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 permfrost 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:

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 layed 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.

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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.

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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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For more information, check the Yukon Geological Survey at:

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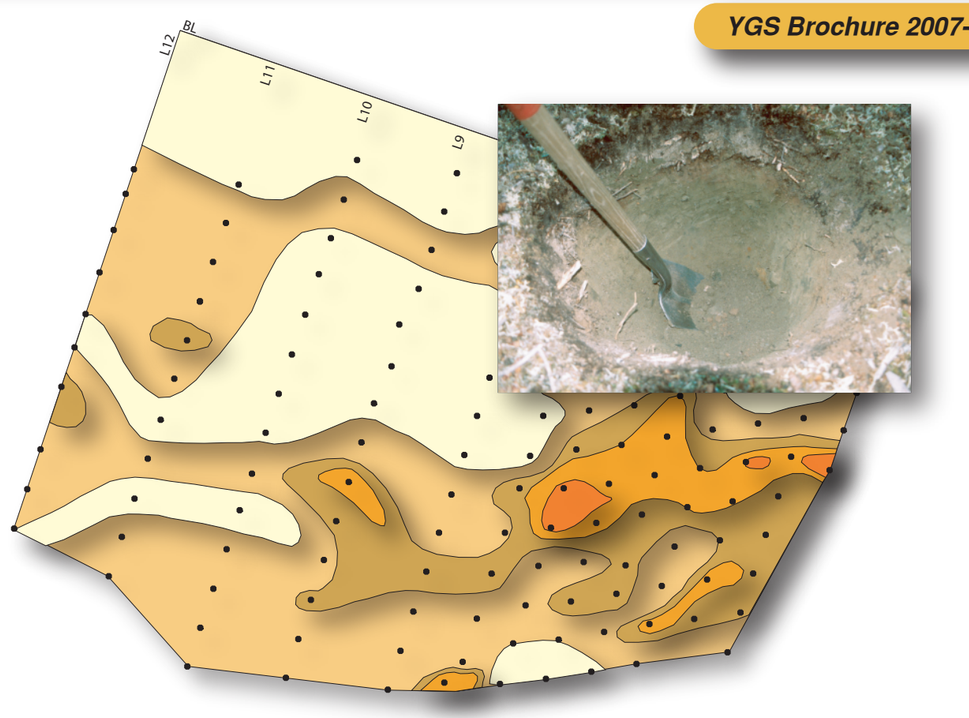
Yukon Geological Survey

Yukon
Energy, Mines and Resources

SOIL SAMPLING

A guide to soil sampling in Yukon

YGS Brochure 2007-2



- 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.

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 between the A and B horizons and should be avoided if conventional soil geochemistry is utilized.

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.

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.

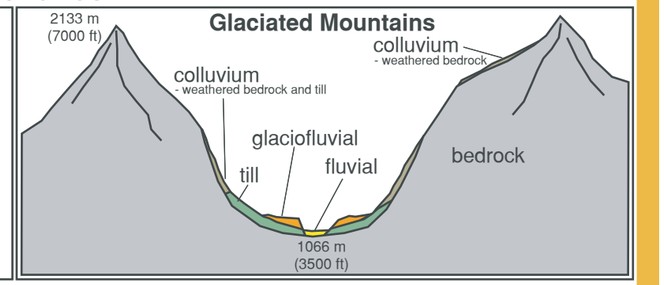
The Pelly Mountains were overriden by the Cordilleran ice sheet at glacial maximum. This resulted in up-valley drift transport in southerly and easterly draining valleys.

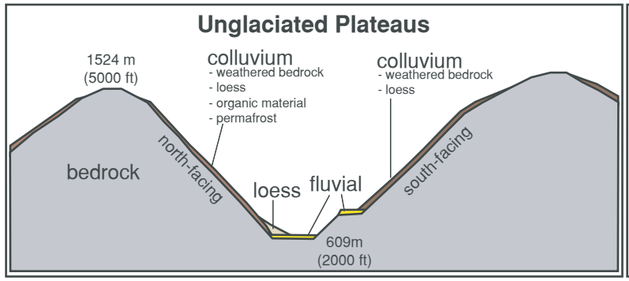
after Duk-Rodkin, 1999

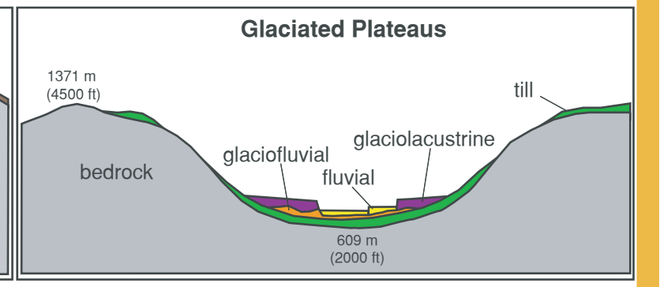
Parent Material and Soil Horizons

Idealized valley cross-sections displaying parent material distribution

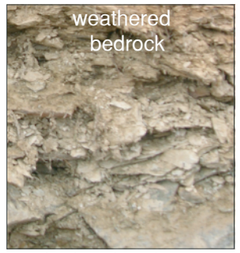
Parent material	Genesis	Sample rating
weathered bedrock	insitu weathing	excellent
fluvial	stream/river	poor
loess	wind	poor
lacustrine	lake	poor
moraine/till	directly by glacier	very good
glaciofluvial	glacial meltwater	poor
glaciolacustrine	glacial lake	poor
colluvium	slope/gravity	depends on moving material







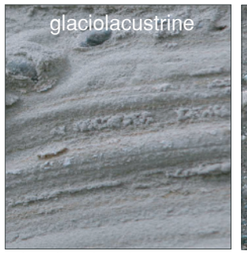
Parent Material Textures



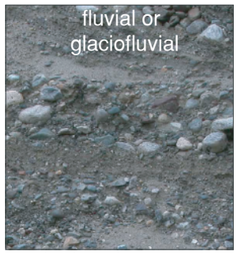
- sand and angular rock fragments

- silt with minor organics and roots
- oxidation common
- no bedding, cohesive

- mixed clay, silt, sand and gravel
- no bedding (massive)
- polished stones, compact



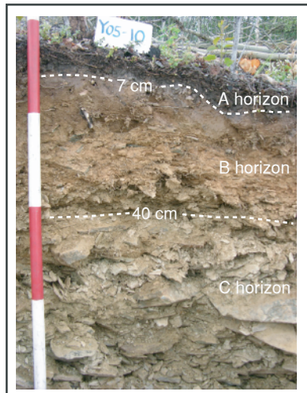
- clay, silt and sand
- few stones
- laminae (banded), bedding



- sand and gravel
- non-cohesive
- laminae, bedding, cross-bedding

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
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. 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.