

## Soil Sampling Tips

- Surficial geology maps are your guide to the distribution of parent materials on the landscape.
- A complete list of surficial geology maps in Yukon is published on the Glacial Limits of Yukon Territory map (Duk-Rodkin, 1999). For more information about digital surficial geology information contact Jeff Bond or Panya Lipovsky at the Yukon Geological Survey.
- Understand the origin of the various parent materials and their suitability for conventional soil geochemistry.
- Do not assume an area is suitable for soil sampling. Check the surficial geology map first.
- Plot old soil geochemistry data against a surficial geology map and discard samples taken from unsuitable parent materials.
- Know the location of the glacial limits in your study area. If your property is close to the glacial limits, this will likely mark a change in parent material.
- Learn to recognize parent materials by the look and feel (texture) of the sediment in your hands. Note textural changes between samples.
- Beware of loess due to its dilution factor. Loess can be especially thick and widespread adjacent to large rivers.
- Past or present permafrost enhances slope dispersion.
- Be consistent in sample depth and parent material.
- Stress quality over quantity when soil sampling.

### Information to include on a soil sampling field data form

Sample Number: \_\_\_\_\_ UTM Position: \_\_\_\_\_  
 Sampler: \_\_\_\_\_ Date: \_\_\_\_\_  
 Sample Quality Index: 1 2 3 4  
**Site Characteristics**  
 Aspect: \_\_\_\_\_  
 Topographic position: \_\_\_\_\_  
 Drainage: poor/moderate/well  
**Parent Material Properties**  
 Total depth (cm): \_\_\_\_\_  
 Genesis: \_\_\_\_\_  
 Texture: silty/sandy/silty sand  
 Density: low/moderate/high  
 Colour: \_\_\_\_\_  
 Clast shape: angular/subrounded/well rounded  
 Organic material present in sample: yes/no/minor

### Notes:

Hand soil augers are the method of choice for accessing the C horizon and for ease of transport.

In the adjacent photo, each successively deeper sample is laid out on the surface giving an indication of colour and textural changes with depth.

photo courtesy of Mike Burke and Ryanwood Exploration



## Further Reading and References

- Bloom, L., 2001.** Writing geochemical reports: Guidelines for surficial geochemical survey, 2nd edition. The Association of Exploration Geochemists Special Volume No. 15, 38 p.
- Bond, J.D. and Sanborn, P.T., 2006.** Morphology and geochemistry of soils formed on colluviated weathered bedrock: Case studies from unglaciated upland slopes in west-central Yukon. Yukon Geological Survey, Open File 2006-19, 70 p.
- Duk-Rodkin, A., 1999.** Glacial limits map of Yukon. Geological Survey of Canada, Open File 3694, Exploration and Geological Services Division, Yukon Region; Indian and Northern Affairs Canada Geoscience Map 1999-2, scale 1:1 000 000.
- McClenaghan, M.B., Bobrowsky, P.T., Hall, G.E.M. and Cook, S.J. (eds.), 2001.** Drift Exploration in Glaciated Terrain. Geological Society Special Publication No. 185, The Geological Society, London, U.K., 350 p.
- Smith, C.A.S., Meikle, J.C. and Roots, C.F. (eds.), 2004.** Ecoregions of the Yukon Territory: Biophysical properties of Yukon landscapes. Agriculture and Agri-Food Canada, PARC Technical Bulletin No. 04-01, Summerland, British Columbia, p. 63-72.

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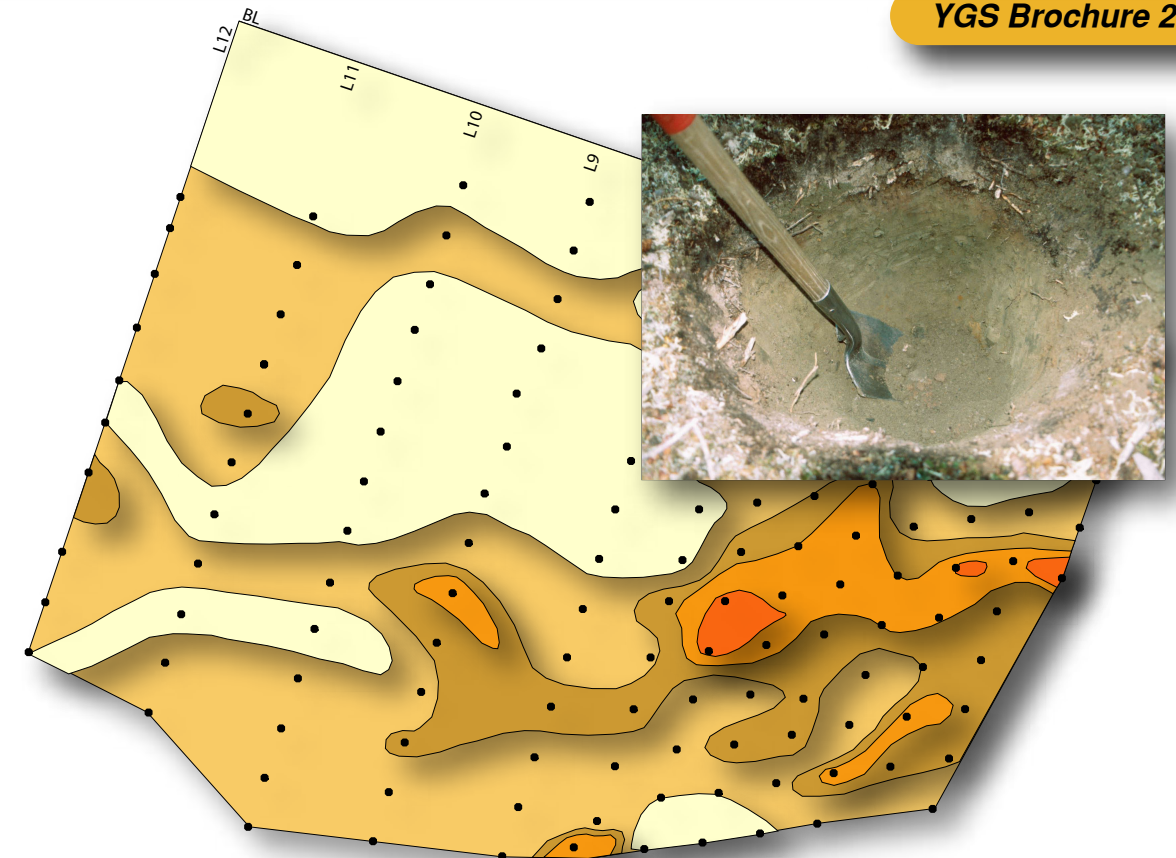
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# A guide to soil sampling in Yukon

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- Approximately 70% of the Yukon has been glaciated and 30% is unglaciated.
- Wind-blown silt (loess) is a common component of the B soil horizon and is geochemical dilutant.
- The Cordilleran Ice Sheet flowed over some interior mountain ranges resulting in up-valley drift transport.
- Discontinuous permafrost is a common sampling inhibitor on north-facing slopes.

# SOIL SAMPLING

[www.geology.gov.yk.ca](http://www.geology.gov.yk.ca)

# Introduction





## CHOOSING THE BEST SOIL SAMPLE = CHOOSING THE BEST PARENT MATERIAL

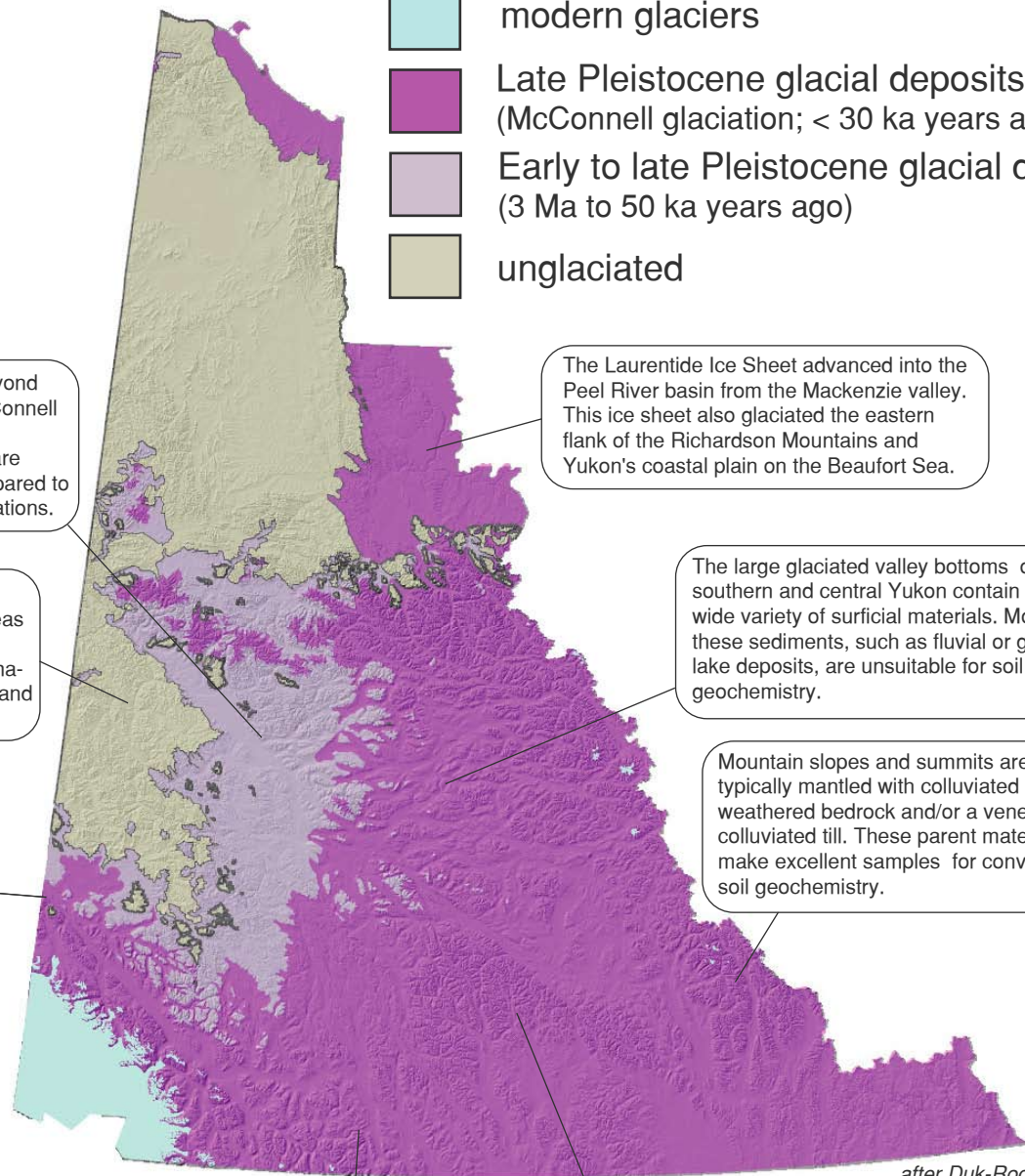
Soil sampling and soil geochemical data are a common component of the mineral exploration process. This may involve collecting new soil data or compiling and evaluating pre-existing data from previous exploration programs. Traditionally, sampling within a consistent soil horizon, such as the B-horizon, was the only guideline used in conventional\* soil sampling. Today, more attention is placed on choosing the appropriate parent material. In Yukon, there are a variety of parent material types each having a unique genesis. The genesis determines whether the material will be useful for conventional soil geochemistry. The greatest contrast in parent material assemblages occurs between the glaciated and unglaciated regions.

\*Conventional soil geochemistry: e.g., an aqua regia digestion (near total digestion) followed by ICP-MS  
 Unconventional soil geochemistry: e.g., MMI or enzyme (weak) leach

# Regional Surficial Geology

## Glaciated and unglaciated regions of Yukon

-  modern glaciers
-  Late Pleistocene glacial deposits (McConnell glaciation; < 30 ka years ago)
-  Early to late Pleistocene glacial deposits (3 Ma to 50 ka years ago)
-  unglaciated



Older glacial deposits are found beyond the limit of the late Pleistocene McConnell surface in central Yukon. Glacial landforms on these older surfaces are more subdued and weathered compared to deposits from the subsequent glaciations.

Parent materials of upland soils in west-central Yukon's unglaciated areas consist of a mixture of loess and colluviated weathered bedrock. Permafrost is found on north-facing slopes and on the margins of valley bottoms.

A 1200-year-old volcanic eruption from Mount Churchill on the Alaska/Yukon border released volcanic ash that draped southern and central Yukon. The ash is visible often present as a distinctive white horizon between the A and B horizons and should be avoided if conventional soil geochemistry is utilized.

Upland areas that contained alpine glaciers and that were also glaciated by the Cordilleran Ice Sheet have a multi-phase ice-flow history to consider when reconstructing drift transport.

The Laurentide Ice Sheet advanced into the Peel River basin from the Mackenzie valley. This ice sheet also glaciated the eastern flank of the Richardson Mountains and Yukon's coastal plain on the Beaufort Sea.

The large glaciated valley bottoms of southern and central Yukon contain a wide variety of surficial materials. Most of these sediments, such as fluvial or glacial lake deposits, are unsuitable for soil geochemistry.

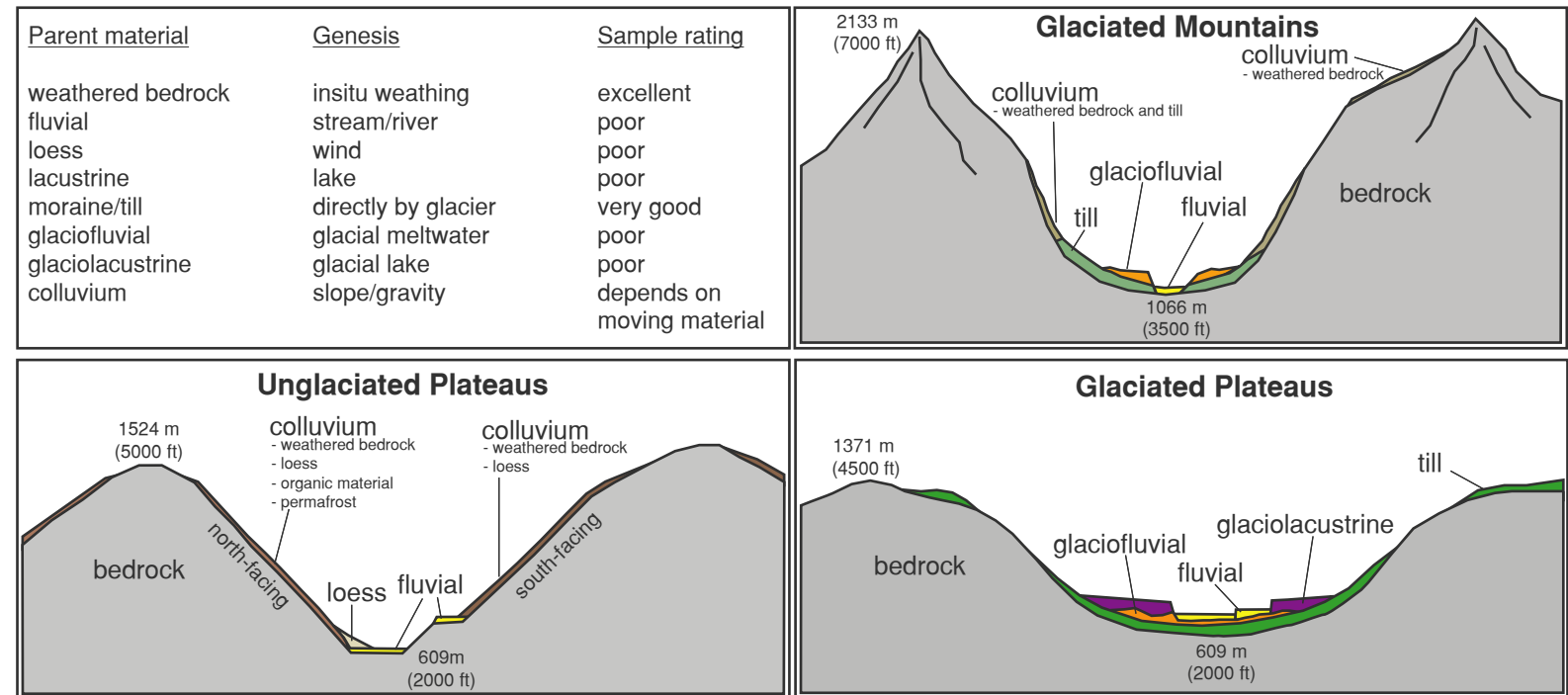
Mountain slopes and summits are typically mantled with colluviated weathered bedrock and/or a veneer of colluviated till. These parent materials make excellent samples for conventional soil geochemistry.

The Pelly Mountains were overridden by the Cordilleran Ice Sheet at glacial maximum. This resulted in up-valley drift transport in southerly and easterly draining valleys.

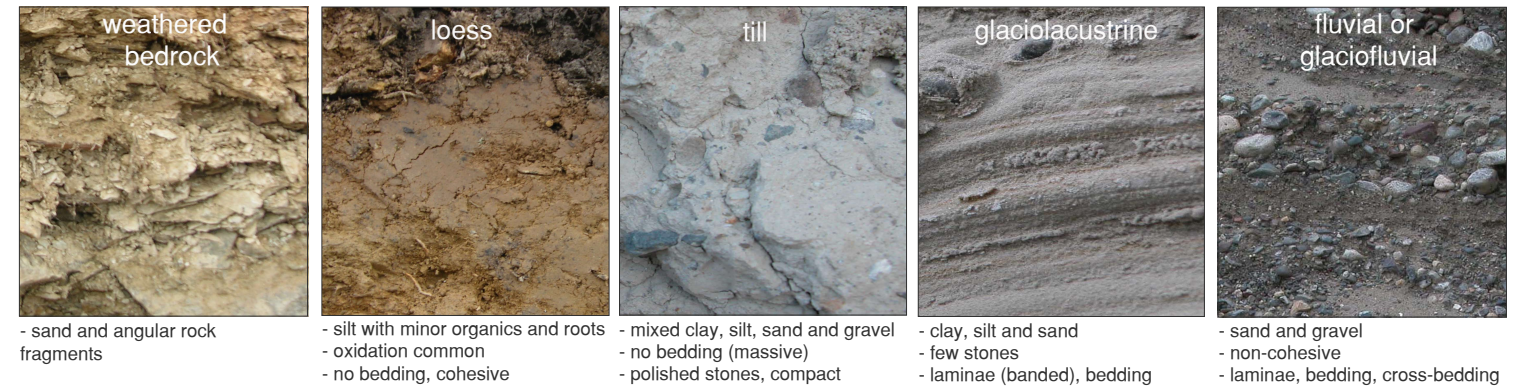
after Duk-Rodkin, 1999

# Parent Material and Soil Horizons

## Idealized valley cross-sections displaying parent material distribution



## Parent Material Textures



## What about soil horizons?

A soil profile and its associated horizons are a reflection of the Earth's climate on the land surface. Humification of organic matter, as well as chemical and physical weathering all play a role in the development of a soil profile. So what is the significance of this process on altering the character of the parent material and how might this affect its geochemistry?

Horizon	Description	Utility for conventional soil geochemistry
LFH	partly decomposed organic matter (humus)	Geochemical composition dependant on vegetation and substrate; limited effectiveness for mineral exploration.
A	mixed organic and parent material, zone of leaching	Generally considered poor for soil geochemistry due to the abundance of organic material.
B	mostly altered parent material; enriched in organic matter, iron, aluminum and manganese oxides transported from the A horizon	Adequate for soil geochemistry, but some elements may be enriched or depleted. Most of the primary mineralogy is weathered or oxidized. Upper B-horizons may contain loess, which may alter the geochemistry.
C	weakly altered parent material; some enrichment from B horizon such as carbonate accumulation	Best horizon for conventional soil geochemistry (least oxidation). On north-facing slopes, this horizon may be inaccessible due to permafrost.

