.

**Alluvial fan:** masses of sediment deposited by a stream where the gradient of the stream decreased so that the sediment was thick at the beginning but thinned out rapidly further downstream; this is often in the shape of a fan.

**Colluvial fan:** similar to an alluvial fan, except in this case sediments were not deposited by a stream but moved down a slope as a result of gravity.

**Cryoturbation:** disturbance of soil by frost action.

**Erratic:** a rock fragment carried by glacial ice, deposited at some distance from its source.

**Glaciofluvial deposits:** deposits produced by meltwater streams from glacial ice.

**Palsa:** frost mound containing ice lenses in peat.

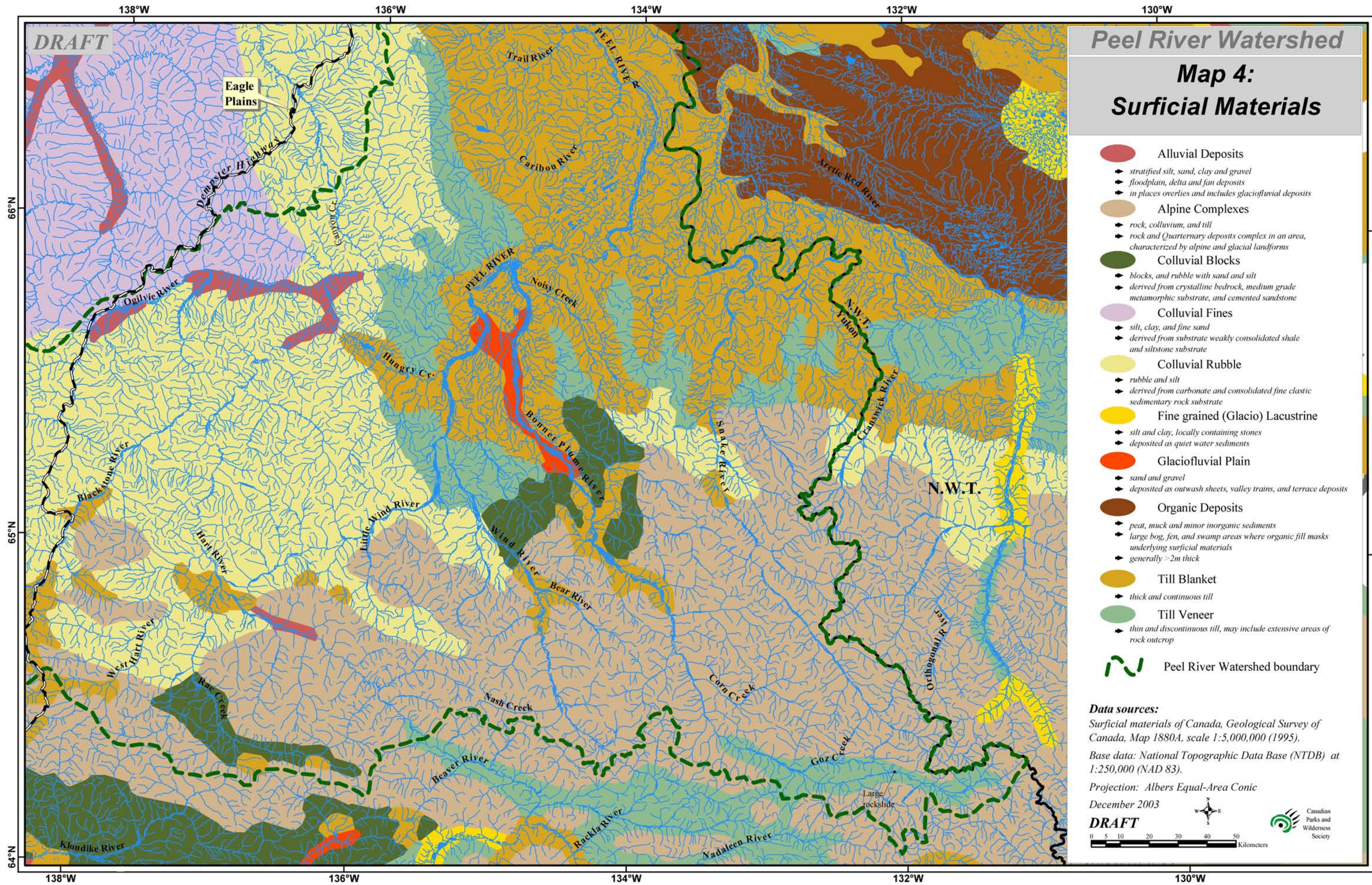
**Pingo:** frost mound of soil-covered ice.

**Polygonal ground:** a ground surface with a discernible pattern of polygons.

**Rock drumlins:** A smooth, streamlined hill with a core of bedrock and covered with till, moulded by glacial action.

**Solifluction:** slow flow of waterlogged soil down a slope.

Sources for definitions: Bates and Jackson, 1980; Oswald and Senyk, 1977; Strahler and Strahler, 1983.



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# Peel River Watershed

## Map 4: Surficial Materials

- Alluvial Deposits**
  - stratified silt, sand, clay and gravel
  - floodplain, delta and fan deposits
  - in places overlies and includes glaciofluvial deposits
- Alpine Complexes**
  - rock, colluvium, and till
  - rock and Quaternary deposits complex in an area, characterized by alpine and glacial landforms
- Colluvial Blocks**
  - blocks, and rubble with sand and silt
  - derived from crystalline bedrock, medium grade metamorphic substrate, and cemented sandstone
- Colluvial Fines**
  - silt, clay, and fine sand
  - derived from substrate weakly consolidated shale and siltstone substrate
- Colluvial Rubble**
  - rubble and silt
  - derived from carbonate and consolidated fine clastic sedimentary rock substrate
- Fine grained (Glacio) Lacustrine**
  - silt and clay, locally containing stones
  - deposited as quiet water sediments
- Glaciofluvial Plain**
  - sand and gravel
  - deposited as outwash sheets, valley trains, and terrace deposits
- Organic Deposits**
  - peat, muck and minor inorganic sediments
  - large bog, fen, and swamp areas where organic fill masks underlying surficial materials
  - generally >2m thick
- Till Blanket**
  - thick and continuous till
- Till Veneer**
  - thin and discontinuous till, may include extensive areas of rock outcrop
- Peel River Watershed boundary

**Data sources:**  
 Surficial materials of Canada, Geological Survey of Canada, Map 1880A, scale 1:5,000,000 (1995).  
 Base data: National Topographic Data Base (NTDB) at 1:250,000 (NAD 83).  
 Projection: Albers Equal-Area Conic  
 December 2003

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0 5 10 20 30 40 50 Kilometers

Canadian Parks and Wilderness Society