Field Manual for Describing Yukon Ecosystems

2017

Yukon
Environment

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Contents

Preface

This manual has been prepared to help field surveyors complete the ecological field forms — the Biophysical Ecological Project Description Form, Ecosystem Site Form, Soil Form, Vegetation Form and Site Visit Form — used by the Government of Yukon. Field forms are available from the Fish and Wildlife Branch (Government of Yukon) for each of these data types. Note: this manual is not suitable for aquatic ecosystems.

The field forms allow users to collect fundamental ecological information that can be used for a variety of purposes, including ecosystem classification and description, ecosystem mapping, and wildlife habitat description and assessment. Not all forms and not all the data fields on the forms need to be filled out for every project. The project objectives will determine which forms and data fields need to be completed.

Much of this manual follows British Columbia's Field Manual for Describing Terrestrial Ecosystems, 2nd Edition (B.C. Ministry of Forests and Range and Ministry of Environment 2010). Many data fields in this manual are the same as those in the B.C. manual, and to ensure consistency and ease of correlation in most cases this manual uses the same names, definitions and options used in B.C. The differences between the two manuals are mainly due either to the desire to maintain some protocols, procedures and codes that have been in place in Yukon for a long time, or because of the unique qualities of some Yukon ecosystems and biophysical features.

Not all the chapters from the B.C. manual are included here, and the Yukon manual adds a Project section (Section 1) for documenting project metadata that is not in the B.C. manual.

For soils, some fields and definitions additional to B.C. are taken from the Expert Committee on Soil Survey 1982. This is indicated in the field descriptions. Terrain Classification is recorded according to the system used by the Yukon Geological Survey's Yukon Digital Surficial Geology Compilation (www.geology.gov.yk.ca/digital_surficial_data.html).

Data field descriptions are generally brief; they are designed for users who have some experience with collecting ecosystem data. For more information, please consult supporting references, such as Luttmerding et al. (1990), Green et al. (1993), Howes and Kenk (1997), and Expert Committee on Soil Survey (1998).

The data collected on the field forms is suitable to be entered and stored in the Yukon Biophysical Information System (YBIS). This is an Oracle web-based application of Yukon ecological plot data. The codes and standards described in this manual are also used in YBIS.

Acknowledgements

The compilers of this manual are very grateful to all the British Columbia ecologists who built that province's system and were willing to share it. Special thanks to Del Meidinger and Will MacKenzie for the training they provided and all the help they gave in making this a manual for the Yukon.

The core group who developed the Yukon version of the field manual and field forms were: Val Loewen, Karen McKenna, Catherine Kennedy, Nadele Flynn and Jennifer Staniforth. The late Charlie Roots of the Geological Survey of Canada adapted B.C. rock keys to Yukon geology. Stuart Alexander was instrumental in helping us clarify our thinking and maintain consistency in data collection, codes and standards.

1. Project

1. Project

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BIOPHYSICAL/ECOLOGICAL PROJECT DESCRIPTION

Project Name/Identification 1	
Start Date: YYYY-MM-DD 2	End Date: YYYY-MM-DD 3
Location 4	
Project Lead 5	Agency 6

Project Type 7

BI	Biophysical Inventory	
SV	Site Visit	
ABI	Aerial Biophysical Inventory	
HA	Habitat Assessment	

Plot Type 9

C20		Aerial	
C22.6		Nested	
R10		Irreg	
R20			

Plot Vegetation Percent Cover = 100 ☐ Yes ☐ No 8

Project Description 10

People and Roles 11

Name	Initials	Agency	Role(s)	Dates Present

Plant identification 12

YBIS Project ID 13

Pre-fieldwork Procedures

- Set procedures and standards before field work begins and coordinated between field crews. These attributes should be consistent:
  - project name/IDs
  - project types
  - plot number formats
  - GPS georeferencing standards: coordinate system, latitude/longitude format, datum, and precision standards
  - forms or data fields (which ones are mandatory, optional, or not required for the project objectives)
  - plot photo standards
  - plant collection procedures
- Determine the sampling protocol and assemble the required support material, such as aerial photos, imagery and/or maps.
- Fill out the Biophysical/Ecological Project Description Form.
- Assemble the required field equipment. See the checklist in Appendix 1.1.

General Field Procedure

- Choose the plot location by traversing the area and selecting a site that is representative of the type.
- Establish the location of plot boundaries. In most cases, a plot size of 300–400 m^2 is considered adequate; however, the plot size could be smaller in species-poor ecosystems (e.g., some wetlands, grasslands and dense forests). Plot shape can be rectangular, square or circular, but should be consistent within a project. Typical plot types are circles with a diameter of either 20 m (area = 314 m^2) or 22.6 m (area = 400 m^2), or a 20-m X 20-m rectangle.
- Traverse the plot. The site observer will note the site characteristics, and the vegetation observer will record the plant species and collect unknown species. Choose a representative spot, preferably at or near the centre of the plot, and dig a soil pit.
- Complete all the required boxes on the forms.
- Photograph a portion of the plot that crew members consider to be representative of the site. Try to include people in the photo or objects that indicate scale. Also photograph a representative area of ground cover. If you were transported to the site by helicopter, also take aerial photos of the site.
- Verify that all the required information has been collected. Strike through any fields that were not assessed.

Later, in the office

- Check again that you have collected all the required information and noted it on each form.
- Organize and label the project photos by plot.
- Enter plot information and upload photos into the Yukon Biophysical Information System.

Completing the Biophysical/Ecological Project Description Form

Here is a detailed description of the information that you should include in each box of the Biophysical/Ecological Project Description Form. Each numbered item here corresponds to the box with the same number on the annotated form on page 1-5.

1 Project Name/Identification

Provide a descriptive and individual name for the project. This could include location, type of project, year, agency, etc. The project name should clearly reflect the project.

2 Start Date

Provide the date when field work began. Use 4 digits for year (yyyy), 2 digits for month (mm), and 2 digits for day (dd).
Example: 2017/07/09 (for July 9, 2017).

3 End Date

Provide the date when field work ended. Use 4 digits for year (yyyy), 2 digits for month (mm), and 2 digits for day (dd).
Example: 2017/07/20 (for July 20, 2017).

4 Location

Describe the general location of the project. Ideally, reference a map or GIS file that shows the boundaries of the study area.

5 Project Lead

Provide the name of the project leader. For a multidisciplinary project, this may be the overall project manager or the leader of the biophysical component of the project. It should be the person with responsibility for the data collected.

6 Agency

Provide the name of the agency that is leading the project. Usually this will be the agency that is funding and managing the project.

7 Project Type

Select a project type:

Biophysical Inventory (BI)

This is a standard biophysical inventory project that usually includes the site description (Ecosystem Site Form), at least some soil and surficial geology characteristics (Soil Form), and a list of the plant species and their per cent

covers (Vegetation Form). The plots are usually chosen to be relatively homogeneous and representative areas of a vegetation or ecosystem type.

Site Visit (SV)

Complete plot data is not collected for a site visit project. A site visit project is for reconnaissance-level ecological plot collection; the level of detail can vary.

Aerial Biophysical Inventory (ABI)

This type of project collects data from the air, usually by helicopter. Site data is incomplete, and is usually limited to location (from a GPS) and perhaps estimates of slope and aspect. Vegetation data is limited to what can be identified from the air (often, only strata designations). This project type is typically for collecting data for land-cover classification and for quality assessment of ecosystem or land-cover maps.

Habitat Assessment (HA)

This type of project describes or evaluates wildlife habitat. A variety of sampling designs, including transects and quadrats, may be used. Generally, site conditions are described and vegetation is described by listing species and their per cent covers. The project may use the Ecosystem Site Form or other data forms.

8 Plot Vegetation Per cent Cover

For land-cover classification that uses satellite imagery, or for other similar projects, you should typically ensure that the total per cent for the plot equals 100. For ecosystem description or habitat assessment projects the total per cent cover of plot vegetation usually exceeds 100%. Check Yes or No on the form.

9 Plot Type (plot size/plot shape)

Jennings et al. (2009) describe two different approaches that are generally used to record vegetation: a) all vegetation assessed from a single entire plot; or b) subplots, where information is recorded from a set of smaller plots within the stand or within a large plot.

The single-plot approach is a rapid and efficient method of collecting floristic and physiognomic data for classification. The plot size should be small enough to be relatively uniform in habitat and vegetation, yet large enough to include most of the species that occur within the stand or type. This approach permits statistical assessments of inter-stand, but not intra-stand, variation.

Generally, in most temperate hardwood or coniferous forests, plots between 200 and 1,000 m^2 in size are adequate for characterizing both the herb and tree strata. Shrublands and herb-dominated stands require plots between 100 and 200 m^2. Studies of fine-scale variation — such as zonation around small wetlands or small sized bryophyte communities — may require even smaller plots, although these are generally not suitable for community classification.

There are many different approaches to subplots, depending on the objectives and study design. Methods with subplots can use quadrats, line transects or point transects of various sizes, lengths and shapes.

There are also hybrid or nested designs. One common approach is to nest plots of differing sizes for progressively lower vegetation strata, so that plot size decreases as the user moves from the tree strata to the shrub and herb strata. This method is efficient for quantitative measures of abundance, especially for common species, but there is a risk of under-representing the floristic richness of the lower strata, which tend to be more floristically diverse.

Wherever possible, keep plot size and shape constant within a project.

For biophysical inventory projects that use a single plot, recommended plot types include circles with a diameter of either 20 metres (m) or 22.6 m, or a 20-m x 20-m rectangle.

Use one of the following codes or provide a description of the size and shape of the plot in order to determine the area sampled:

C20	circle: diameter = 20 m (area = 314 m^2)
C22.6	circle: diameter = 22.6 m (area = 400 m^2)
R10	rectangle: 10 x 10 m (area = 100 m^2)
R20	rectangle: 20 x 20 m (area = 400 m^2)
Aerial	approximately 100 x 100 m, estimated from an aircraft (area approximately 1,000 m^2)
Nest	nested design (outline the sampling protocol in Box 10
Irreg	irregular (other plot sizes and shapes): provide plot dimensions or describe the sampling protocol in Box 10

10 Project Description

Describe the objectives of the project, information about the sampling design, criteria for stand selection, and any other information that might be relevant to users of the data.

11 People and Roles

Record the names, full initials, the agency with which each individual is associated, his or her roles in the project, and the dates present in the field. Several tasks are included:

Plot	the person who was mainly responsible for describing the site conditions and filling in the Ecosystem Site Form
Veg	the person who identified plant species and estimated cover
Soil	the person who described the soil
Photos	the person who took plot photos
Nav	the person who navigated to the aerial plots
Rec	the person who recorded data (usually related to vegetation) called by the vegetation assessor (for aerial plots)
Other	people without a specific role in the biophysical data collection, but present in the field crew (they may have collected other types of biological inventory data)

12 Plant Identification

List the experts who identified and/or collected plant specimens. Different experts may be used to identify different plant groups.

If known, list the sources and/or keys used to identify plants. Different sources may be used for different plant groups.

13 YBIS Project ID

When you enter the data from your project into YBIS, the system will generate a YBIS identification number for the project. Record this number here to assist with locating the project data.

Appendix 1.1 Field Equipment Checklist

General

- Field manual
- Data sheets
- Felt pen and pencils
- Field notebook
- Digital camera

Site

- Regional field guides
- GPS
- Compass
- Clinometer

Vegetation

- Plant identification guides
- Hand lens
- Collection bags

Soils

- Shovel
- Soil auger
- Metric measuring tape
- Trowel or soils knife
- Plastic bags for soil samples
- pH kit and 10% HCl
- Water bottle for texturing
- Munsell Color Charts

Optional soils equipment

- Cloth measuring tape and index cards for photos
- White golf tees (for marking horizons)
- Hand lens
- Pruners
- Folding saw
- Rock hammer
- Crowbar or pick

- Small 2-mm sieve
- Upland and/or wetland augers
- Umbrella or tarp
- J-cloth
- Hofer probe
- Depth to permafrost probe
- References

Mensuration

- Vertex or other height tools
- Diameter tape
- Releskop or prism set
- Increment borer
- Straws and tape (for transport of cores)
- Flagging tape (for marking trees)
- Critical distance tables

2. Site

2. Site

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ECOSYSTEM SITE FORM

Project 1

Plot No. 2

3 Plot Type ☐ Standard ☐ Noveg ☐ Irreg

Date: YYYY-MM-DD 4

Observer(s) 5

Ecoregion 6

Airphoto 7

NTS Map 8

YBEC 9

Location 10

11 Lat N

Long W

Source NGPS ☐

Accur (m) 12

Datum WGS84 ☐

UTM Zone

Northing

Easting

Site Diagram 33

Site Description

Elev (m) 13

Source NGPS ☐ 14

Aspect (°) 15

Slope % 16

Surface Shape 17

Microtopography Type: 18

Intensity: 19

Meso Position 20

Structure 21

Stand Age 22

Flood Regime 23

SMR 24

SNR 25

Disturbance None _____ 26

Plot Representing 27

Exposure Type 28

Ecosite 29

Veg Association 30

Complex No. Component: 31

Wetland (CWCS)

Class Form Subform Type Subtype 32

Comments 34

Photos 35

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Field Procedure

Getting started in the field

- Record the date, project ID, plot number, surveyor name, general location and, if known, the ecoregion and National Topographic System (NTS) map sheet.
- If air photos are available, record the flight line and photo numbers.
- Establish the plot centre and georeference it with a GPS; record latitude and longitude and location metadata.

Measure and assess

- Determine the elevation, slope and aspect.
- Traverse the entire plot systematically, observing the position of the plot relative to the surrounding landscape and micro-topographic features. Record the meso-slope position and surface topography.
- Determine the flood regime and assess the exposure type, if any.
- Assess the structure based on site factors and vegetation.
- Note any evidence of site disturbance and assess the exposure type, if any.
- Integrate site, soil, and vegetation factors and work through Keys 6.2–6.6 to determine soil moisture and soil nutrient regimes. Also consult keys or guidebooks (if they are available) to determine the bioclimate unit and ecosite type.
- Sketch the site diagram.
- Take several plot photos. Photos should show a representative portion of the site and a representative portion of ground cover. If possible, they should also place the site in a landscape context. It is useful to have people or other indicators of scale in the photos.

Completing the Ecosystem Site Form

These numbered items refer to the circled numbers on the Ecosystem Site Form (see facing page). See the Field Procedure subsection above for the recommended sequence for completing the form.

1 Project

Enter the same project name/ID that you used on the Biophysical/Ecological Project Description Form.

2 Plot Number

Assign a unique plot number (numeric or alpha-numeric) to each site, and record it on the Ecosystem Site Form. Record this number on all other forms you complete for the plot.

3 Plot Type

For more information, refer to Plot Type in the section on the Biophysical/Ecological Project Description Form (see Section 1, box 9). Check one of the following:

Standard	if the plot is the standard one chosen for the project
Noveg	if no vegetation data was recorded at the site
Irreg	if irregular plot shapes/sizes are needed for ecosystems that cannot be captured in the standard plot type (e.g., zones in wetlands or riparian areas); record the dimensions of the irregular plot type, if known

4 Date

Provide the date when field work began. Use 4 digits for year (yyyy), 2 digits for month (mm), and 2 digits for day (dd).
Example: 2017/07/09 (for July 9, 2017).

5 Observer(s)

Record the name or full initials of the person responsible for filling out the form. The initials of other team members can be included in parentheses.

6 Ecoregion

Record the name and/or number of the ecoregion where the plot occurs. A map of ecoregions, including ecoregion number codes, can be found at www.env.gov.yk.ca/animals-habitat/elcprogram_projects.php.

Note that there have been some changes to ecoregion boundaries. Consult the Ecological and Landscape Classification (ELC) program for the most up-to-date revisions. For more details and contact information visit www.env.gov.yk.ca/animals-habitat/elcprogram.php.

7 Air Photo

Record the air photo flight line and photo number, using the format of flight line plus photo number, separated by a dash (e.g., A22927–204).

8 National Topographic System (NTS) map

Record the NTS 1:250,000 map sheet and the 1:50,000 map sheet.

9 Yukon Bioclimate Ecosystem Classification (YBEC)

Enter the code for the bioclimate zone and subzone. The best sources for this information are regional field guides to site identification or maps produced by the Ecological and Landscape Classification Program of Environment Yukon.

See the Yukon Ecological and Landscape Classification and Mapping Guidelines (Version 1.0) for more information: www.env.gov.yk.ca/animals-habitat/documents/ELC-classification-mapping-guidelines-version1.0.pdf.

10 Location

Describe the location of the plot at a regional and local scale, relative to natural features such as mountains or bodies of water and to permanent structures such as road signs. In addition, it may be useful to describe the plot's relationship to adjacent plots. This description should allow other users to locate the general position of the plot on a map and should help to locate the plot in the field.

11 Latitude/Longitude or UTM

Determine the precise plot location and record its latitude and longitude (degrees, minutes, decimal seconds or decimal degrees) or UTM zone, northing and easting. Latitude/longitude is the preferred system.

12 Coordinate Metadata

Describe the source of your coordinate data, its accuracy and the map datum used.

Source

Check the box for "NGPS" (navigational uncorrected GPS) or enter one of the following codes to describe how you located your plot or the source of your location coordinates:

DGPS	differentially corrected GPS
MAP	coordinates from a map with scale unknown
MAP 1000K	coordinates from a location plotted on a 1:1,000,000 scale map
MAP 250K	coordinates from a location plotted on a 1:250,000 scale map
MAP 50K	coordinates from a location plotted on a 1:50,000 scale map
IMAGE	coordinates obtained from satellite imagery
ORTHOPHOTO	plot marked on an aerial photo or orthophoto

Accuracy

This refers to the likely error/uncertainty of the coordinates in terms of +/- a certain radius. For locations determined from maps, it refers to the minimum mapping unit (the number of map units below which a narrow feature can be reasonably represented by a line and an area by a point for a given map scale).

From the GPS, record the estimated georeferencing accuracy in metres.

Datum

A geodetic datum is the tool used to define the shape and size of the earth and to determine the reference point for the various coordinate systems used in mapping the earth. The two most common datums in use today are World Geodetic System of 1984 (WGS84) and North American Datum of 1983 (NAD83). North American Datum of 1927 (NAD27) was the primary geodetic datum and geographic coordinate system used during the mid-20th century. Many NTS maps are referenced to NAD27.

Set your GPS to WGS84. Check "Datum WGS84" or enter one of the following codes:

UNK	unknown
NAD83	North American Datum of 1983
NAD27	North American Datum of 1927

13 Elevation (m)

Record the elevation in metres.

14 Elevation Source

Check "NGPS" (navigational uncorrected GPS) or enter one of the following codes:

UNK	unknown
DGPS	differentially corrected GPS
GPS ALT	GPS altimeter
ALT	other altimeter, e.g., helicopter

15 Aspect (°)

Record the orientation of the meso slope in degrees. Measure with a compass. Record due north as 0° and not applicable (N/A) as –1, or leave blank.

16 Slope (%)

Slope (%) is the grade of the slope. Grade is the rise as a percentage of the run. Grade ranges from 0 (zero) to infinity. A 45-degree slope has a 100% grade. A 90-degree slope has an infinite grade.

Record per cent slope gradient, measured with a clinometer or similar instrument.

Slope (degrees)

If you are not able to record per cent slope, then record slope in degrees and note the unit. The YBIS database cannot accept infinite grades; slope in degrees is limited to values between 0 and 89.

If you don't have a clinometer or other instrument for measuring slope, then visually estimate the slope and enter one of the values shown in Table 2.1, based on your estimate. Note in Comments (Box 34) that you have based slope value on an estimate.

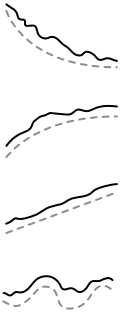
Table 2.1 Slope values

0	level	≤2%
6	gentle	>2–10%
20	moderate	>10–30%
40	strong	>30–45%
70	steep	>45%

Note: These values were adapted from SCWG 1998.

17 Surface Shape

Note the general surface shape at the meso scale and record it (see Figure 2.1).



CV concave: surface profile is mainly hollow or bowl-shaped

CX convex: surface profile is mainly rounded or sphere-shaped

ST straight: surface profile is linear, either flat or sloping in one direction

UN undulating: surface profile is non-linear and rolling

Figure 2.1 Illustration of surface shapes

Note: The black line represents the actual surface; the grey broken line represents the generalized surface shape.

18 Microtopography: Type

Describe the very small variations in the height and roughness of the ground surface. Select the predominant type of microtopography from Table 2.2.

Table 2.2 Microtopography: type

CHA	channelled	incised water tracks or channels
DOM	domed	raised bogs
GUL	gullied	geomorphic ridge and ravine patterns
HMK	hummocks	mounds composed of organic materials
LOB	lobed	solifluction lobes
MND	mounded	mounds composed of mineral materials
NET	nets	net vegetation patterns from freeze-thaw action in alpine or subarctic terrain
POL	polygonal	polygonal patterns associated with permafrost
RIB	ribbed	wetland pattern with raised ridges perpendicular to direction of water flow
SMO	smooth	surface relatively flat
TUS	tussocks	associated with tussock-forming graminoids
TER	terraced	small terraces across a slope, often caused by wildlife trails

19 Microtopography: Intensity

Describe the size and frequency of microtopographic features. From Table 2.3, select the level that best represents what you see.

Table 2.3 Microtopography: intensity

M	micro	low-relief features (recognizably >0 but <0.3 m high), with minimal effect on vegetation
SL	slight	prominent features (0.3–1 m high) spaced >7 m apart
MD	moderate	prominent features (0.3–1 m high) spaced 3–7 m apart
ST	strong	prominent features (0.3–1 m high) spaced 1–3 m apart
SV	severe	prominent features (0.3–1 m high) spaced <1 m apart
E	extreme	very prominent features (>1 m high) spaced >3 m apart
U	ultra	very prominent features (>1 m high) spaced <3 m apart

20 Mesoslope Position

Note the position of the plot relative to the local catchment area (see Figure 2.2), which is often a slope segment at the macro scale. This descriptor is at the level of the landscape that affects surface water flow (Table 2.4).

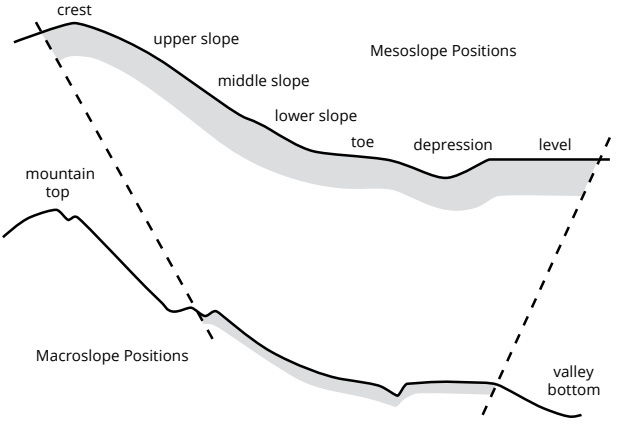


Figure 2.2 Mesoslope position

Table 2.4 Mesoslope position

CR	crest	the generally convex uppermost portion of a hill; usually convex in all directions with no distinct aspect
US	upper slope	the generally convex upper portion of the slope immediately below the crest of a hill; has a specific aspect
MS	middle slope	area between the upper and lower slope; the surface profile is generally neither distinctly concave nor convex; has a straight or somewhat undulating surface profile with a specific aspect
LS	lower slope	the area toward the base of a slope; generally has a concave surface profile with a specific aspect
T	toe	the area demarcated from the lower slope by an abrupt decrease in slope gradient; seepage is typically present
D	depression	any area concave in all directions; may be at the base of a meso-scale slope or in a generally level area
L	level	any level meso-scale area not immediately adjacent to a meso-scale slope; the surface profile is generally horizontal and straight with no significant aspect
G	gully	A narrow, steep-sided channel formed by running water; usually dry except after periods of heavy rainfall or after the melting of snow or ice

21 Structure

Describe the appearance of a stand or community using the characteristic life form (stratum) and certain physical attributes. Structure can depict stand development features along a trajectory that is characteristic for the vegetation (e.g., development of a forest type), or a certain type of vegetation (e.g., herb community).

As you assess community structure, you should consider structural features and age criteria. Modifiers for stand composition and canopy structure are available to help describe stand conditions (see below). When recording, separate structural (number) codes from modifier (letter) codes with a slash (e.g., 7a/Cm; 3b/B).

Choose from the following structural codes:

1. **Non-vegetated** – Very recent disturbance (e.g., fire or flood) and no vegetation or less than 5% vegetation.
2. **Sparse/cryptogram** – Either the initial stages of primary succession or a cryptogram community maintained by environmental conditions (e.g., bedrock, talus). Sparse tree, shrub and herb cover. Either sparsely vegetated overall (low cover of vascular plants and cryptograms, if present), or dominated by cryptograms.

2a	**Sparse**	5–10% vegetation cover
2b	**Bryoid**	bryophyte-dominated
2c	**Lichen**	lichen-dominated

3. **Herb** – Early successional stage (e.g., post-fire forest succession) or a herb community maintained by environmental conditions or disturbance. Vegetation dominated by herbs (forbs, graminoids, ferns), although if the site overall is sparsely vegetated, herb cover can be low as long as herbs characterize the vegetation. Trees and shrubs are usually sparse or absent; however, shrub cover and stature (compared to herb cover and stature) determine whether the site is considered herbaceous.

3a	**Forb-dominated**	includes non-graminoid herbs and ferns
3b	**Graminoid-dominated**	includes grasses, sedges, reeds and rushes
3c	**Aquatic**	floating or submerged plants dominate
3d	**Ground shrub-dominated**	dominated by dwarf woody species such as kinnikinnick or dwarf willows

4. **Shrub** – Early successional stage of a forest or a shrub community maintained by environmental conditions or disturbance. Dominated either by shrubby vegetation, including tree seedlings/saplings; or, if sparsely vegetated overall, dominated by shrubs, which characterize the community as a shrubland.

   4a Tall shrub dominated by woody plants >2m tall with diameter at breast height (dbh) ≤7 cm

   4b Low shrub dominated by woody plants <2 m tall

5. **Treed: pole/sapling** – Trees >2 m tall and with dbh >7 cm, typically densely stocked. Self-thinning and vertical structure are not yet evident in the canopy. Younger stands are vigorous (usually >15 to 20 years old); older stagnated stands (up to 100 years old) are also included; time since disturbance usually <40 years; up to 100+ years for dense (5,000–15,000+ stems per ha) stagnant stands.
6. **Treed: young forest** – Self-thinning has become evident and the forest canopy has begun to differentiate into distinct layers. A more open stand than at the pole/sapling stage.
7. **Treed: mature forest** – Trees established after the last stand-replacing disturbance have matured; a second cycle of shade-tolerant trees may have become established; shrub and herb understoreys become well developed as the canopy opens up.
8. **Treed: old forest** – Stands of old age with complex structure; patchy shrub and herb understoreys are typical; regeneration is usually of shade-tolerant species with composition similar to the overstorey. Fire-maintained stands may have a single-storey appearance.
9. **Treed: very old forest** – Very old stands with complex structure, with abundant large trees, snags and coarse woody debris (CWD); snags and CWD occurring in all stages of decomposition; stands are comprised entirely of shade-tolerant overstorey species, with well-established canopy gaps.

Structural stage modifiers

Modifiers for stand composition and canopy structure can be used to provide additional information to characterize stands (see Tables 2.5 and 2.6); e.g., 7/Ct describes a two-storey, mature coniferous forest.

Stand composition modifiers (stages 5 to 9 only)

A description of the leaf types of trees in a stand (Table 2.5) provides general information about the appearance and structure of the stand and is helpful as a broad descriptor of stand composition.

Table 2.5 Stand: leaf type

C	coniferous	>75% of total tree cover is coniferous
B	broadleaf	>75% of total tree cover is broadleaf
M	mixed	neither coniferous or broadleaf account for >75% of total tree cover

Canopy structure modifiers (stages 5 to 9 only)

Overstorey tree structure can vary within a structural stage due to edaphic differences or disturbance history (Table 2.6).

Table 2.6 Stand: structure

s	single-storied	• closed or open forest stand dominated by the overstorey crown class (dominant and tall, main canopy trees) • intermediate and suppressed trees comprise less than 20% of all combined crown classes
t	two-storied	• closed or open forest stand co-dominated by distinct overstorey and intermediate crown classes • the suppressed crown class is lacking or comprises less than 20% of all combined crown classes
m	multi-storied	• closed or open forest stand with all crown classes well represented • each of the intermediate and suppressed classes comprise greater than 20% of all combined crown classes

22 Stand Age

Record the approximate age of the stand based on tree cores, inventories or other sources of information, where appropriate.

23 Flood Regime

Flooding is defined as immersion of the substrate by water. Flood regime can be assessed according to yearly frequency and seasonal duration, if known. A range of flood regimes is possible; choose the most severe. Use code letters for frequency (Table 2.7) and duration (Table 2.8). For more information see Key 6.17: Flood Hazard Characteristics.

Table 2.7 Flood frequency

A	annual	at least once per year
F	frequent	every 2–5 years
O	occasional	>5-year interval between flooding events
R	rare	only during extreme events
X	never	never floods

Table 2.8 Flood duration

W	winter	winter flooding
P	permanent	permanent flooding during growing season
E	extended	<1 month not flooded during last part of growing season
M	moderate	flooded for 1–3 months
T	temporary	flooded 7–30 days during the growing season
B	brief	flooded <7 days during the growing season
D	diurnal (daily)	includes tidal flooding and flooding that occur on a daily basis, such as that related to glacial melt due to warm daytime temperatures

24 Soil Moisture Regime (SMR)

This indicates on a relative scale the moisture available for plant growth. Available moisture varies throughout the year; it is assessed on the basis of the growing season as a whole, not at any particular time. SMR is correlated with micro-variations in topography and climate, slope position, slope gradient, soil drainage, depth of surface humus layers, soil texture (including the content of coarse fragments), soil depth, and the presence of an impermeable layer, including permafrost. In general, the most influential factor is position on a slope. On ridges and upper slopes precipitation is the main source of water and the soil retains little if any moisture. Middle slopes receive some seepage from upslope, in addition to precipitation. Lower slopes, flats and depressions are usually enriched by a temporary or permanent water flow.

SMR classes and identifying characteristics are shown in Table 2.9. Indicator plants can also be used for assessing soil moisture regime; however, Yukon has not documented relationships between vegetation indicators and the range of edaphic conditions within its bioclimate zones.

See Key 6.1 for a list of definitions and Key 6.2 and 6.3 for help choosing a code (0 to 9) from Table 2.9.

Table 2.9 Soil moisture regime: codes and classes

Code	Class	Description	Water source
0	very xeric	water removed extremely rapidly in relation to supply; soil is moist for a negligible time after precipitation	precipitation
1	xeric	water removed very rapidly in relation to supply; soil is moist for brief periods following precipitation	precipitation
2	subxeric	water removed rapidly in relation to supply; soil is moist for short periods following precipitation	precipitation
3	submesic	water removed readily in relation to supply; water is available for moderately short periods following precipitation	precipitation
4	mesic	water removed somewhat slowly in relation to supply; soil may remain moist for a significant but sometimes short period; available soil moisture reflects climatic inputs	precipitation in fine- to moderate- textured soils; limited seepage in coarse-textured soils
5	subhygric	water removed slowly enough to keep soil wet for a significant part of the growing season; some temporary seepage and possible mottling below 20 cm	precipitation and seepage
6	hygric	water removed slowly enough to keep soil wet for most of growing season; permanent seepage and mottling; gleyed colours common	seepage
7	subhydric	water removed slowly enough to keep the water table at or near the surface for most of year; gleyed mineral or organic soils; permanent seepage <30 cm below surface	seepage or permanent water table
8	hydric	water removed so slowly that water table is at or above soil surface all year; gleyed mineral or organic soils	permanent water table
9	aquatic	water is well above the sediment bed all year	water body

25 Soil Nutrient Regime (SNR)

The soil nutrient regime indicates on a relative scale the nutrients available for plant growth (with an emphasis on soil pH and exchangeable cations, e.g., Ca, Mg, Na and K). SNR integrates many environmental and biotic parameters, which in combination determine the actual amount of nutrients available.

It is a dynamic property characterized by inputs and losses, with seasonal variations. The aim is to provide a qualitative assessment of the available nutrient supply for a site that characterizes it relative to all other sites within the same bioclimatic unit. In general, biomass production is expected to increase from oligotrophic to eutrophic nutrient regimes under particular soil moisture and climatic conditions. Enter a code (A–F) for SNR. Refer to Table 2.10 for some criteria for SNR classes, and use the definitions (Key 6.1) and Keys 6.4–6.6 for additional assistance.

Table 2.10 Classes and relationships: SNR and site factors

	Oligotrophic	Submesotrophic	Mesotrophic	Permesotrophic	Eutrophic	Hypereutrophic
	A very poor	B poorer than average	C medium	D richer than average	E very rich	F saline
Available nutrients	very low	low	average	plentiful	abundant	excess salt accumulations
Humus form	Mor	Mor	Mor, Moder	Moder	Moder, Mull	
A horizon	Ae horizon present	Ae horizon present	A horizon present	A horizon present, Ah horizon present	Ah horizon present	
Organic matter content	low (light coloured)	low, medium (intermediate in colour)	medium (intermediate in colour)	medium, high (dark coloured)	high (dark coloured)	
Soil depth	extremely shallow	very shallow to deep	very shallow to deep	very shallow to deep	very shallow to deep	
Soil texture	coarse textured	coarse textured, medium to fine textured	medium to fine textured	medium to fine textured	medium to fine textured	
% Coarse fragments	high	high, moderate to low	moderate to low	moderate to low	moderate to low	
Parent Material Minerology	base-low	base-low, base-medium	base-medium	base-medium, base-high	base-high	
Soil pH	extremely-moderately acid	moderately acid-neutral	moderately acid-neutral	slightly acid-mildly alkaline	mildly alkaline to alkaline	mildly alkaline to alkaline
Water pH (wetlands)	<4–5	4.5–5.5	5.5–6.5	6.5–7.4	7.4+	
Seepage			temporary ≥ permanent	temporary ≥ permanent	temporary ≥ permanent	

26 Disturbance

Note any events that have caused vegetation and soil characteristics to differ from those expected for the site. Be as specific as possible, using the codes listed below for the category and specific types of disturbance. If existing codes are inadequate, enter an "X" and explain under Comments (box 34 on the form).

Check "None" if there are no plot disturbances.

A. Atmosphere-related effects

Use these codes if causative factors are no longer in effect or are isolated incidents. If effects are ongoing, code as an Exposure Type (see Item 28):

- **co** extreme cold
- **ht** extreme heat
- **gl** glaze ice
- **ha** severe hail
- **sn** heavy snow
- **p.** atmospheric pollution
- **w.** windthrow

B. Biotic effects

- **b.** beaver tree-cutting
- **d.** domestic grazing/browsing
- **w.** wildlife grazing/browsing
- **e.** excrement accumulation (other than that normally associated with grazing/browsing)
- **ki** insect kill
- **in.** insect infestation
- **p.** disease
- **t.** turbation
- **v.** aggressive vegetation, including invasive species

D. Disposals

- **c.** chemical or oil spill or disposal
- **e.** effluent disposal
- **g.** domestic garbage disposal

F. Fires

- **g.** ground fire – burned or charred organic material below surface; generally caused by smouldering, not active flaming
- **c.** crown fire (recent, severe) – presence of burned organic matter, bare mineral soil, black snags or downed trees, charred shrub/tree stumps
- **r.** surface fire (recent, light/moderate) – surface vegetation burned but not completely consumed; trees may be scarred
- **s.** crown fire (older, severe) – regenerating canopy, understorey recovered; fire-killed snags or downed trees present; carbon in soil profile
- **i.** surface fire (older, light/moderate) – some tree scarring but little evidence of fire in understorey
- **j.** burning of logging slash

L. Vegetation removal

- **t.** cutlines
- **l.** land clearing (includes abandoned agriculture)

Timber harvest:

- **a.** patch cut system – openings of less than 1 ha, with the intent for each opening to be managed as a distinct even-aged opening

  wr with reserves – forested patches or individual trees retained during harvesting for at least one rotation
- **c.** clearcut system – cutting the entire stand of trees at planned intervals

  wr with reserves (patch retention) a variation of clearcutting in which trees are retained either uniformly or in small groups
- **e.** selection system – removal of mature timber, either as single scattered individuals or in small groups at relatively short intervals, repeated indefinitely, where an uneven-aged stand is maintained
- **gr.** group selection – removal of groups of trees over short intervals to develop a mosaic of at least three or more age classes throughout the stand
- **si.** single tree – removal of individual trees and small clumps of trees of all size classes, more or less uniformly throughout the stand
- **st.** strip – harvesting in uniformly spaced linear strips; over the regeneration period, strips are added beside the initial strips until the entire block is harvested
- **s.** shelterwood system – removal of mature trees in a series of cuts to achieve a new even-aged stand under the shelter of remaining trees

M. Plant or site modification effects

- **c.** herbicide use (chemical)
- **f.** fertilization
- **i.** irrigation
- **h.** seeded or planted to herbs or shrubs
- **t.** planted or seeded to trees

P. Gathering or removal of plant products

- **b.** berries
- **f.** firewood gathering
- **m.** mushrooms
- **o.** moss
- **s.** shrubs and/or trees
- **x.** other: specify under Comments (box 34)

S. Soil disturbance

- **a.** cultivation (agricultural)
- **c.** compaction
- **r.** roadbed, abandoned
- **t.** railway, abandoned
- **e.** excavation
- **m.** mining effects
  - **pt** placer tailings
  - **rq** rock quarrying (including open-pit mines)
  - **ta** tailings
- **p.** mechanical site preparation

T. Terrain-related effects

- **a.** avalanche
- **d.** recent deglaciation
- **e.** eolian (active deflation or deposition)
- **s.** terrain failures (active/recent slumps, slides, solifluction, etc.)
- **v.** volcanic activity

W. Water-related effects

- **i.** inundation (including temporary inundation resulting from beaver activity)
- **s.** temporary seepage (usually artificially induced; excludes intermittent seepage resulting from climatic conditions)

d. water table control (diking, damming)

e. water table depression (associated with extensive water extraction from wells)

X. Other

For other disturbance types, enter "X" and describe in Comments (box 34)

27 Plot Representing

Detail the important characteristics of the sampled ecosystem. This statement should provide a concise description that lists the main attributes of the site, such as these examples:

- 30-year-old Pl stand; kinnikinnick/lichen on FG terrace
- Productive reference Sw/willow stand on warm aspect
- Mature Sw/feathermoss on floodplain

28 Exposure Type

Note any significant localized atmosphere and climate-related factors that are reflected in atypical soil and/or vegetation features (Table 2.11). If existing codes are inadequate, code as "Other" and describe. If there is no evidence of exposure to anomalous conditions, write "NA."

Table 2.11 Exposure type

AT	atmospheric toxicity	where highly acid or alkaline precipitation or chemically toxic fumes from industrial plants affect soil chemistry, morphology, and the type of growth form of vegetation: • soil indicators: unusually high or low pH value; accumulations of chemicals normally either absent or present only in small quantities • vegetation indicators: defoliated areas; diseased or dead standing species; presence of several species tolerant of abnormal chemical accumulations
AU	aufeis (accumulation of layered ice)	forms along stream and river valleys during the winter, when upwelling or overflowing water is blocked by ice, causing a small incremental rise in the local water table until water discharges along the bank and over the top of the previously formed ice; successive ice layers can lead to aufeis accumulations that are several metres thick; aufeis often melts over the summer, although sometimes not until late summer, and it often forms in the same place year after year: • indicators include significant bare ground, sparse vegetation and/or different species than expected

Table 2.11, continued

CA	cold air drainage	downslope areas that cold air passes through; these often grade into frost pockets, but cold air does not accumulate in them: • soil and vegetation indicators are similar to those for "FR," but the influence of cold temperature is usually not as pronounced as in FR
FR	frost	cold air accumulation in depressions and valley bottoms associated with extensive nighttime surface cooling and/or cold air drainage; frost pockets are often surrounded by slopes leading up to the higher elevations where the cold air originates: • soil indicators: wet conditions and/or deep organic accumulations • vegetation indicators: species normally found in colder conditions than those in the general area; the presence of frost-hardy shrubs and herbs; abundant frost cracks on the trunks of trees
IN	insolation	sites subjected to heat from the sun to a significantly greater degree than on associated flat or gently sloping ground; generally found on SE, S and SW aspects with slopes >20 to 50%, depending on climate: • soil indicators: weaker than average soil profile development, reflecting a drier environment; or occasionally, soil profiles with darker-coloured surface horizons • vegetation indicators: heat-tolerant species; reduced tree growth; slow or sparse tree regeneration; open crown cover, and tree regeneration in distinct age groups, reflecting a history of wetter and drier years
RN	localized rain shadow	valleys that are protected from the prevailing winds so that they are significantly drier than surrounding areas: • soil indicators: weaker soil development resulting from less precipitation, or different soil development because of significantly different vegetation • vegetation indicators: plant communities or species that indicate a drier local climate
SA	salt spray	areas that receive salt spray from a marine environment, affecting the type and growth of the vegetation and the chemical and morphological characteristics of the soil: • soil indicators: high pH and conductivity, presence of white salt accumulations as distinct crystals, and weak profile development • vegetation indicators: an abundance of salt-tolerant species, and slow growth of many species

Table 2.11, continued

SF	freshwater spray	areas adjacent to waterfalls and large rapids that receive spray from rushing water: • soil indicators: moister soils • vegetation indicators: species characteristic of moister sites are present or more abundant than outside the spray area
SN	snow accumulation	areas that receive significantly more snow than surrounding areas: • soil indicators: weaker soil development resulting from a shorter snow-free period, or moister soils because of the longer snowmelt period • vegetation indicators: species adapted to greater snow accumulations (i.e., resistant to breakage) or a shorter growing season; or vegetation displaying the effects of a shorter growing season compared to adjacent areas; or species or communities that indicate moister conditions due to greater snowmelt
WE	winter exposure	areas that are influenced by winter exposure due to minimal or no snow cover, resulting in dessication of and frost damage to plants (e.g., on some south-facing slopes after winter/early spring thaws, terrain crests and mountaintops)
WI	wind	sites directly influenced by strong winds; e.g., on exposed mountaintops, along seashores or large lakes, or where wind is funnelled because of the convergence of valleys in the direction of wind flow: • soil indicators: weak soil development because of eroded profiles; evidence of soil erosion on windward side and deposition on lee side; formation of dunes • vegetation indicators: greatly reduced height and gnarled growth form, with treetops and branches oriented downwind; wind-shorn thickets of trees or shrubs (wind-shorn surface of vegetation follows the outline of any object that provides wind protection)
X	other	describe under Comments (box 34)

29 Ecosite

An ecosite is the local (or site-level) classification unit of the Yukon Ecological and Landscape Classification Framework. Ecosites are classified based on an approach that considers climate and site (terrain, soils, landforms) and vegetation, with an emphasis on relatively stable and enduring landscape position and terrain features. Where ecosites have been defined, make a preliminary field assessment of the type and record it here.

30 Vegetation Association

A vegetation (veg) association is a classification unit that is "defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions, and physiognomy" (Faber-Langendoen et al. 2014). A subassociation is a division of an association; generally, it is used to characterize variation in species composition that is not considered significant enough to be an association.

Vegetation associations for treed, shrub, grassland and wetland communities across Yukon are being described. Consult regional ecosite guides or contact the Ecological and Landscape Classification Coordinator for the most current classification.

31 Complex

This section of the form is designed specifically for wetlands or frost-affected patterned ground, where small-scale changes in site conditions result in significantly different vegetation. Here are some examples of complexes:

- strings and flarks in fens;
- zones in a marsh wetland, such as marginal shrub swamp, emergent sedge, emergent horsetail or submergent aquatic; and
- troughs and centres of high-centred polygons.

Enter a number for the complex and then separately number/describe each component. Components can be letters or numbers and the components can be named (e.g., Complex #1, Component: string; Complex #1, Component: flark). There are no standards for component naming. If possible, provide the percentage of the complex that each component comprises.

32 Wetland (CWCS)

If the site is a wetland, classify it (class, form, subform, type and subtype) according to the Canadian Wetland Classification System, or CWCS (Warner and Rubec 1998).

33 Site Diagram

A cross-section diagram of plot location in relation to the surrounding landscape is often most useful, although a plan view is helpful for showing the distribution of plots within a wetland complex or other areas of relatively level ground. Use the diagram to provide additional information about site features and location relative to adjacent plots or to assist in locating the plot again. You can depict stand structure, mesoslope position, physical features of the surrounding landscape, and plot location relative to identifiable landmarks such as bodies of water or roads (Figure 2.3).

Figure 2.3 Examples of site diagrams

Source: Modified from B.C. Ministry of Forests and Range and Ministry of Environment 2010; used with permission.

34 Comments

Record wildlife observations and any additional information that further characterizes the site, assists in finding the plot again, or explains any unusual entries elsewhere on the form.

35 Photos

Record the photo number or any information that will assist with determining the correct photos for the site, such as the number of photos taken per site.

3. Soil

3. Soil

Yukon
Environment

SOIL FORM

Project: 1	Date: YYYY-MM-DD 2	Observer(s) 3	Soil Classification 4	Plot No. 5

Profile Diagram 34

TERRAIN

Texture	Surficial Material	Surface Express.	Geomorph Process
1.	1.	1.	1.
2. 6	2.	2.	2.
3.	3.	3.	3.

Bedrock 7	Rooting Zone	Depth to (cm)	
Humus Form/Phase 8	Depth 13	Min. soil	Bedrock
Hydrogeo 9	Particle Size	Water table	Mottles
Water Source 10	Upper: Lower: 14	Permafrost	Other Restrict.
Drainage 11	Root Restrict Layer	$CaCO_3$	
pH Method Org: Min: 12	Type: Depth: 15	Seepage 16	

ORGANIC HORI/LAYERS

Hori/Layer	Depth	Structure Degree	Structure Kind	Structure vPost	Myc. Ab.	Fecal Ab.	Roots Abund Size	pH	Additional Info
17	18		19		20	21	22	23	24

MINERAL HORI/LAYERS

Hori/Layer	Depth	Colour	Asp	Roots Abund Sz	Text	% Coarse Fragments CF	G	P	C	B	Shape	Structure K	C	Gr	pH	Additional Info
25	26	27		28	29			30					31		32	33

Field Procedure

Getting started

- Locate plot boundaries, assess variability, and select pit location(s).
- Excavate pit (generally 50 to 75 cm deep), leaving the face and sides undisturbed around the ground surface.
- While excavating, observe factors such as these:
  - organic horizon depths and fabric
- mineral horizon depths, colours, structure and textural changes
  - percentage and shape of coarse fragments
  - rooting abundance, depth and restrictions
  - mottling, water seepage or water table
- Set out notes, forms, and soil description tools
- Clean off the face of the pit from top to bottom:
  - note horizon changes and mark with knife indentations or golf tees
  - photograph clean face and general terrain
  - collect soil texture samples from bottom to top and put them aside

Record and classify

- Record the date, project, plot number, names of observers, and method of pH measurement.
- Designate horizons on the Soil Form (organic and mineral). For each horizon (depending on survey objectives/requirements), carry out these tasks:
  - record average, starting and ending depths or minimum and maximum thicknesses of extensively cryoturbated horizons
  - record pH, colour, roots and horizon boundaries
  - for organic horizon, record fabric, mycelia and faecal abundance, and material character/composition
  - for mineral horizons, hand-texture soil samples; record per cent, shape and lithology of coarse fragments, soil structure and consistence; and describe mottles and clay films if present
  - note important observations (e.g., soil fauna, etc.) in Comments (item 35)
  - confirm original horizon designations
- Sketch a profile diagram to approximate scale.
- Record this information:
  - depth to mineral soil, water table, permafrost, calcium carbonate ($CaCO_3$), seepage, mottles/gley and bedrock
  - depth of roots, rooting zone particle size, and restriction type and depth
  - water source and drainage class

- Classify:
  - bedrock type(s)
  - terrain type(s), soil classification, humus form, and hydro-geomorphic unit
- Use the Comments box of the Soil Form to summarize or describe important soil features not otherwise collected, or that are significant to study, classification or management.

Check and integrate

Review the Soil Form to ensure there are no missing data, and then (under most circumstances) fill in the pit. Strike through any fields not assessed. Integrate the soil data with other site and vegetation factors to determine and record the soil moisture regime and soil nutrient regimes on the Ecosystem Site Form (see Section 2).

Completing the Soil Form

These numbers refer to the circled numbers on the Soil Form (see beginning of this section). See the page opposite for a recommended sequence for completing the form. A large-format form, with additional fields, is available from Environment Yukon.

1 Project

Enter the same project name/ID that you used on the Biophysical/Ecological Project Description Form (see Section 1).

2 Date

Provide the date when field work began. Use 4 digits for year (yyyy), 2 digits for month (mm), and 2 digits for day (dd). Example: 2017/07/09 (for July 9, 2017).

3 Observer(s)

Record the name or full initials as described on the Biophysical Ecological Project Description Form for the persons responsible for describing and classifying the soil profile. Initials of other team members can be included in brackets.

4 Soil Classification

Record the soil classification according to SCWG 1998. The system is tabulated alphabetically by soil order. See Key 6.11 and 6.13 (soil great groups and subgroups), Key 6.12 (soil orders) and Key 6.14 (soil texture). If you want to use family and phase criteria, refer to SCWG 1998 and include in Comments (item 35).

5 Plot No.

Record the same plot number used on the Ecosystem Site Form (see Section 2).

6 Terrain

This is modified from B.C. Ministry of Forests and Range and Ministry of Environment (2010). Modifications are indicated with an asterisk (*).

The Soil Form provides boxes for recording terrain texture (Table 3.1), surficial material (Table 3.2), surface expression (Table 3.3) and geomorphological process (Table 3.4) for up to three components. The components may be stratigraphic layers or may represent complexes (Howes and Kenk 1997). If you want to use terrain subclasses and subtypes, refer to Howes and Kenk (1997). Place qualifier codes (Table 3.5) in the appropriate field to the right of any surficial material codes used in that field; e.g., zEAvx\szgFp-J. See Key 6.9.

Terrain Texture — you can enter up to three codes (Table 3.1).

Table 3.1 Texture codes

Code	Name	Size (mm)	Other characteristics
a	Blocks	>256	angular particles
b	Boulders	>256	rounded and subrounded particles
k	Cobble	64–256	rounded and subrounded particles
p	Pebbles	4–64	rounded and subrounded particles
s	Sand	0.062–2.000	
z	Silt	0.002–0.062	
c	Clay	<0.002	
d	Mixed	>2	mix of rounded and fragments; angular particles
g	Gravel	>2	mix of boulders, cobbles and pebbles
x	Angular	>2	mix of blocks and rubble
r	Rubble	2–256	angular particles
m	Mud	<0.062	mix of clay and silt
y	Shells	—	shells or shell fragments
e	Fibric	—	well-preserved fibre; (40%) identified after rubbing
u	Mesic	—	intermediate composition between fibric and humic
h	Humic	—	decomposed organic material; (10%) identified after rubbing

Table 3.2 Surficial (genetic) material codes

Code	Name	Assumed status	Description
A	Anthropogenic	(A)	artificial or human-modified material
C	Colluvium	(A)	products of mass wastage
D	Weathered bedrock	(A)	in-situ decomposed bedrock
E	Eolian	(I)	materials deposited by wind action
F	Fluvial	(I)	river deposits
FG	Glaciofluvial	(I)	ice contact fluvial material
H *	Water bodies		waterbodies
I	Ice	(A)	permanent snow, glaciers and icefields
L	Lacustrine	(I)	lake sediments; includes wave deposits
LG	Glaciolacustrine	(I)	ice contact lacustrine material
M	Morainal	(I)	material deposited directly by glaciers
O	Organic	(A)	accumulation/decay of vegetative matter
R	Bedrock	(–)	outcrops/rocks covered by <10 cm of soil
S *	Snow patches	(A)	
U	Undifferentiated	(–)	u-layered sequence; three materials or more
V	Volcanic	(I)	unconsolidated pyroclastic sediments
W	Marine	(I)	marine sediments; includes wave deposits
WG	Glaciomarine	(I)	ice contact marine sediments

* Modification from B.C. Ministry of Forests and Range and Ministry of Environment 2010.

Table 3.3 Surface expression codes

Code	Name	Description
a *	Apron	gentle to moderate slope (composed of material derived from above) at the base of a steeper slope
b	Blanket (>1 m thick)	layer of unconsolidated material thick enough to mask minor irregularities of the surface of the underlying material, but still conforming to the general underlying topography; a blanket is >1 m thick and possesses no constructional forms typical of the material's genesis; outcrops of the underlying unit are rare
c	Cone	cone or sector of a cone with a relatively smooth surface, and mostly steeper than 26% (15°), with a longitudinal profile that is either straight or slightly concave or convex
d	Depression	circular or irregular area at a lower elevation (hollow) than the surrounding terrain and delimited by an abrupt break in slope; side slopes within the depression are steeper than the surrounding terrain; depressions are m in depth
f	Fan	relatively smooth sector of a cone, with a slope gradient from apex to toe up to and including 26% (15°), and a longitudinal profile that is either straight, or slightly concave or convex
h	Hummock	steep-sided hillock and hollow with multi-directional slopes, predominantly between 26 and 70% (15 and 35°) if composed of unconsolidated materials; bedrock slopes may be steeper; local relief is >1 m; in plan, an assemblage of nonlinear, generally chaotic forms that are rounded or irregular in cross-profile
l *	Delta	flat to gently sloping surface that forms from the deposition of sediment carried by a river as the flow leaves its mouth and enters slower-moving or standing water
m	Rolling	elongated hillock with slopes dominantly between 5 and 26% (3 to 15°), with local relief >1 m; in plan, an assemblage of parallel or sub-parallel linear forms with subdued relief
p	Plain	a level or very gently sloping, unidirectional (planar) surface with gradients of 0 to 5% (0 to 3°); local surface irregularities generally have a relief of <1 m
r	Ridge	elongated hillock with slopes dominantly between 26 and 70% (15 to 35°) if composed of unconsolidated materials; bedrock slopes may be steeper; local relief is >1 m; in plan, an assemblage of parallel or sub-parallel linear forms
t	Terrace	a single or assemblage of step-like forms, where each form consists of a scarp face and a horizontal or gently inclined surface (tread) above it

Table 3.3, continued

Code	Name	Description
u	Undulating	gently sloping hillock and hollow with multidirectional slopes, generally up to 26% (15°); local relief is >1 m; in plan, an assemblage of nonlinear, generally chaotic forms that are rounded or irregular in cross-profile
v	Veneer (0.1–1 m thick)	layer of unconsolidated materials too thin to mask the minor irregularities of the surface of the underlying material; about 10 cm to 1 m in thickness, and possessing no constructional form typical of its genesis
w	Mantle of variable thickness	layer or discontinuous layer of surficial material of variable thickness (typically 0 to 3 m) that fills or partly fills depressions in an irregular substrate; generally too thin to mask prominent irregularities in the underlying material
x	Thin veneer (2–20 cm thick)	very thin layer of unconsolidated material (about 2 to 20 cm thick)

* Note: Modification by Yukon Geological Survey from B.C. Ministry of Forests and Range and Ministry of Environment 2010.

Table 3.4 Geomorphological process codes

You may use up to three uppercase letters following a dash (–). Lowercase letters (see column 4) indicate subclass.

Code	Name	Assumed status[1]	Description
A	Avalanche	(A)	a large mass of snow, ice, etc., that detached from a mountain slope and slid or suddenly fell downward
B	Braiding	(A)	diverging/converging channels; unvegetated bars
C	Cryoturbation	(A)	materials modified by frost heaving and churning
D	Deflation	(A)	removal of sand and silt by wind action
E	Channeled	(I)	channel formed by meltwater
F	Slow mass movement	(A)	slow downslope movement of mass of cohesive or non-cohesive material
G [2]	Surface seepage	(A)	zones of active seepage, often found in lower or toe slope positions
H	Kettled	(I)	depressions in surficial material resulting from the melting of buried or partially buried glacier ice

Table 3.4, continued

Code	Name	Assumed status[1]	Description
I	Irregularly sinuous floodplain	(A)	a single, clearly defined main channel displaying irregular turns and bends
J	Anastomosing floodplain	(A)	a zone where channels diverge and converge around many vegetated islands
K	Karst	(A)	processes associated with the solution of carbonates
L [3]	Undifferentiated landslide	(A)	subclasses: s = slide; u = slump
M	Meandering floodplain	(A)	channels characterized by a regular pattern of bends with uniform amplitude and wave length
N	Nivation	(A)	erosion beneath and along the margin of snow patches
P	Piping	(A)	subterranean erosion by flowing water
R	Rapid landslide	(A)	rapid downslope movement of dry, moist or saturated debris
S	Solifluction	(A)	slow downslope movement of saturated overburden across a frozen or otherwise impermeable substrate
T [3]	Glacial ice contact	(I)	glacial ice contact processes
U	Inundation	(A)	seasonally under water because of high water table
V	Gully erosion	(A)	parallel/sub-parallel ravines caused by running water
W	Washing	(A)	modification by wave action
X	Permafrost	(A)	processes controlled by the presence of permafrost (subclasses: s = sheetflow; t = thermokarst)
Z	Periglacial	(A)	general periglacial processes (cryoturbation, nivation, solifluction) occurring within a single unit

Notes:
1. These qualifier codes (see Table 3.5) are used to characterize the current state of activity of surficial material and geomorphological processes.
2. Modifications to Yukon Geological Survey (YGS) and B.C. terrain classification systems. Surface seepage (G) is used in YBIS; seepage is represented in B.C. as seepage (L), which is not used by YGS in Yukon. In addition, YGS reassigned the letter L to mass movement of variable velocity.
3. YGS made modifications to the B.C. classification system; see below.

Table 3.5 Qualifier Codes

Code	Name
A	Active
I	Inactive

Yukon Geological Survey modifications to the B.C. classification system

The YGS modifications were made to the BC classification system to accommodate additional landforms, processes and permafrost features common in Yukon.

Surficial materials (See Table 3.2):

- **H** was added to indicate Water bodies
- **S** was added to indicate Snow patches

Surface expressions (see Table 3.3):

- slope steepness codes **j, a, k** and **s** were discarded
- **a** was changed to indicate Apron
- **l** was added to indicate Delta

Geomorphological processes (see Table 3.4):

- **L** in reference to surface seepage was discarded
- **L** was changed to indicate mass movements of undifferentiated velocity
- **T** was added to indicate ice-contact glacial processes

Geomorphological process subclasses:

- **b** was added to indicate beaver damming (i.e., Ub)
- **c** was added to indicate cryoplanation (i.e., Zc)
- **l** was added to indicate segregated ice (i.e., Xl)
- n was added to indicate open-system pingos (i.e., Xn)
- **s** was added to indicate sheetflow (i.e., Xs)

7 Bedrock

Record general or specific codes (see Tables 3.6, 3.7 and 3.8) for up to three rock types in the underlying bedrock, in order of dominance if possible. This is particularly important at sites with shallow soils or bedrock exposure. Refer to Keys 6.7 and 6.8 for guides to common rock types. You can note additional relevant data such as age or formation in Comments (item 35).

Table 3.6 Sedimentary rock codes (sed)

	General	Code	Specific	Code
Clastic, calcareous	Fine-grained	**kf**	Calcareous Siltstone	**kz**
			Calcareous Mudstone	**kd**
			Calcareous Shale	**kh**
	Medium-grained	**km**	Calcareous Greywacke	**kg**
			Calcareous Arkose	**ka**
			Calcareous Sandstone	**ks**
	Coarse-grained	**kc**	Calcareous Conglomerate	**kn**
			Calcareous Breccia	**kb**
Clastic, non-calcareous	Fine-grained	**uf**	Siltstone	**zl**
			Mudstone	**md**
			Shale	**sh**
	Medium-grained	**um**	Sandstone	**ss**
			Greywacke	**gk**
			Arkose	**ak**
	Coarse-grained	**uc**	Conglomerate	**cg**
			Breccia	**bx**
Precipitates, crystalline	Calcareous	**pk**	Travertine	**tv**
			Limestone	**ls**
			Dolomite	**do**
	Non-calcareous	**pu**	Chert	**ch**
			Gypsum	**gy**
			Limonite	**li**
			Barite	**ba**
Organic	Calcareous	**ok**	Marl	**ma**
	Carbonaceous	**oc**	Lignite	**lg**
			Coal	**co**

Table 3.7 Igneous rock codes (ign)

	General	Code	Specific	Code
Intrusive	Acid (felsic)	**ia**	Syenite	**sy**
			Granite	**gr**
			Quartz Monzonite	**qm**
			Granodiorite	**gd**
	Intermediate	**ii**	Quartz Diorite	**qd**
			Diorite	**di**
	Basic (mafic)	**ib**	Quartz Gabbro	**qg**
			Gabbro	**gb**
			Pyroxenite	**py**
			Dunite	**du**
Extrusive	Acid (felsic)	**ea**	Trachyte	**tr**
			Rhyolite	**rh**
			Dacite	**da**
	Intermediate	**ei**	Andesite	**an**
	Basic (mafic)	**eb**	Quartz Basalt	**qb**
			Basalt	**bs**
	Recent lava flow	**la**		
	Pyroclastic	**ep**	Tuff	**tu**
			Volcanic Breccia	**vb**
			Agglomerate	**ag**

Table 3.8 Metamorphic rock codes (met)

	General	Code	Specific	Code
Foliated	Fine-grained	**ff**	Slate	**sl**
			Pelite	**pe**
			Phylite	**ph**
	Medium- to coarse-grained	**fm**	Psammite	**ps**
			Schist	**sc**
			Gneiss	**gn**
			Granite Gneiss	**gg**
			Diorite Gneiss	**dg**
	Coarse-grained	**fc**	Migmatite	**mi**
Non-foliated	Fine-grained	**nf**	Chert	**ch**
			Argillite	**ar**
			Serpentinite	**sp**
	Medium- to coarse-grained	**nm**	Quartzite	**qt**
			Hornfels	**hf**
			Granulite	**gl**
	Coarse-grained	**nc**	Amphibolite	**am**
			Hornblendite	**hb**
	Calcareous	**nk**	Marble	**mb**
			Dolomite Marble	**dm**
			Serpentine Marble	**sm**

8 Humus Form/Phase

Humus forms are classified to order and group. Humus forms are classified to order and group. The following humus forms have been adapted from Green et al. (1993) to meet soil conditions commonly found in Yukon. Select codes from Table 3.9. See 6.10 for a key to humus forms.

If you want to use humus phases, refer to Table 3.10.

Table 3.9 Codes for humus orders and groups

Order	Code	Order	Code	Order	Code
MOR	**R**	**MODER**	**D**	**MULL**	**L**
Group		**Group**		**Group**	
HR	Hemimor	**PD**	Paramoder	**PL**	Paramull
UR	Humimor	**RD**	Mormoder	**VL**	Vermimull
RR	Resimor	**TD**	Leptomoder	**ZL**	Rhizomull
LR	Lignomor	**MD**	Mullmoder	**YL**	Hydromull
YR	Hydromor	**LD**	Lignomoder		
FR	Fibrimor	**YD**	Hydromoder		
MR	Mesimor	**SD**	Saprimoder		

Table 3.10 Humus phases

Note: Phases are used to designate variations from the "typical" situation.

Code	Name	Description
an	Andic	volcanic ash present (all Orders)
ca	Calcic	Enriched with calcium; Ahk horizon and underlain with calcareous parent material (Mulls and Mullmoders)
ch	Charcic	>35% volume of charcoal in humus profile (all Orders)
cl	Clastic	>35% volume of coarse fragments in humus profile (Mors and Moders)
co	Compactic	High-density humus forms, typical of high snowfall areas (Mors)
cs	Crustic	Upper horizons with dry brittle firm fabric, typically on xeric sites (Mors and Moders)
cy	Cryic	Directly influenced by permafrost (all Orders)
gr	Granuic	H horizon with strong granular structure (Mors)
hi	Histic	O horizons comprise 25–50% thickness of humus (Hydromors and Hydromoders)
la	Lammic	Mormoders with Fm horizon; Leptomoders with Fm or Fa horizon
li	Lignic	>35–80% volume of wood (hydromorphic Mors)
me	Melic	Well-developed LFH and Ah horizons (Mors and Moders)
mi	Mineric	Significant intermixed mineral soil particles in humus form (Mors and Moders)
my	Mycic	Presence of a horizon comprised almost entirely of fungal mycelia (Mors)
pa	Pachic	Atypically thick forest floor (Mors and Moders)
re	Resic	Presence of continuous Hr horizon but <50% thickness of combined F and H horizons (Mors)
rh	Rhizic	Presence of Ah horizon derived from decomposition of fine herbaceous roots (Moders)
te	Tenuic	Atypically thin forest floor (Mors and Moders)
tu	Turbic	Humus form markedly disturbed by physical processes (all Orders)
us	Ustic	Recently affected by fire; blackened crusty surface horizon (all Orders)
vl	Velic	Initial stage of humus development; LFH is >80% of humus thickness (Mors and Moders)
vr	Vermic	Earthworms and casts common in the humus form profile (Moders and Mulls)
xy	Xylic	>80% volume of wood in humus form profile (Mors and Moders)

9 Hydrogeomorphic Unit

System codes define broad hydrological processes that characterize landscape units and ecosystems by water sources and hydrodynamics. Subsystem codes divide a system by patterns of waterflow that indicate generic hydrodynamics, water source and connectivity in the landscape. Record the system code first and the modifier, where applicable (Table 3.11), followed by the subsystem code (Table 3.12). For example, alluvial (a) river (Fr) = Fr+a = Fra.

Table 3.11 Hydrogeomorphic system codes

Code	Name	Description
L	Lacustrine	Adjacent to lakes and ponds and directly affected by lacustrine processes (e.g., wave action, sedimentation and relatively high nutrient content of flood waters)
P	Palustrine	Basins and depressions with poor drainage that collect waterflows from runoff, groundwater and precipitation; often, peatlands, ponds and marshes
F	Fluvial [1]	Along flowing watercourses, the watercourse itself, and the surrounding (riparian) terrain and vegetation; subject to flooding and sedimentation processes
U	Upland	Sloping, level and depressional sites not described by other hydrogeomorphic systems
E	Estuarine	Intertidal habitats where ocean water is at least occasionally diluted by freshwater runoff from the land; occurs at the confluence of rivers and ocean and has characteristics that reflect the flooding and salinity gradients found there
M	Marine	Exposed to waves and currents of the open ocean; water regimes are determined primarily by the ebb and flow of ocean tides

Note:
1. Modifiers: r = river (20 m+ wide); s = stream (5–20 m wide); c = creek (1.5–5 m wide); v = rivulet (<1.5 m wide)

Table 3.12 Hydrogeomorphic subsystem codes

System	Subsystem	Code	Description
Lacustrine or palustrine; confined basins	closed basin	**cb**	Basin receives water from surrounding upland only; no inlet or outlet channel
	overflow basin	**ob**	Basin receives water from upland only; excess water flows through an outlet channel
	linked basin	**lb**	Basin receives water from upland and an inflow stream; excess water flows through an outflow; includes basins with slow streams where there is little sedimentation or erosion
Palustrine; unconfined slopes and hollows	terminal basin	**tb**	Basin receives water from upland and an inflow stream; no outlet channel
	overflow hollow	**oh**	Hollow receives groundwater from upslope; drains through an outlet channel or water track
	linked hollow	**lh**	Hollow receives water from upland and an inflow stream; excess water flows out through an outflow stream or water track; includes gullies with slow streams where there is little sedimentation or erosion
	blanket slope	**bs**	Occurs in subdued topography where basin types are not definable
	toe slope	**ts**	Occurs on toe slope positions not confined by basin or hollow; water received from upslope, sheet or channelled flow
	lobe slope	**ls**	Peatlands on slopes with a downslope edge elevated above the upland in the form of a lobe; water received from upslope, sheet or channelled flow
Fluvial	alluvial	**a**	Associated with low-gradient streams where floodplain building processes predominate; flooding and subsequent deposition of alluvium leads to extensive floodplains of sandy or silty soils
	transport	**t**	Associated with moderate-gradient streams where neither erosion or deposition forces predominate; floodplain development limited, in-stream bars and gravelly soil common
	headwater	**h**	Associated with high-gradient streams where erosion processes predominate; flood plain and bar development limited; cobble, stone or bedrock substrates are common

10 Water Source

Determine the most influential source of water on a site through a qualitative assessment, and record it using the codes in Table 3.13.

Table 3.13 Water source codes

Code	Water source
P	precipitation
G	groundwater
S	snowmelt (prolonged through the growing season)
F	stream sub-irrigation and flooding
M	mineral spring
T	tidal, freshwater
E	tidal, saltwater
Z	permafrost

11 Drainage

Drainage describes the speed at which and extent to which water is removed from a mineral soil in relation to additions of water. Enter the code that best describes growing-season conditions (Table 3.14).

Table 3.14 Drainage classes and codes

Code	Name	Description
VR	Very rapidly drained	Water is removed from the soil very rapidly in relation to supply; water source is precipitation and water storage capacity following precipitation is essentially nil; soils are typically fragmental/skeletal, shallow, or both
R	Rapidly drained	Water is removed from the soil rapidly in relation to supply; excess water flows downward if underlying material is pervious; subsurface flow may occur on steep gradients during heavy rainfall; water source is precipitation; soils are generally coarse-textured
W	Well drained	Water is removed from the soil readily, but not rapidly; excess water flows downward readily into underlying pervious material or laterally as subsurface flow; water source is precipitation; on slopes, subsurface flow may occur for short durations, but additions are equalled by losses; soils are generally intermediate in texture and lack restricting layers

Table 3.14, continued

MW	Moderately well drained	Water is removed from the soil somewhat slowly in relation to supply because of imperviousness or lack of gradient; precipitation is the dominant water source in medium- to fine-textured soils; precipitation and significant additions by subsurface flow are necessary in coarse-textured soils
I	Imperfectly drained	Water is removed from the soil sufficiently slowly in relation to supply to keep the soil wet for a significant part of the growing season; excess water moves slowly downward if precipitation is the major source; if subsurface water or groundwater (or both) are the main source the flow rate may vary, but the soil remains wet for a significant part of the growing season; precipitation is the main source if water storage capacity is high; contribution by subsurface or groundwater flow (or both) increases as available water storage capacity decreases; soils generally have a wide range of texture, and some mottling is common
P	Poorly drained	Water is removed so slowly in relation to supply that the soil remains wet for much of the time that it is not frozen; subsurface or groundwater flow (or both), in addition to precipitation, are the main water sources; a perched water table may be present; soils are generally mottled and/or gleyed
VP	Very poorly drained	Water is removed from the soil so slowly that the water table remains at or near the surface for most of the time the soil is not frozen; groundwater and subsurface flow are the major water sources; precipitation is less important, except where there is a perched water table, and precipitation exceeds evapotranspiration; this class is typically associated with wetlands

Source for descriptions: Expert Committee on Soil Survey 1982

12 pH Method

Using the codes from Table 3.15, record the method you used to determine the pH of organic horizons/mineral horizons. See also item 23.

Table 3.15 Codes for methods of measuring pH

Code	Method
1	Bromothymol blue
2	Cresol red
3	Hellige-Truog
4	Lamotte-Morgan
5	pH meter (H_2O)
5a	pH meter for groundwater sample
6	pH meter (0.1 M $CaCl^2$)
7	Phenol red
8	Soiltex
9	Thymol blue
10	pHydrion

Source: Expert Committee on Soil Survey 1982

13 Rooting Zone: Depth

Rooting depth refers to the distance in cm from the ground surface (the top of the uppermost soil horizon, including organic horizons; e.g., Fm1), down to the bottom of the rooting zone. This is where rooting abundance drops from "plentiful" to "few."

14 Rooting Zone: Particle size (upper, lower)

Use the distribution of particle size within the mineral portion of the rooting zone to make broad interpretations. After determining the rooting depth, estimate the rooting zone particle-size class as a weighted average of the mineral horizons within the rooting zone (Figure 3.1; Table 3.16). In cases where rooting is restricted to the organic horizons, use the organic material codes in Table 3.16. For the most part, class names and definitions have been modified from the particle-size criteria in the Canadian System of Soil Classification. Rooting zone classes are greatly simplified, using only per cent coarse fragments (>2 mm) by volume, and texture class sizes by per cent weight for sand (0.05–<2 mm), silt (<0.05–0.002 mm), and clay (<.002 mm). Note: you can enter two different classes on the form if there are strongly contrasting size classes; e.g., upper = CLS and lower = FC; coarse-loamy over fine-clayey.

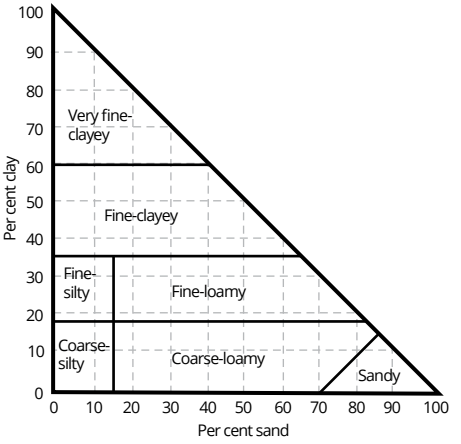


Figure 3.1 Rooting zone: particle size classes

Source: B.C. Ministry of Forests and Range and Ministry of Environment (2010); used with permission.

Table 3.16 Rooting zone particle-size codes and classes

Code	Class [1]	Definitions
Coarse fragments >70%		
F	Fragmental	Particles <2 mm of various textures
Coarse fragments >35 and <70%		
SS	Sandy-skeletal	Particles <2 mm sandy
CLS	Coarse-loamy-skeletal	Particles <2 mm coarse-loamy
FLS	Fine-loamy-skeletal	Particles <2 mm fine-loamy
SIS	Silty-skeletal	Particles <2 mm fine-silty or coarse-silty
CS	Clayey-skeletal	Particles <2 mm clayey
Coarse fragments <35%		
S	Sandy	
CL	Coarse-loamy	
FL	Fine-loamy	
CSI	Coarse-silty	
FSI	Fine-silty	
FC	Fine-clayey	
VFC	Very-fine-clayey	

Table 3.16, continued

Organic material codes		
FI	Fibric	
ME	Mesic	
HU	Humic	
W	Woody	
Substitute classes for Volcanic and Thixotropic soils		
Ci	Cindery	>60% of the soil consists of volcanic ash and cinders; >35% of cinders >2 mm
A	Ashy	>60% of soil consists of volcanic ash and cinders; <35% of cinders >2 mm
AS	Ashy-skeletal	Ashy, with >35% non-cinder particles >35% by volume
T	Thixotropic	Soils liquify on agitation and resume solid state when undisturbed; <35% particles >2 mm
TS	Thixotropic-skeletal	Soils liquify on agitation and resume solid state when undisturbed; >35% particles >2 mm

1. Refer to the bottom right corner of Figure 3.1 for the proportion of sand and clay in the fine particle sizes (<2 mm) of these classes.

15 Root Restricting Layer

If a root restricting layer is present, enter a code for its type (Table 3.17) and record the depth in cm from the ground surface down to the top of the root restricting layer.

Table 3.17 Root restricting layer codes

Code	Description
C	Strongly cemented horizon
P	Clay pan or restriction due to fines
K	Compacted morainal material
L	Lithic contact
W	Excessive moisture; this refers to the depth where the roots are being restricted by excessive moisture, but does not require the presence of free water at the time of sampling
X	Excessive accumulations of chemicals that inhibit root growth (i.e., $CaCO_3$) within the profile
Z	Permafrost; characterized by temperatures that never exceed 0°C, ice cementation, ice lenses or massive ice
N	No root restriction evident

16 Depth to (cm)

Record the following depths as calculated from the ground surface; i.e., the top of the uppermost soil horizon, including organic horizons (e.g., Fm1):

- **Mineral soil**—Record the depth of organic horizons overlying the top mineral horizon
- **Water table**—If water is present, record the depth to the water surface. Use negative values to record water above the ground surface
- **Permafrost**—If permafrost is present, record the depth to the top of the frozen soil. if you recognize the frost as seasonal frost note this in Comments (item 35)
- **$CaCO_3$**—If calcium carbonate is present, record the depth to free $CaCO_3$ present in the soil that reacts with 10% hydrochloric acid (HCl)
- **Seepage**—If seepage is present, record the depth from the ground surface to the level of temporary or permanent subsurface waterflow
- **Bedrock**—Record the depth to the top of the bedrock surface
- **Mottles**—Record the depth to prominent or distinct mottles

17 Organic Horizons/Layers

Soil horizons

The soil horizon and layer definitions and methods for field description that follow are taken or modified from B.C. Ministry of Forests and Range and Ministry of Environment (2010); SCWG (1998), Expert Committee on Soil Survey (1982), Green et al. (1993) and Luttmerding et al. (1990). If two or more horizons have the same master horizon label, add a numeric suffix to the second and subsequent horizons with the same designation; e.g., Bm, Bm2, Bm3.

Lithologic discontinuity

Designate the contact between two unlike parent materials by adding the prefix 2 to the horizon designation for the second parent material; e.g., 2Bt. If two lithologic discontinuities are present, use the prefix 3 for the third parent material. In both cases, number from the surface down.

Record the organic horizon or layer designation. Two groups of master organic horizons are recognized: L, F and H (upland) horizons; and O (wetland) horizons. All contain >17% organic carbon by mass. These two groups are differentiated primarily by the features outlined in Table 3.18.

Table 3.18 Differentiating between upland/wetland organic horizons

Property	L, F and H horizons	O horizons
Physiography	Sloping to level	Depression to gently sloping
Soil drainage	Very rapid to imperfect	Imperfect to very poor
Water table	Absent in organic horizons (may fluctuate in response to water input)	At or near ground surface for significant duration during the frost-free period
Origin of materials	Organic residues from plant communities typically associated with soil moisture regimes 0–6	Organic residues from plant communities typically associated with soil moisture regimes 7–8

Codes for master organic horizons

L An upland horizon consisting of relatively fresh organic residues that are readily identifiable as to origin

F An upland horizon comprised of partly decomposed plant residues in which fragmented plant structures are generally recognizable as to origin

H An upland horizon comprised of well-decomposed plant residues in which plant structures are generally not recognizable

O A wetland organic horizon comprised of materials in varying degrees of decomposition

Codes for other organic layers

S A distinct surface layer composed of living organic material such as bryophytes or "soil crusts"

Codes for subordinate organic horizons

Ln An L horizon composed of newly accreted and essentially unfragmented plant residues

Lv An L horizon exhibiting initial decay and strong discolouration

Fm An F horizon in which plant residues are aggregated in a matted structure, with a tenacious consistence; fungal mycelia are clearly a predominant biotic component; some faunal droppings may be present

Fz An F horizon in which plant residues are weakly aggregated with a loose or friable consistence; faunal droppings are typically numerous and easily observed under magnification with a hand lens or binocular microscope; fungal mycelia may be present

Fa An F horizon in which plant residues are aggregated into a weak to moderate, non-compact matted structure; an intergrade between the Fm and Fz horizons, and as such, reflecting properties of both, but neither fungal mycelia nor faunal droppings predominate

Hh An H horizon dominated by fine substances with very few if any recognizable plant residues

Hz An H horizon dominated by fine substances with very few if any recognizable plant residues; faunal droppings constitute most of the fabric

Hr An H horizon dominated by fine substances, but which also contains recognizable plant residues, usually from fine roots, wood or bark; typically dark reddish-brown hues, around 2.5 YR

Of An O horizon comprised largely of poorly decomposed plant residues that are readily identifiable as to origin; it has 40% or more rubbed fibre (i.e., fibre that remains after rubbing a sample about 10 times between thumb and forefinger); these materials are classified in the von Post scale of decomposition (defined below, in Item 19: "Structure") as class 1 to class 4

Om An O horizon comprised of partly decomposed plant residues that are at a stage of decomposition intermediate between Of and Oh horizons; rubbed fibre usually ranges between 10 and 40% by volume; these materials are classified in the von Post scale of decomposition as class 5 or 6

Oh An O horizon of well-decomposed plant residues that for the most part have been transformed into humic materials; the rubbed fibre content is less than 10% by volume; these materials are usually classified in the von Post scale of decomposition as class 7 or higher, and very rarely as class 6

Oco Coprogenous earth, deposited or modified by aquatic organisms

Lowercase modifiers

These lowercase modifiers may be applied to any organic horizon without restriction.

i An organic horizon that contains intermixed mineral particles finer than 2 mm, with 17–35% organic carbon by mass; this intermixing of mineral particles with organic materials may result from a range of processes (e.g., colluvial, aeolian, alluvial, cryoturbation, silvoturbation and zooturbation)

p,u,y May also be used with organic horizons, and are defined under Mineral Horizons/lowercase modifiers in item 25

w An organic horizon that contains significant amounts (>35% of volume of solids) of coarse woody debris in various stages of decomposition

Other soil layers can be used to describe and or classify organic soils:

Limno A layer or layers 5 cm or more thick of sedimentary peat, diatomaceous earth or marl

Cumulo A layer or layers 5 to 30 cm thick of mineral material in organic soils

Terric An unconsolidated mineral substratum not underlain by organic matter, or one continuous unconsolidated mineral layer more than 30 cm thick in the middle or bottom tiers underlain by organic matter within a depth of 160 cm

Lithic Bedrock occurring within 10 to 160 cm in organic soils

Hydric A layer of water that extends from a depth of not less than 40 cm from the organic surface to more than 160 cm

Tiers

Arbitrary depth intervals used in classifying wetland organic soils, these consist of three tiers: surface (0–40 cm), middle (40–120 cm) and bottom (120–160 cm). They are not recorded, but are used to help classify organic soils.

18 Depth

Record the average depths (in cm) of the upper and the lower boundaries of the soil horizon being described (e.g., Fm 9–2, Hh 2–0, Ah 0–5, Bm 5–20). The top of the uppermost mineral horizon is considered as zero depth. The depth of organic horizons for mineral soils is measured upward from the mineral horizon interface and is recorded with the upper boundary height listed first (e.g., L 12–9). In soils of the organic soil order, organic horizons are measured downward from the ground surface, or uppermost O horizon (e.g., S 4–0, Of 0–35 and Om 35–110).

19 Structure

Describe the material composition of all organic horizons; the structure, character and consistence for upland horizons; and record the von Post scale of decomposition for wetland horizons. Structure is important in distinguishing between Fm, Fz and Fa horizons, and the von Post scale helps to distinguish the Of, Om and Oh horizons.

Aggregation

Describe structure according to the degree and kind of the macromorphological aggregation of the material within a horizon. Record the code for degree of aggregation (Table 3.19) and the code for kind of aggregation (Table 3.20) in the appropriate columns. See the diagrams in Appendix 3.1.

Table 3.19 Degree of aggregation: codes

Code	Name	Description	
W	Weak	Disaggregated materials are dominant	<20% distinctly aggregated
M	Moderate	Some disaggregated materials are present;	20–60% distinctly aggregated
S	Strong	Aggregated materials are dominant; most material conforms to the same arrangement	>60% distinctly aggregated

Table 3.20 Kind of aggregation: codes

Code	Name	Description
SP	Single particle	An incoherent mass of individual particles with no aggregation
BK	Blocky	Faces rectangular and flattened; vertices angular
GR	Granular	Spheroidal and characterized by rounded or subrounded vertices
NM	Non-compact matted	Materials arranged along horizontal planes, with no compaction
CM	Compact matted	Materials arranged along horizontal planes, with evident compaction
ER	Erect	Materials arranged vertically
RC	Recumbent	Materials arranged in recumbent (reclining) position
MA	Massive	A coherent mass showing no evidence of aggregation

von Post scale of decomposition (for wetland O horizons)

Peats are classified on the basis of their degree of decomposition (or aging). This indicates the layer they came from: a young peat is taken from nearer the surface, rather than from farther down. The von Post scale classifies peat decomposition from 1 (completely undecomposed, with all plant tissues identifiable) to 10 (completely humified with little or no plant tissue identifiable).

Squeeze a sample of the O horizon between your fingers and observe the colour of the solution that is squeezed out, the nature of the fibre, and the proportion of the original sample that remains in your hand. Record the class on the form, using Table 3.21 for reference.

Table 3.21 von Post scale of decomposition

Code/Class	Description
1	Undecomposed; plant structure unaltered; yields only clear water that is coloured light yellow-brown
2	Almost undecomposed; plant structure distinct; yields only clear water that is coloured light yellow-brown
3	Very weakly decomposed; plant structure distinct; yields distinctly turbid brown water, no peat substance passes between the fingers, residue not mushy
4	Weakly decomposed; plant structure distinct; yields strongly turbid water, no peat substance escapes between the fingers, residue rather mushy
5	Moderately decomposed; plant structure evident, but becoming indistinct; yields much turbid brown water, some peat escapes between the fingers, residue very mushy
6	Strongly decomposed; plant structure somewhat indistinct, but more evident in the squeezed residue than in the undisturbed peat; about one-third of the peat escapes between the fingers, residue strongly mushy
7	Strongly decomposed; plant structure indistinct, but recognizable; about one-half of the peat escapes between the fingers
8	Very strongly decomposed; plant structure very indistinct; about two-thirds of the peat escapes between the fingers, residue almost entirely resistant remnants such as root fibres and wood
9	Almost completely decomposed; plant structure almost unrecognizable; nearly all the peat escapes between the fingers
10	Completely decomposed; plant structure unrecognizable; all the peat escapes between the fingers

20 Mycelial abundance

In most cases, fungal presence is indicated by masses of hyphae called mycelia. Although individual hyphae are generally too small to be seen, the mycelial mass is usually visible. Determining mycelial abundance helps to distinguish the Fm, Fz and Fa horizons, and therefore helps classify the humus form. Describe fungal mycelia by noting their abundance (Table 3.22).

Table 3.22 Mycelial abundance: codes and classes

Code	Class	Description
X	None	Fungal mycelia are not observed
F	Few	Fungal mycelia are occasionally present, but are scattered and not easily observed
C	Common	Fungal mycelia are commonly observed
A	Abundant	Fungal mycelia are observed continuously throughout the horizon, often matting materials together and creating a "felty" tactility

21 Faecal Abundance

You may observe the presence of soil fauna directly, or indirectly by the presence of faecal droppings or casts. Determining faecal abundance helps to distinguish the Fm, Fz and Fa horizons, and therefore helps classify the humus form. Describe the presence of soil faecal matter by noting its abundance class (Table 3.23).

Table 3.23 Faecal abundance: codes and classes

Code	Class	Description
X	None	No faeces observed
F	Few	Faecal droppings occasionally observed, but scattered
C	Common	Droppings commonly observed
A	Abundant	Droppings frequently observed (droppings in relatively large numbers throughout the horizon)

22 Root Abundance and Size

Since root distribution in organic horizons differs substantially from that in mineral soils, the abundance and size classes and the reference unit areas are somewhat different from those used for mineral horizons. Describe roots by noting the abundance of each size class (Table 3.24). E.g., FV.F.M/PC = Few very fine/fine/medium and Plentiful coarse roots.

Table 3.24 Root size and abundance classes in organic horizons

Root size Class		**Very Fine**	**Fine**	**Medium**	**Coarse**	**Very Coarse**
Size code		**V**	**F**	**M**	**C**	**K**
Size (mm)		<1	1–2	3–5	6–15	>15
Abundance class						
Code	**Class**			**Reference area**		
		25 cm^2	25 cm^2	100 cm^2	100 cm^2	100 cm^2
X	None	0	0	0	0	0
F	Few	<10	<10	1	1	1
P	Plentiful	10–50	10–50	2–10	2–5	2–5
A	Abundant	>50	>50	>10	>5	>5

23 pH

Record pH, noting the determined values to one decimal place. Be sure to note the method you used to measure pH in item 16.

24 Additional Information

Record any observations or measurements not otherwise recorded about features that are unique, nonconforming, or could be of particular significance to the project, classification or management. This includes faunal species, colour of mycelium, presence of charcoal, porosity, cementation and disturbance history. Examples of additional properties are listed below. When coding a property, be sure to note the property being described.

Consistence

This describes the nature and strength of forces that hold materials together. It is determined by classifying the kind of deformation or rupture that occurs when pressure is applied and then released. Use the codes in Table 3.25.

Table 3.25 Consistence codes and classes

Code	Class	Description
LO	Loose	Material has no consistence
FR	Friable	Material crumbles easily under gentle pressure
FM	Firm	Material can be crushed under moderate pressure; resistance is noticeable
PL	Pliable	Material is soft and plastic
RE	Resilient	Material is springy or elastic and assumes its original shape after pressure is released
TE	Tenacious	Material is cohesive and not easily pulled apart

Character

This describes tactile qualities, particulate shapes, and other noteworthy qualities of materials in organic horizons. Determining the character requires you to make a qualitative examination of the fabric. Use the codes in Table 3.26.

Table 3.26 Character codes and classes

Code	Class	Description
MS	Mushy	Soft and spongy tactility; materials wet or saturated
MK	Mucky	Smooth and sticky tactility; materials usually wet; silt- and clay-sized mineral particles usually present
GR	Greasy	Smooth and greasy tactility; materials easily workable when moist; fine mineral particles are usually absent
GT	Gritty	Rough tactility produced by mineral granules or coarse fragments
LF	Leafy	Tactility of materials produced by deciduous foliage showing a shingle-like layering (banded structure)
GA	Grassy	Tactility of materials produced by graminoid remains
MO	Mossy	Tactility produced by bryophytes with more or less preserved vegetative structures
AC	Acerose	Tactility produced by particles that have a tip, such as the needles of conifers
FE	Felty	Tactility produced by abundant fungal mycelia
FI	Fibrous	Tactility produced by an abundance of fibrous plant residues that do not break down when rubbed between fingers (i.e., fine roots)
LG	Ligneous	Tactility produced by coniferous or deciduous wood fibres
CR	Crusty	Hard and brittle tactility of dry or desiccated materials

Material types

Table 3.27 lists the types of materials that could comprise the horizon. Record the codes for type of material and the percentage of the horizon that each of them comprises. Total per cent should equal 100.

Table 3.27 Material type codes

Code	Description	Code	Description
LV	Leaves	**SR**	Sedges and reeds
N	Needles	**HF**	Herbaceous fragments
SP	Sphagnum	**WF**	Wood fragments
FM	Feathermosses	**CE**	Coprogenous earth
OM	Other mosses	**LI**	Lichen

Root orientation

You can add information on root orientation (Table 3.28) to Additional Info (item 33).

Table 3.28 Root orientation codes

Code	Description	Code	Description
H	Horizontal	**R**	Random
O	Oblique	**V**	Vertical

Sample

Record if the horizon has been sampled.

Fauna

When describing soil fauna, record the taxon code (Figure 3.2 and Table 3.29) and abundance class (1, 2 to 4, 5 to 9, 10 to 19, 20 or more). You may record numerous taxa.

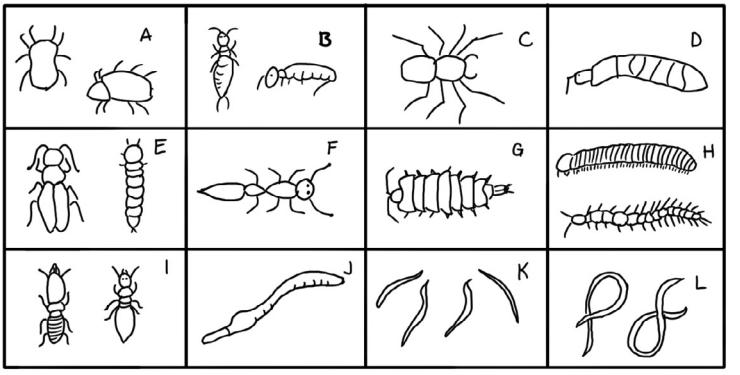


Figure 3.2 Major kinds of soil fauna

Source: B.C. Ministry of Forests and Range and Ministry of Environment 2010; used with permission.

Table 3.29 Soil fauna codes

Code	Fauna	Code	Fauna
A	Mites (Acarina)	**G**	Woodlice (Isopoda)
B	Springtails (Collembola)	**H**	Centipedes and millipedes (Myriapoda)
C	Spiders (Araneida)	**I**	Termites (Isoptera)
D	Fly larvae (Diptera)	**J**	Earthworms (Lumbricida)
E	Beetles and larvae (Coleoptera)	**K**	Potworms (Enchytraeida)
F	Ants (Hymenoptera)	**L**	Nematodes (Nematoda)

25 Mineral Horizons/Layers

Horizon/Layer

Record the mineral horizon or layer designation, followed by lowercase modifiers (e.g., Btg).

Codes for major horizons

A Mineral horizon, containing <17% organic carbon by mass, that has formed at or near the soil surface in the zone of leaching or eluviation of organic materials in solution or suspension, or of maximum in situ accumulation of organic matter, or both

B Mineral horizon characterized by enrichment in organic matter, sequioxides, or clay; or by the development of soil structure; or by a change of colour denoting hydrolysis, reduction, or oxidation

C Mineral horizon comparatively unaffected by the pedogenic processes in the A and B horizons, except the process of gleying (Cg), and the accumulation of calcium and magnesium carbonates (Cca) and more soluble salts (Cs, Csa)

Codes for layers

R Consolidated bedrock layer that is too hard to break with your hands

W Layer of water in Gleysolic, Organic or Cryosolic soils

Lowercase modifiers

b Buried soil horizon

c Irreversibly cemented horizon (e.g., ortstein, placic, duric and $CaCO_3$ cemented layers)

ca Horizon >10 cm thick of secondary carbonate enrichment in which the concentration of lime exceeds that in the unenriched parent material

cc Irreversibly cemented concretions

e Horizon characterized by the eluviation of clay, Fe, Al or organic matter, alone or in combination

f Horizon enriched with amorphous material, principally Al and Fe combined with organic matter; it must have a hue of 7.5YR or redder, or its hue must be 10YR near the upper boundary and become more yellow with depth; when moist the chroma is higher than 3 or the value is 3 or less; it is used primarily with the Bf, Bhf, Bfg and Bgf codes; the following f horizons are differentiated on the basis of the organic carbon content:

Bf 0.5–5% organic carbon

Bhf >5% organic carbon

g Horizon characterized by grey colours, or prominent mottling, or both, which indicates permanent or periodic intense reduction; chromas of the matrix are generally 1 or less; it is used with the Aeg, Bg, Bfg, Bgf, Bhfg, Btg, Cg, Ckg codes, and others; when used with the Ae, Bf, Bhf and Bt codes, the limits set for the other modifiers must be met; the Bgf horizons are usually prominently mottled, and more than half of the soil material occurs as mottles of high chroma; the Bgf horizons occur in Fera Gleysols and Fera Humic Gleysols and possibly below the Bfg of gleyed Podzols

h Horizon enriched with organic matter; it is used with the Ah, Ahe, Bh, and Bhf codes:

- **Ah** an A horizon enriched with humified organic matter; at least one colour value unit lower than the underlying horizon, or 0.5% more organic carbon than the C horizon, or both
- **Ahe** an Ah horizon that has undergone eluviation as evidenced by streaks and splotches of different shades of grey, and often by plated structure
- **Bh** contains >1% organic carbon with less than 0.3% pyrophosphate-extractable Fe [Fe(p)] and a ratio of C: Fe(p) of 20 or more (very rare in Yukon)
- **Bhf** defined under f (above)

j Used with e, f, g, n and t to denote an expression of, but failure to meet, the specified limits of the letter code it modifies, it is placed to the right of the letter it modifies

k Denotes the presence of carbonate as indicated by visible effervescence when a dilute HCl solution is added

m Horizon slightly altered by hydrolysis, oxidation or solution (or all three) to give a change in colour or structure, or both; it is used with the Bm, Bmgj, Bmk and Bms codes and has three characteristics:

- evidence of one or more of the following:
  - higher chromas and redder hues than the underlying horizons
  - enrichment or complete removal of carbonates either as Bmk or Bm
  - change in structure from that of the original material
- illuviation too slight to meet the requirements of a Bt or podzolic B
- no cementation or induration, and lacks a brittle consistence when moist

n Horizon with distinctive prismatic or columnar structure, dark coatings on ped surfaces, and hard to very hard consistence when dry; the exchangeable Ca to exchangeable Na is 10 or less; it is used with Bn or Bnt codes

p Horizon disturbed by human activities such as cultivation, logging and habitation

s Horizon with salts, including gypsum, that may be detected as crystal or veins, or as surface crusts of salt crystals, it is used with any combination of horizon codes

sa Horizon >10 cm thick with secondary enrichment of salts more soluble than Ca and Mg carbonates; the concentration of salts exceeds that in the unenriched parent material

t An illuvial horizon enriched with silicate clay. It is used with the Bt, Btg, and Bnt codes and may be modified by j; these factors are required in order to use Bt:

- the horizon must be at least 5 cm thick
- if any part of the eluvial horizon has <15% total clay in the fine fraction (<2 mm), the Bt horizon must contain at least 3% more clay; and if the eluvial horizon has >40% total clay, then it must contain at least 8% more clay
- if the eluvial horizon has >15% and <40% clay in the fine fraction, then the ratio of the clay in the Bt to that of the eluvial horizon must be 1.2 or more (e.g., Ae 25% clay; Bt at least 30% clay)
- in massive soils there should be oriented clay in pores and as bridges between sand grains
- if peds are present, clay films (skins) should be visible on ped surfaces and in pores

u Horizon that is markedly disrupted by physical processes (e.g., blowdown of trees, mass movement, etc.) or faunal processes (e.g., burrowing animals), but not by cryoturbation

x Horizon of fragipan character; loamy subsurface horizon of high-bulk density and very low organic matter; when dry, it is hard and seems to be cemented; when moist, it has moderate to weak brittleness; air-dried clods crumble in water

y Horizon affected by cryoturbation; it is used with any combination of horizon codes

z A frozen layer, it may be used with any horizon or layer code

Mineral diagnostic horizons

Chernozemic A

- at least 10 cm thick;
- colour value darker than 5.5 dry and 3.5 moist; chroma is lower than 3.5 moist
- organic carbon content 1–17% and C:N ratio <17
- structure when dry is neither massive and hard nor single grained
- mean annual soil temperature of 0°C or higher, and soil moisture regime subclass drier than humid

Duric horizon

A strongly cemented horizon that does not satisfy the criteria of a podzolic B horizon

Usually has an abrupt upper boundary and a diffuse lower boundary; air-dried clods do not hydrate in water, and moist clods at least 3 cm thick usually cannot be broken in the hands

Fragipan horizon

See definition of "x" (above)

Ortstein horizon

A strongly cemented Bh, Bhf or Bf horizon at least 3 cm thick that occurs in more than one-third of the exposed pedon; generally reddish brown to very dark reddish brown

Placic horizon

A thin layer (commonly 5 mm thick or less) or a series of thin layers that are irregular or involuted, hard, impervious, often vitreous, and dark reddish brown to black

Podzolic B horizon (field criteria only)

- at least 10 cm thick
- moist crushed colour: hue is 7.5YR or redder or 10YR near the upper boundary and becomes yellower with depth; the chroma is higher than 3 or the value is 3 or less
- accumulation of amorphous material is indicated by brown to black coatings on some mineral grains or brown to black microaggregates; silty feel when the material is rubbed wet, unless cemented; and
- texture coarser than clay

Solonetzic B horizon

The term includes both Bn and Bnt horizons

Lithic layer

Bedrock (R) below a depth of 10 cm; the upper surface of a lithic layer is a lithic contact

26 Depth

Record the average depths (in cm) of the upper and the lower boundaries of the soil horizon being described (e.g., Fm 9–2, Hh 2–0, Ah 0–5, Bm 5–20). The top of the uppermost mineral horizon is considered as zero depth.

27 Colour

Determine soil colour by comparing it to Munsell Color Charts. Your notation for a specific colour should be in the order of hue, value/chroma. You can express intermediate hues, values and chromas with the use of decimals.

Asp (Colour aspect)

The colour of a soil varies with its moisture content and physical state. Record the aspect of the Munsell colour notation using the codes in Table 3.30. You can record mottle colour as mottle plus the colour code (e.g., M7).

Table 3.30 Mineral soils: colour codes and aspects

Code	Name	Description
1 and 2	Matrix moist and Matrix dry	Matrix is the main soil constituent or material that encloses other soil features; e.g., peds — this colour aspect is reserved for structureless soils or weakly structured soils whose peds crumble upon handling
3 and 4	Exped moist and Exped dry	Colour of ped surfaces in soils with moderately durable peds that can be broken open and examined
5 and 6	Inped moist and Inped dry	Dominant colour of ped interiors in soils with moderately durable peds that can be broken open and examined
7 and 8	Crushed moist and Crushed dry	Soil material is crushed and mixed; surface of the sample is smoothed to reduce irregularities that affect colour
9	Natural wet reduced	Original wet condition in which organic material is found
10	Natural wet oxidized	Change in colour noted after original wet reduced condition oxidizes
11	Pressed wet reduced	Wet material pressed between fingers
12	Pressed wet oxidized	Wet material pressed between fingers; oxidized colour noted after original reduced pressed sample oxidizes
13	Rubbed wet	Wet material rubbed between fingers
14	Rubbed dry	Dry material rubbed between fingers
M	Mottle	Mottle colour; M code may be combined with colour codes above

28 Root Abundance and Size

Describe roots by noting the abundance of each size class (Table 3.31); e.g., FV.F.M/PC = few very fine/fine/medium and plentiful coarse roots.

Table 3.31 Root size and abundance classes in mineral horizons

Root size					
Class		**Very Fine**	**Fine**	**Medium**	**Coarse**
Size code		**V**	**F**	**M**	**C**
Size (mm)		<1	1–2	3–5	>5
Abundance class					
Code	**Class**	**Reference area**			
		100 cm²	100 cm²	100 cm²	100 cm²
X	None	0	0	0	0
F	Few	<10	<10	1	1
P	Plentiful	10–100	10–100	2–10	2–5
A	Abundant	>100	>100	>10	>5

29 Texture

Soil texture is defined by the size distribution of primary mineral particles (2 mm diameter or less). Determine the textural classes and codes by estimating the percentage of clay (less than 0.002 mm diameter) and sand (0.05–<2.0 mm diameter; see the soil texture triangle in Figure 3.3). See Keys 6.14, 6.15 and 6.16 for methods to assess soil texture in the field.

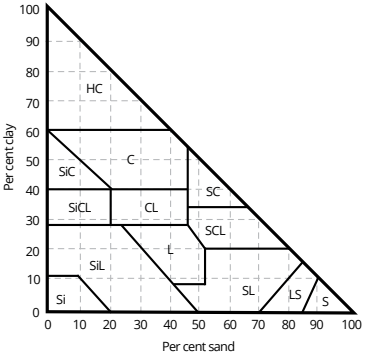


Figure 3.3 Soil texture triangle

Modified from B.C. Ministry of Forests and Range and Ministry of Environment 2010.

30 % Coarse Fragments

Estimate the percentage of total volume of coarse fragments (>2 mm diameter) in each size class. Coarse fragments should fit through a sieve of the diameter limit specified in Table 3.3.2. A coarse fragment has a long axis (A); measure the diameter at the widest point when looking down the A axis (i.e., the B axis; see Figure 3.4). Total coarse fragments = 100%; e.g., G (granules)= 20%; P (pebbles) = 50%; C (cobbles) = 20%; and B (boulders) = 10%.

Describe the coarse fragment using the type codes in Table 3.32.

Table 3.32 Coarse fragments: type codes and size classes

		Shape type: R, SR, SA, S, A	Shape type: T
Code	**Size class**	**Diameter (cm)**	**Length (cm)**
G	Granules	2–4	<4
P	Pebbles (gravel)	4–7.5	<15
C	Cobbles	7.5–25	15–38
B	Boulders (stones)	>25	>38

Record the shape of the coarse fragments (Table 3.33).

Table 3.33 Coarse fragments: shape class

Code	Description	Code	Description	Code	Description
T	Thin, flat	**SA**	Subangular	**R**	Rounded
A	Angular	**SR**	Subrounded	**WR**	Well rounded

Note: You can also record a range of coarse fragment shapes: A-SA, A-SR, A-R, A-WR, SA-SR, SA-R, SA-WR, SR-R, SR-WR and R-WR.

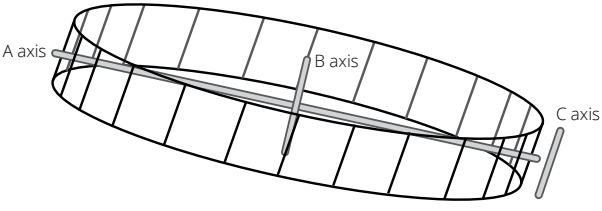


Figure 3.4 Measuring coarse fragments to determine size class
Modified from B.C. Ministry of Forests and Range and Ministry of Environment 2010.

31 Structure

Record the kind and class (size) of structure (Table 3.34 and Figure 3.4). For example, SBK.F = Fine subangular blocky. See the diagram in Appendix 3.1. When more than one kind of primary structure is present, record the dominant structure in box 32 and the subdominant structure in Additional info (box 33).

Table 3.34 Kind and class of soil particle structure

Kind	Class	Description	Size (mm)[1]
ABK: Angular blocky: peds bounded by flattened rectangular faces that intersect at relatively sharp angles	**VF**	Very fine angular blocky	<5
	F	Fine angular blocky	5–10
	M	Medium angular blocky	10–20
	C	Coarse angular blocky	20–50
	VC	Very coarse angular blocky	>50
SBK: Subangular blocky: peds bounded by slightly rounded, sub-rectangular faces with vertices[2] of their intersections mostly subrounded	**VF**	Very fine subangular blocky	<5
	F	Fine subangular blocky	5–10
	M	Medium subangular blocky	10–20
	C	Coarse subangular blocky	20–50
	VC	Very coarse subangular blocky	>50
GR: Granular; spheroidal peds bounded by curved or very irregular faces that do not adjoin those of adjacent peds	**VF**	Very fine granular	<1
	F	Fine granular	1–2
	M	Medium granular	2–5
	C	Coarse granular	5–10
	VC	Very coarse granular	>10
PL: Platy; peds flat or platelike; horizontal planes more or less well developed	**VF**	Very fine platy	<1
	F	Fine platy	1–2
	M	Medium platy	2–5
	C	Coarse platy	5–10
	VC	Very coarse platy	>10
PR: Prismatic; vertical faces of peds well defined and vertices angular (edges sharp); prism tops essentially flat	**VF**	Very fine prismatic	<10
	F	Fine prismatic	10–20
	M	Medium prismatic	20–50
	C	Coarse prismatic	50–100
	VC	Very coarse prismatic	>100

Table 3.34, continued

Kind	Class	Description	Size (mm)[1]
COL: Columnar; vertical edges near top of columns not sharp (vertices subrounded); column tops flat, rounded, or irregular	**VF**	Very fine columnar	<10
	F	Fine columnar	10–20
	M	Medium columnar	20–50
	C	Coarse columnar	50–100
	VC	Very coarse columnar	>100
SGR: Loose, single-grained, incoherent mass of individual primary particles, as in sands			
MA: Massive amorphous; a coherent mass showing no evidence of any distinct arrangement of soil particles; separates into clusters of particles, not peds			
CDY: Cloddy; not a structure, used to indicate the condition of some ploughed surfaces			

Notes:
1. The size limits refer to measurements in the smallest dimension of platy, prismatic and columnar peds, and to the largest of the nearly equal dimensions of blocky and granular peds.
2. Vertices are the intersections of two planes of a geometrical figure.

Grade

Record the degree of distinctness of aggregation of soil particles, using codes from Table 3.35.

Table 3.35 Grade of structure: codes

Code	Grade	Description
W	Weak	Weakly formed peds that are barely visible in place
WM	Weak to Moderate	
M	Moderate	Moderately formed peds that are evident in place; soil when disturbed breaks down into a mixture of many distinct entire peds; some broken peds and little disaggregated soil
MS	Moderate to Strong	
S	Strong	Peds are clearly evident in undisturbed soil; they adhere only weakly to one another and separate from each other and remain largely intact when the soil is disturbed; when displaced, soil material consists of entire peds, few broken peds and little disaggregated material

32 pH

Record pH, noting the determined values to one decimal place.

33 Additional Information

Record any observations or measurements not otherwise recorded that are unique or nonconforming or could be of particular significance to the project, classification or management. Examples include colour and description of mottles, description of clay films, effervescence, coarse fragment lithography, porosity, and root orientation (see Table 3.43). When coding a property, be sure to note the property being described. Examples of additional properties are listed here.

Sample

Record if horizon has been sampled.

Mottles

Describe mottles by recording their abundance (Table 3.36), size (Table 3.37), contrast (Table 3.38) and colour. Use Munsell Color Charts to determine mottle colour, defaulting to aspect 7 (crushed moist) unless you note otherwise.

Table 3.36 Mottles: abundance codes and classes

Code	Class	% of exposed surface
F	Few	<2
C	Common	2–20
M	Many	>20

Table 3.37 Mottles: size codes and classes

Code	Class	Diameter (mm)
F	Fine	<5
M	Medium	5–15
C	Coarse	>15

Table 3.38 Mottles: contrast codes

Code	Class	Description
F	Faint	Evident only on close examination; faint mottles commonly have the same hue as the colour to which they are compared and differ by no more than 1 unit of chroma or 2 units of value; some faint mottles of similar but low chroma and value can differ by 2.5 units of hue
D	Distinct	Readily seen, but contrast only moderately with the colour to which they are compared; distinct mottles commonly have the same hue as the colour to which they are compared, but differ by 2–4 units of chroma or 3–4 units of value, or differ from the colour to which they are compared by 2.5 units of hue, but by no more than 1 unit of chroma or 2 units of value
P	Prominent	Contrast strongly with the colour to which they are compared; prominent mottles are commonly the most obvious colour feature in a soil; prominent mottles that have medium chroma and value commonly differ from the colour to which they are compared by at least 5 units of hue, chroma and value are the same; they differ by at least 4 units of value or chroma if the hue is the same, or by more than 1 unit of chroma or 2 units of value if hue differs by 2.5 units

Clay films (skins)

Clay films are accumulations of oriented clay translocated from another part of the soil. Describe clay films by recording the frequency of occurrence (Table 3.39) and estimated thickness (Table 3.40). Most Bt horizons will exhibit clay films and should be noted; e.g., FMTK = Few, moderately thick clay films.

Table 3.39 Clay film frequency: codes and classes

Code	Class	Description
X	None	No clay films present
F	Few	Clay films cover less than 2% of the total area of the specified surface(s); patches of film are identifiable, but their frequency is so low that the significance of their presence may be nil or doubtful
C	Common	Clay films cover 2–20% of the total area of the specified surface(s)
M	Many	Clay films cover 20–80% of the total area of the specified surface(s); they may occur as discrete patches or as a continuous network
CS	Continuous	Clay films cover more than 80% of the total area of the specified surface(s); patches of these surfaces may be free of clay films, but the films are essentially continuous

Table 3.40 Clay film thickness: codes and classes

Code	Class	thickness (mm)	Description
TN	Thin	<0.05	Hand lens is needed for identification; visible in cross-section with 10X lens, but not to the unaided eye; if present, fine sand grains protrude through the film or are only thinly coated and are readily apparent
MTK	Moderately thick	0.05–0.5	Clay films are visible in cross-section to the unaided eye; fine sand grains are enveloped by the film or their outlines are indistinct; film surfaces are relatively smooth
TK	Thick	0.5–1.0	Clay films and their broken edges are readily visible without magnification; film surfaces are smooth
VTK	Very thick	>1.0	Clay films are a striking feature of the morphology

Effervescence

Effervescence is the bubbling, hissing or foaming that occurs when you add a 10% HCl solution to a sample of soil. Enter the appropriate code from Table 3.41.

Table 3.41 Degree of effervescence: codes and classes

Code	Class	Degree of effervescence
X	None	No evidence of effervescence
VW	Very Weak	Few bubbles (ensure that the bubbling sound is from reaction, rather than absorption of liquid; compare with water)
W	Weak	Bubbles readily observed
M	Moderate	Bubbles form low foam
S	Strong	Bubbles form thick foam

Horizon porosity

An estimate of total pore volume reflects the combined effects of soil structure and density. Record porosity classes for mineral horizons as described in Table 3.42.

Table 3.42 Mineral horizon porosity: codes and classes

Code	Class	Description
S	Slightly porous	Closely packed structureless soil material; highly compacted material
M	Moderately porous	Horizons with weak to moderate structure and moderately close packing; closely packed soils with large, well-developed peds
H	Highly porous	Horizons that are loosely packed and/or very well structured, with small peds

Coarse fragment lithology

See item 7: Bedrock. Record up to three rock types in order of dominance (from most to least dominant) that make up the coarse fraction (i.e., gravels, cobbles and stones) of the soil material. Record the characters using the same codes as you used for bedrock type. If the lithologies are so mixed that you cannot determine dominance, record this by entering the code "mx." The colour of coarse fragments may be characteristic of a particular bedrock source.

Root orientation

See Table 3.43.

Table 3.43 Root orientation codes

Code	Description
H	Horizontal
O	Oblique
R	Random
V	Vertical
MX	Mixed

34 Profile Diagram

Sketch a cross-sectional profile diagram of the horizon boundaries, and add other significant features (such as relative coarse fragment distribution and size, piping, turbation, cryoturbation, seepage, water table, frost table, lithic contact); see Figure 3.5 for an example.

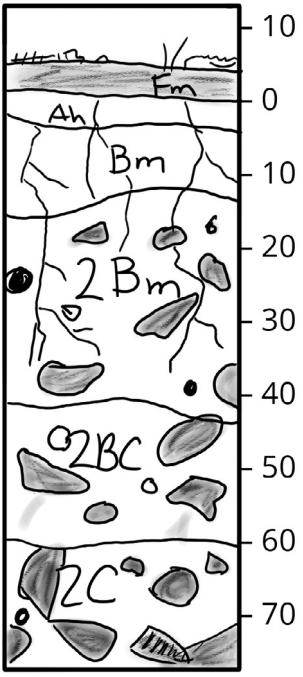


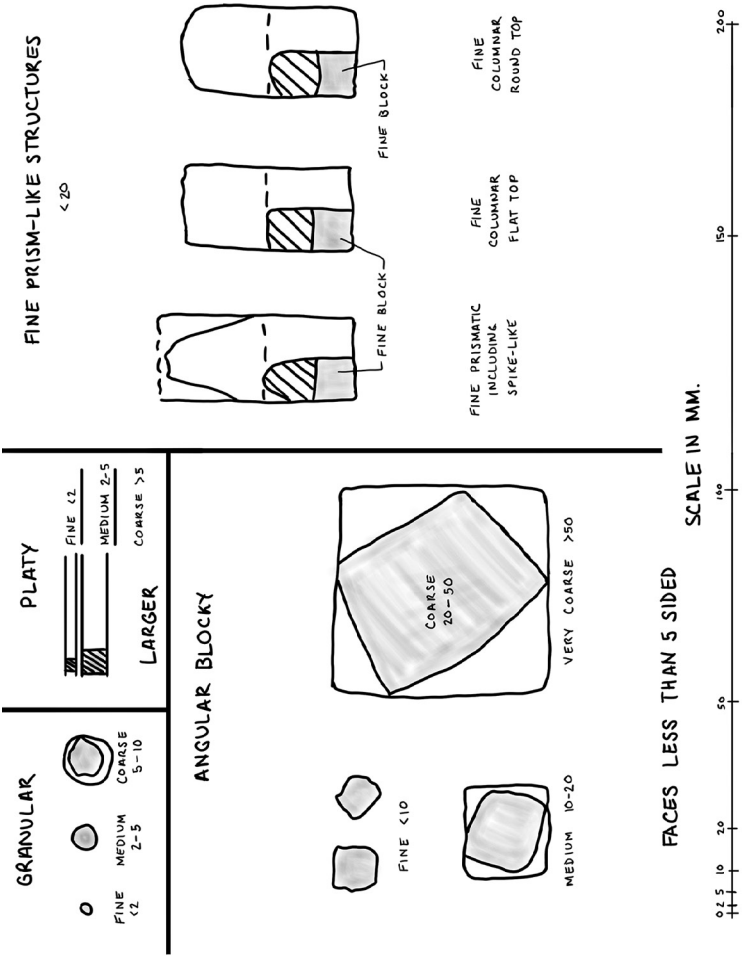
Figure 3.5 Example of profile diagram

35 Comments

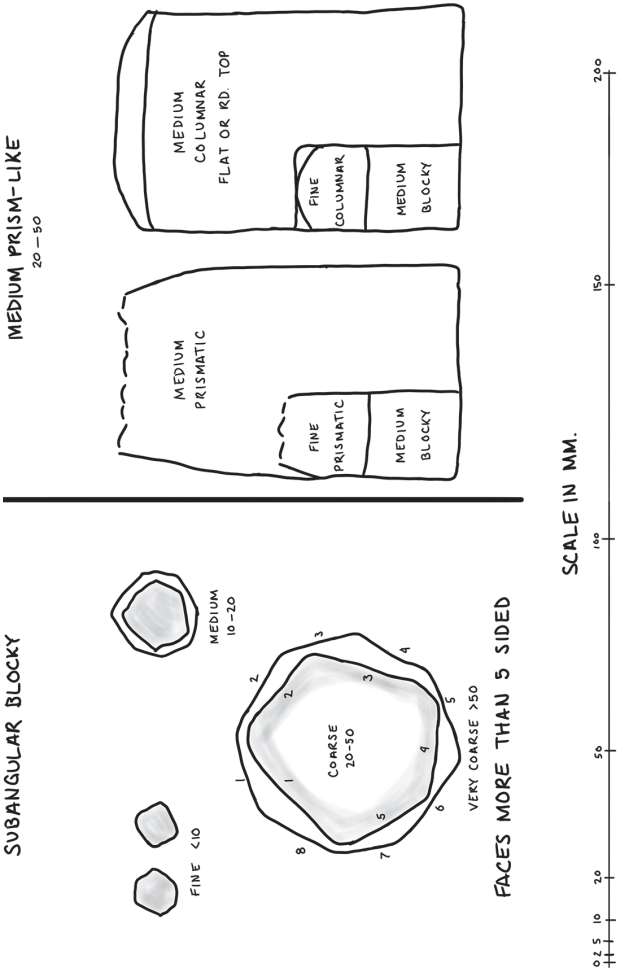
Record any observations or measurements of features not otherwise recorded that are unique or nonconforming, or could be of particular significance to the project, classification or management.

Record the photo number or any information that will assist with determining correct photos for the site, such as the number of photos taken per site.

Appendix 3.1, Part 1: Diagram of soil structure



Appendix 3.1, Part 2: Diagram of soil structure



Modified from B.C. Ministry of Forests and Range and Ministry of Environment 2010; used with permission.

4. Vegetation

4. Vegetation

Yukon
Environment

VEGETATION FORM

Project 1									Date: YYYY-MM-DD 2	Plot No. 3
Observer(s) 4	% Cover by Stratum 5	TR	SH	GS	FB	GR	BR	LN	Species List Vasculars. Non-vasc. 6	Complete | Partial

C	Trees	TD	TT	LT	S_	S_	C	Herbs	%	C	Non-vascular	%
7	8	9					7	8	9	7	8	9
C	Shrubs	TS	MS	LS	GS	S_						
7	8	9										
											Bare	
											Litt	
											Rock	
											Slas	
											Twig	
											Wate	

Comments 10	Photos 11

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Plot No. ____________________

C	Trees	TD	TT	LT	S_	S_

C	Shrubs	TS	MS	LS	GS	S_

C	Mensuration	Dbh	Ht	Age

C	Herbs	%	C	Non-vascular	%

Field Procedures

Getting Started

- Locate plot boundaries.
- Assemble description forms, collection bags, plant keys and implements (e.g., a knife, trowel).

Record and Estimate

- Enter the project, plot number, date and observer names.
- Standing at one point in the plot, list all the species you observe in each layer.
- Traverse the entire plot (or one quadrant at a time) in an increasing spiral or zigzag pattern, noting each new species.
- Collect unknown species, recording each by a temporary name and plot collection number on the form (e.g., moss 01, hairy grass 02, herb 03, etc.). Mark the sample bags and pressing sheets with plot and collection numbers.
- When the list seems complete, estimate the per cent cover for each stratum:
  - roughly estimate total cover and then individual species covers in that stratum;
  - add up species covers, compare to total species cover and total stratum cover, and reconcile any discrepancies. Ensure that vegetated and non-vegetated strata comprise a total cover of at least 100%; usually there is more than 100% because of overlap between species and strata.
- Verify that you have completed all the required boxes on the Vegetation Form.
- Photograph the plot, if required.

Guidelines for Describing Vegetation

All vegetation is assigned to one of the following strata.

Tree Stratum

The tree stratum includes all woody plants greater than 2 m tall and with a diameter at breast height (dbh) greater than 7 cm. Three sub-strata are recognized:

- **TD** Dominant Trees – greater than 5 m tall and with a dbh greater than 7 cm; this includes the tallest trees of the main canopy, which may be veterans that survived past fires, or the tallest trees of the same age class as the main canopy; usually a minor portion of the stand composition
- **TT** Tall Trees – greater than 5 m tall and with a dbh greater than 7 cm; this is the main layer of tree cover, usually the major portion of the stand composition
- **LT** Low Trees – between 2 and 5 m tall and with a dbh greater than 7 cm

Snags (standing dead woody plants, mainly trees) are recorded based on the degree of decay (Table 4.1).

Table 4.1 Decay classes for snags

Code	Description
SN	Dead tree/shrub; state of decay unspecified
S1	Most foliage gone and some twigs and branches gone; top may be broken
S2	All foliage gone and some twigs and branches gone; top may be broken
S3	No foliage or twigs present; up to 50% branches gone; top usually broken
S4	Branches gone, except for some branch stubs; top broken
S5	No branches; top broken
S6	Stump

Shrub stratum

The shrub stratum includes all woody plants that are generally less than 5 m tall and have a dbh less than 7 cm. Established tree regeneration that is less than 5 m in height and with a dbh less than 7 cm is considered part of the shrub layer. Four sub-strata are recognized (Table 4.2).

Table 4.2 Shrub strata

TS	Tall Shrub	Includes all woody plants >2 m tall and with a dbh <7 cm
MS	Medium Shrub	Includes all woody plants between 0.5 and 2 m high
LS	Low Shrub	Includes all woody plants between 0.1 and 0.5 m high
GS	Ground Shrub	Includes woody plants <0.1 m; may be trailing

Forbs, graminoids and aquatic plants

The remaining vascular plants, regardless of height, are listed under herbs (Table 4.3). These are the strata used in YBIS:

Table 4.3 Herbs

FB	Forbs	Herbaceous flowering plants
FN	Ferns	
GR	Graminoids	Grasses, sedges, rushes; i.e., plants in the Poaceae, Cyperaceae, or Juncaceae families
AQ	Aquatic plants	Floating or submerged, in wetlands

Non-vascular stratum

The non-vascular stratum includes fungi (**FG**), lichens (**LN**), and mosses and liverworts (**BR**). Algae (**AL**) are also included.

Non-vegetated (NV) plot attributes

The non-plant portions of a plot are described using the codes in Table 4.4.

Table 4.4 Non-vegetated (NV) portions of a plot

ROCK	Unconsolidated rock (particles >2 mm)
BEDR	Bedrock exposed; consolidated mineral material
BARE MINE	Bare mineral soil
BARE ORGA	Bare organic matter/soil
LITT	Litter: dead non-woody plant material
LITT TUSS	Dead material of tussock-forming graminoids
SLAS	Slash: dead woody plant material with a diameter >7 cm
TWIG	Twigs: dead woody plant material with a diameter <7 cm
WATE	Water above the ground surface

Species lists

Record the species of all vegetation by stratum, either by entering the names in full, or by using the four-letter codes for genus and species/subspecies/variety. You can obtain the codes from YBIS. More information on codes and exceptions is provided in Appendix 4.1. At a minimum, record all those species growing on the dominant substrate. This substrate will most often be organic matter or mineral soil, but at some sites may be rock or decaying wood. For ease of data entry, list the species in each plant group together; i.e., separate the herb stratum into forbs and graminoids and the non-vascular stratum into bryophytes (mosses and liverworts) and lichens.

It is not always possible to identify all species within a plot, especially non-vascular species. Some projects may require you only to list the indicator plants or dominant species growing on the main substrate.

In such cases, it is important to check the appropriate box at the top of the Vegetation Form (see box 6) to indicate that you have made only a partial listing. Checking "Complete" indicates that you identified all plants to infra-species if relevant and that you collected unknown species of sufficient quality for identification. Checking "Partial" generally means that you recorded the dominant and/or most abundant species, and that unless unknowns were dominant/abundant, you did not collect them. It also means that you did not identify or collect non-vascular plants that are difficult to identify, such as Sphagnum species.

Unknown species

Collect specimens of unknown species for verification, numbering them sequentially within each plot. Note the collection number in the collection column of the Vegetation Form. Record the plot number, temporary name and collection number on pressing sheets.

Record the per cent cover for unknowns using the temporary name in lieu of species name and the collection number (e.g., Carex droopy 03). These procedures are extremely important if several persons are collecting data, or if a significant time lag occurs between field collection and office verification and coding.

Estimating per cent cover

This is estimated as the percentage of the ground surface that is covered when the crowns are projected vertically. Follow the outside perimeter of the projected crown. For the tree layer, subtract distinct holes in the canopy from the estimate. For other layers, you can ignore small gaps that are not fully covered:

- view the layer vertically; if you view it obliquely, this can result in an over-estimation
- for species with high cover values, mentally move the plants to a corner of the plot to estimate if they represent one-quarter, one-third, one-half, or more of the plot
- for species that almost cover the plot, mentally move them together and estimate how much of the area is not covered by the plants; for species with low cover, estimate the subsections in each quarter of the plot
- equating per cent cover with equivalent dimensions relative to plot area can be helpful (Table 4.5). For several small scattered areas of coverage, think about the area covered by 1% or 0.1%, and add up the total number of areas of cover that are roughly equivalent to these dimensions
- comparison charts (Figure 4.1) and the coverage diagram shown in Figure 4.2 are other useful aids

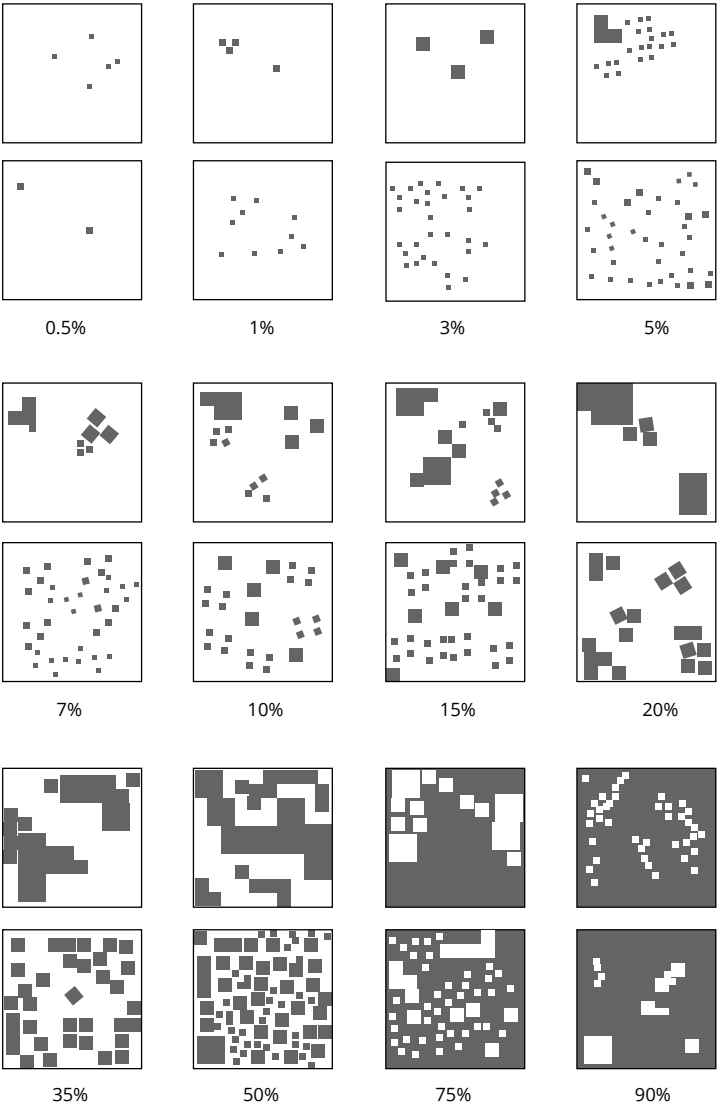


Figure 4.1 Visual aid for determining per cent cover of plant species

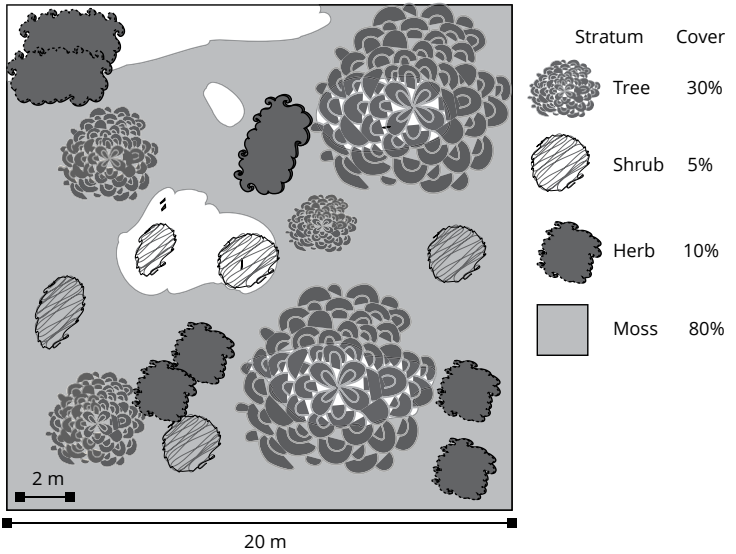


Figure 4.2 Determining per cent cover of plant species: an example

Recording per cent cover

Record per cent cover of all plant species and non-vegetated components of the plot. For ground cover components such as mosses and lichens, try to record the per cent cover of all living material, even if some components may obscure others; e.g., lichens growing on top of mosses.

Table 4.5 gives examples of the relationship of dimensions to percentage area for a 20 m x 20 m (400 m^2) plot, and the associated per cent cover. The values in Table 4.5 are useful for documenting plants with very low cover.

Table 4.5 Dimensions and their per cent covers in a 400-m^2 plot

Dimensions	Area (m^2)	% cover
10 x 10 m	100.0	25.0
5 x 8 m	40.0	10.0
2 x 2 m	4.0	1.0
63 x 63 cm	0.4	0.1
20 x 20 cm	0.04	0.01
6.3 x 6.3 cm	0.004	0.001

Completing the Vegetation Form

1 Project

Enter the same project name/identification that you used on the Biophysical/Ecological Project Description Form (Section 1).

2 Date

Provide the date when field work began. Use 4 digits for year (yyyy), 2 digits for month (mm), and 2 digits for day (dd).
Example: 2017/07/09 (for July 9, 2017).

3 Plot No.

Record the plot number used on the Ecosystem Site Form (Section 2).

4 Observer(s)

Record the full initials, as noted on the Biophysical/Ecological Project Description Form, of the person(s) responsible for filling out the Vegetation Form. If you wish, you can include the initials of other members of the team in parentheses; e.g., VAL (RM, DWM).

5 % Cover by Stratum

This section is helpful to double-check the cover values of individual plant species. After you list all species, enter the total per cent cover by stratum (see descriptions of strata and instructions for estimating and recording per cent cover at the beginning of this section). Note that because of overlaps the sum of the per cent cover values for all species within each stratum may be greater than the total stratum coverage.

6 Species List

Check the appropriate box to indicate whether you have identified all vascular and non-vascular plants.

7 C (Collected)

Indicate in this column if a species has been collected. Provide a collection number if possible.

8 Names of Species

List the species by strata using the eight-letter genus/species/subspecies/variety code. Generally, the code will consist of the first 4 letters of the genus and the first four letters of the species, subspecies or variety. If you are uncertain of the code write the entire scientific name. You can find the correct codes in YBIS under Reports/Data QA/QC and Codes/Vegetation codes. See also Appendix 4.1 for a description of the code rules and examples of exceptions.

9 % Cover

Enter the estimated per cent cover for each species and for the non-vegetated components of the plot. Tree and shrub species may fall into both the tree and shrub strata, depending on height and size. Refer to the previous part of this section for descriptions.

10 Comments

Record any important features of the site or vegetation not evident from the species list. Record wildlife sightings or signs of wildlife. List any indicators or other interesting plant species that are near but outside the plot boundaries.

11 Photos

Record photo numbers or any information that will help determine the correct photos for the site, such as the number of photos taken at the plot.

12 Mensuration

For treed plots, select a representative individual of each species, or two individuals if veterans are present, and measure trunk diameter at breast height, or dbh (e.g., 1.3 m from the ground surface), tree height in metres and tree age from a core sample taken at breast height.

Appendix 4.1 Vegetation Codes for YBIS

YBIS = Yukon Biophysical Information System

Identified species

Use the first four letters of the genus and the first four letters of the species, with a space after the genus code, to construct an eight-letter code.

Examples: *Anemone multifida* = **ANEM MULT**
Festuca brachyphylla = **FEST BRAC**

Unknowns

If the species is unknown, use the first eight letters of the genus. If the genus name is less than eight letters long, use the full name, as shown below:

Examples: *Pedicularis* sp. = **PEDI CULA**
Salix sp. = **SALI X**

If there are multiple unknown species for one genus, use the first four letters of the genus and "SPP" for the species.

Examples: *Salix* spp. = **SALI SPP**
Carex spp. = **CARE SPP**

If the genus has fewer than five letters, use "SP" for the unknown.

Example: *Poa* sp. = **POA SP**

Infraspecies

Use the infraspecies name with the genus code.

Example: *Myosotis alpestris* spp. *asiatica* = **MYOS ASIA**

If the infraspecies has the same name as the species, put an "S" or "V" as the last letter in the species code for subspecies and variety, respectively.

Examples: *Anemone multifida* var. *multifida* = **ANEM MULV**
Festuca brachyphylla spp. *brachyphylla* = **FEST BRAS**

If the genus and variety/subspecies names are already used, then the species code is two letters of the species name plus the first letter of the infraspecies plus "V" or "S," respectively.

Example: *Anemone patens* var. *multifida* = **ANEM PAMV**

Anemone issue:

Name	Code
Anemone multifida	**ANEM MULT**
Anemone multifida var. *multifida*	**ANEM MULV**
Anemone patens	**ANEM PATE**
Anemone patens var. *multifida*	**ANEM PAMV**

Exceptions

Examples of exceptions to the vegetation code naming convention described above are listed in the following table. For example, in the table below, following the vegetation code naming convention for *Arctoa fulvella* means the code would be ARCT FULV (the "Expected Code" in the table); however, this code has previously been applied to the species *Arctophila fulva*. As a result, the correct (or "Accepted") code for *Arctoa fulvella* is ARCT FULE. A complete list of current exceptions is provided in the table below. Note that these may change over time as taxonomy changes and/or new species are identified.

Exception	Accepted code	Expected code	Expected code assigned to
Arctoa fulvella	**ARCT FULE**	**ARCT FULV**	*Arctophila fulva*
Brachytheciastrum sp.	**BRAC HYTA**	**BRAC HYTH**	*Brachythecium* sp.
Carex micropoda	**CARE MICO**	**CARE MICR**	*Carex microchaeta*
Cladonia cristatella	**CLAD CRIT**	**CLAD CRIS**	*Cladonia crispata*
Cladonia macroceras	**CLAD MACC**	**CLAD MACR**	*Cladonia macrophylla*
Cladonia macrophyllodes	**CLAD MACP**	**CLAD MACR**	*Cladonia macrophylla*
Cyrtomnium hymenophylloides	**CYRT HYMP**	**CYRT HYME**	*Cyrtomnium hymenophyllum*
Dicranoweisia crispula	**DICW CRIS**	**DICR CRIS**	*Dicranella crispa*
Encalypta brevicollis	**ENCA BREC**	**ENCA BREV**	*Encalypta brevipes*
Melanelixia sp.	**MELA NELX**	**MELA NELI**	*Melanelia* sp.
Melanohalea olivaceoides	**MELA OLIO**	**MELA OLIV**	*Melanohalea olivacea*
Mnium spinulosum	**MNIU SPIU**	**MNIU SPIN**	*Mnium spinosum*
Oxytropis borealis var. *viscida*	**OXYT VISV**	**OXYT VISC**	*Oxytropis viscida*

Exception	Accepted code	Expected code	Expected code assigned to
Oxytropis deflexa spp. *sericea*	**OXYT SERS**	**OXYT SERI**	*Oxytropis sericea*
Poa pratensis spp. *alpigena*	**POA ALPG**	**POA ALPI**	*Poa alpina*
Pohlia crudoides	**POHL CRUO**	**POHL CRUD**	*Pohlia cruda*
Polygonum convolvulus var. *convolvulus*	**POLY COVV**	**POLY CONV**	*Polygonum convolvulus*
Polytrichastrum sp.	**POLY ASTR**	**POLY TRIC**	*Polytrichum* sp.
Populus balsamifera spp. *balsamifera*	**POPU BASS**	**POPU BALS**	*Populus balsamifera*
Pseudoleskea radicosa	**PSEU RADC**	**PSEU RADI**	*Pseudocampylium radicale*
Ptychostomum pallescens	**PTYC PALE**	**PTYC PALL**	*Ptychostomum pallens*
Rhizocarpon eupetraeum	**RHIZ EUPT**	**RHIZ EUPE**	*Rhizocarpon eupetraeoides*
Rinodina mniaraea var. *mniaraeiza*	**RINO MNZV**	**RINO MNIV**	*Rinodina mniaraea* var. *mniaraea*
Rumex acetosella	**RUME ACEA**	**RUME ACET**	*Rumex acetosa*
Rumex crispus spp. *crispus*	**RUME CRSS**	**RUME CRIS**	*Rumex crispus*
Stellaria longifolia	**STEL LONF**	**STEL LONG**	*Stellaria longipes*
Symphyotrichum ciliolatum	**SYMP CILO**	**SYMP CILI**	*Symphyotrichum ciliatum*
Timmia norvegica var. *norvegica*	**TIMM NOVV**	**TIMM NORV**	*Timmia norvegica*
Tortella tortuosa var. *fragilifolia*	**TORT FRAV**	**TORT FRAG**	*Tortella fragilis*

5. Site Visit

5. Site Visit

Yukon
Environment

SITE VISIT FORM

Project 1		Plot Level: ☐ G 2	Plot No. 3
Date: YYYY-MM-DD 4	Plot Type: ☐ Standard ☐ Noveg ☐ Irreg 5	Observer(s) 6	NTS map 7
Location 8			
Lat N	Long W	Accur (m) WGS84 ☐ _____ 10	YBEC 11
Northing 9	Easting	UTM Zone	Polygon 12

Site Features	Elev (m) 13	Aspect (°) 14	Slope % 15	Surface Shape ☐ CV ☐ CX ☐ ST ☐ 16	
	☐ Crest ☐ Toe 17 ☐ Upper ☐ Level	☐ Mid ☐ Dep.	☐ Lower ☐ Gully	Flood plain? ☐	SMR 18 / SNR 19
Site Disturb.	☐ None ☐ Fire ☐ Other 20	☐ Veg. Removal ☐ Biotic	☐ Soil Dist. ☐ Terrain	☐ Plant Gather ☐ Water	
Expose. Type	☐ None ☐ Frost ☐ Other 21	☐ Insolation ☐ Cold Air	☐ Wind ☐ Aufeis	☐ Snow ☐ Rain Shadow	☐ Water Spray
Stand Attributes	Stand Age _____ 22 ☐ Est. ☐ Mea.		Canopy Composition 24		
	Stand Ht. _____ 23 ☐ Est. ☐ Mea.				
	Structure 25 ☐ 1 ☐ 2a ☐ 2c ☐ 3a ☐ 3b ☐ 3c ☐ 3d ☐ 4a ☐ 4b ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9				
Plot Representing 26					
Wetland Class 27		Veg Assoc. 28			
Ecosite 29		Map Label 30			

Terrain	Texture	Surficial Material	Surface Expression	Geo. Process	Rock Types
1. 31					1. 32
2.					2.

Rooting Zone	Drainage 33 ☐ VR ☐ R	☐ W	☐ MW	☐ I	☐ P	☐ VP
	Humus/Organic Form 34 ☐ Mor ☐ Moder	☐ Mull	☐ Fibric	☐ Mesic	☐ Humic	
	Humus thickness _____ 35 cm	☐ Ah? ☐ Ae? _____ 36 cm	Est. soil depth _____ 37 cm			
	Depth (cm) 38	Min Soil	Wat. table	Seepage	Mottle/gley	Restrict. ☐ None
	Rest. Type 39 ☐ Cement ☐ Pan	☐ Kompact	☐ Water	☐ Lithic	☐ CaCO3	☐ Frost
	Texture 40	R.Z. Coarse Fragment % 41	Estimated Rooting Depth _____ 42 cm			

Comments

Plot No. 43	% Cover by Stratum 44	TR	SH	GS	FB	GR	BR	LN	Species List Vasculars. Non-vasc. 45	Complete	Partial	Observer(s) 46

C	Trees	TD	TT	LT	S_	S_
47	48		49			

C	Shrubs	TS	MS	LS	GS	S_

Tree Mensuration

Species	dbh	Ht.	Bh Age	Est/meas
50				

C	Herbs	%

C	Non-vascular	%

C	Non-vegetated	%

Diagram

53

Comments

51

Photos

52

Background

The Site Visit Form is designed to be used for reconnaissance-level ecological plot collection at several levels:

- ground calls require minimal supporting information, as recorded on the form;
- ground inspections for specific ecosystem classification, mapping or other projects (e.g., bioterrain, species collection, wetland, and habitat assessments), which require specific data; and
- ad hoc ecological site notes.

More than 50 data fields are presented on the form and described in this manual, but not all of them are relevant to every project. The objectives of a study will determine the data to be collected. The attributes collected on the form can be entered into the Yukon Biophysical Information System (YBIS). Project objectives may also require attributes not listed on this form. In cases where many additional attributes are required, you should probably develop project-specific forms.

See Section 2 (Site), Section 3 (Soil) and Section 4 (Vegetation) for more detailed explanations of the attributes and codes. You also need to fill out a Biophysical/Ecological Project Description Form (Section 1).

Mandatory information for all plots

These items are mandatory for all plot levels, including customized data forms. The numbers correspond to the numbers on the annotated form:

1. Project ID
2. Plot Number
3. Plot Level
4. Plot Type
5. Date
6. Observer(s)
9. Latitude/Longitude or UTM
10. Accuracy and Datum

Ground Inspections

For ecosite assessments that may be used for checking/auditing a classification, you should fill out the entire form.

Ground Call

Ground calls are quick field inspections where minimal information is collected. These plots do not contain the information required for use in compiling ecological data. They are intended for georeferenced point information to be used in ecological mapping. An accurate georeferenced location is essential. Generally, a ground call has a specific purpose; e.g., to confirm an ecosystem unit. Commonly, little if any species information is collected.

You should complete the following items on the Site Visit Form (at the beginning of this section) for all visual ground calls:

1. Project ID
2. Plot Number
3. Plot Level – check the V (visual) box
4. Plot Type
5. Date
6. Observer(s)
9. Latitude/Longitude or UTM
10. Accuracy and Datum
11. YBEC unit
13. Elevation
14. Aspect
15. Slope
29. Ecosite

Data is also commonly collected for these items:

17. Meso Slope Position
20. Site Disturbance
24. Canopy Composition
25. Structure
52. Plot photos

Ground Inspection Field Procedure

Getting started in the field

- Select the sample plot. The project objectives will determine how plot locations are selected.
- Check box "G" (ground) in Plot Level (box 3). Record the project ID, plot number, plot type, date, observer(s) name(s), map sheet number, location, polygon number (if using) and YBEC unit.
- Record latitude and longitude (or UTM) using field GPS. Record datum and estimated location accuracy.
- Locate and excavate a soil pit to a depth of about 50 cm.

Measure and assess

- Determine the elevation, aspect and slope.
- Traverse the entire plot systematically, observing the position of the plot relative to the surrounding landscape, micro-topographic features, and the composition of surface substrates. Record the meso slope position.
- Assess the soils and determine humus form, soil drainage, rooting zone soil texture, and per cent coarse fragments. Estimate the depth of soil and rooting depth. Note the presence and depth of Ah or Ae horizons, gleying and seepage. Record the depth and type of root restricting layer, if any, and the depth of the surface organic horizon.
- Record the terrain texture, surficial material, surface expression and geomorphological processes.
- Record the dominant and indicator plant species by strata. Evaluate the per cent cover by species and total for each stratum. Indicate on the form whether the species list is complete or partial.
- Confirm the YBEC unit. Integrate site, soil and vegetation factors to determine soil moisture and soil nutrient regimes, and ecosite. Note unusual features or conclusions in the Comments section.
- Determine the stand structure.
- Measure or estimate stand age, average stand height, and canopy composition.
- Describe the key site features under Comments (box 51). Draw a site diagram, if you can effectively depict important features.
- Be sure that you have completed all the required boxes.

Completing the Site Visit Form

The numbered items refer to the numbers on the Site Visit Form.

1 Project

Enter the same project name/ID that you used on the Biophysical/Ecological Project Description Form (Section 1).

2 Plot Level

Check the appropriate box ("G" for Ground or "V" for Visual) to indicate the level of the survey.

3 Plot Number

This number (numeric or alpha-numeric) identifies the plot. It can comprise up to 15 characters. Note that leading zeroes are required in order to sort the plot numbers consecutively in YBIS (e.g., for a project with 100 plots, plot 1 will be 001, plot 10 will be 010 and plot 100 will be 100.

4 Date

Provide the date when field work began. Use 4 digits for year (yyyy), 2 digits for month (mm) and 2 digits for day (dd).
Example: 2017/07/09 (for July 9, 2017).

5 Plot Type

Refer to Plot Type (item 9) in Section 1 for more information. On the Site Visit Form, check one of the following:

Standard	if the plot is the standard one chosen for the project
Noveg	if no vegetation data was recorded at the site
Irreg	if irregular plot shapes/sizes may be needed for ecosystems that cannot be captured in the standard plot types, such as zones in wetlands or riparian areas; record the dimensions of the irregular plot type, if known

6 Observer(s)

Record the name or full initials of the observers as described on the Biophysical/Ecological Project Description Form (see Section 1). Indicate their role in data collection (P = Site; V = Veg; S = Soil).

7 NTS Map

Record the National Topographic System (NTS) 1:250,000 map sheet and the 1:50,000 map sheet.

8 Location

Describe the location of the plot at a regional and local scale, relative to natural features such as mountains or bodies of water and permanent structures such as road signs. It may also be useful to describe the plot's relationship to adjacent plots. The description should allow other users to locate the general position of the plot on a map and should help them relocate the plot in the field.

9 Latitude/Longitude or UTM

Determine the precise plot location and record it as latitude and longitude (degrees, minutes, decimal seconds or decimal degrees) or UTM zone, northing and easting. Latitude/longitude is the preferred coordinate system. If you are not using a GPS, please record your source for coordinates.

10 Accuracy and Datum

From the GPS, record the estimated georeferencing accuracy in metres.

Set your GPS to WGS84. Check the WGS84 box or enter one of the following codes:

UNK	unknown
NAD83	North American Datum 1983
NAD27	North American Datum 1927

11 YBEC

YBEC is the Yukon Bioclimate Ecosystem Classification. Enter the code for the bioclimate zone and subzone. The best sources for bioclimate information are regional field guides to site identification or maps produced by the Ecological and Landscape Classification Program of Environment Yukon. See the Yukon Ecological and Landscape Classification Guidelines for more information (www.env.gov.yk.ca/elc).

12 Polygon Number

If the inspection is part of a mapping project, record a full polygon identifier where the plot is located. The polygon number will be specific to the project and/or the map sheet.

13 Elevation (m)

Record the elevation in metres.

14 Aspect (°)

Record the orientation of the meso slope in degrees. Measure with a compass. Record due North as 0° and not applicable (N/A) as –1 or leave blank.

15 Slope (%)

Record per cent slope gradient, measured with a clinometer or similar instrument.

16 Surface Shape

Check the appropriate box for surface shape. See Figure 2.1.

17 Meso Slope Position

Check the appropriate box to indicate the position of the plot relative to the localized catchment area.

18 Soil Moisture Regime (SMR)

Enter a code (0 through 9) for the soil moisture regime.

19 Soil Nutrient Regime (SNR)

Enter a code (A through F) for the soil nutrient regime.

20 Site Disturbance

Note any events that have caused vegetation and soil characteristics to differ from those expected for the site. Check the general category of disturbance and add codes for the specific type of disturbance within that category. If existing codes are inadequate, check the "Other" box and explain in the space provided. See Section 2, Item 27, for a list of disturbance codes. Examples include: B.b (Biotic: beaver tree cutting); F.c (Fire: recent, severe crown fire); L.t (Vegetation Removal: cutlines). If no disturbances are noted, check the "None" box.

21 Exposure Type

If significant localized atmospheric and climate-related factors are reflected in atypical soil and/or vegetation features, check the appropriate box. If existing codes are inadequate, check the "Other" box and explain in the space provided. If there is no evidence of exposure to anomalous conditions, check the "None" box.

22 Stand Age

Record the approximate age of the stand based on tree cores, inventories or other sources of information. Check the appropriate box to indicate whether you estimated or measured stand age.

23 Stand Height

Record the average height of the stand using the dominant canopy (generally the TT, TS or MS stratum). Check the appropriate box to indicate whether you estimated or measured stand height.

24 Canopy Composition

If the stand is forested, record the canopy composition using two-letter tree species codes followed by single digits that represent 10% of canopy cover (e.g., Pl7 Bl2 At1 for 70% lodgepole pine, 20% subalpine fir, 10% aspen).

25 Structure

Check the appropriate box.

26 Plot Representing

Outline the important characteristics of the sampled ecosystem. This outline should provide a concise description of the key attributes of the site, such as in these examples:

- 30-year-old Pl stand; kinnikinnick/lichen on FG terrace
- Productive reference Sw/willow stand on warm aspect
- Mature Sw/feathermoss on floodplain

27 Wetland Classification

If the site is a wetland, you may classify it according to the Canadian Wetland Classification System. Classification keys are available; see Warner and Rubec (1998).

28 Vegetation Association

Vegetation associations for treed, shrub, grassland and wetland communities across Yukon are being described, and an ecological classification for arctic vegetation is being developed. Consult regional ecosite guides or contact the Ecological and Landscape Classification Coordinator for the most current classification.

29 Ecosite

Where ecosites have been defined (see regional ecosite guides) make a preliminary field assessment of the ecosite and record it here.

30 Map Label

If the plot is part of a mapping project, enter the appropriately formatted map code for the terrestrial ecosystem or other map unit (soils, terrain, etc.).

31 Terrain Classification

Boxes are provided on the form for recording terrain texture, surficial material, surface expression, and geomorphological processes. You can use up to three codes in each of these boxes. Line 1 is for the uppermost stratigraphic layer; Line 2 is for an underlying layer. Refer to Section 3 (Soil) and Howes and Kenk (1997) for further information.

32 Rock Types

Record the dominant rock types for coarse fragment lithography.
See Key 6.7 and 6.8.

33 Drainage

Check the box for the appropriate drainage class. See Table 3.14.

34 Humus/Organic Form

Examine the humus form profile and check the appropriate box (see Table 3.9).

35 Humus Thickness

Measure the surface organic horizon in cm from the top of the ground surface to the top of the first mineral horizon.

36 A Horizon Characteristics

If an A horizon is present, check the appropriate box and record the thickness of the horizon in cm.

37 Estimated Soil Depth

Record the thickness in cm of the entire soil profile from the ground surface to a root restricting layer. If you see no restricting layer in the soil pit, estimate the depth of soil based on nearby road cuts or other indicators of active seepage or water table.

38 Depth to:

Record the following depths in cm as calculated from the ground surface (the top of the uppermost soil horizon including organic horizons; e.g., Fm1):

- mineral soil: record the depth of organic horizons that overlie the top mineral horizon
- water table: if water is present, record the depth to the water surface
- seepage: if seepage is present, record the depth from the ground surface to the level of temporary or permanent subsurface water flow
- mottles/gleying: record the depth at which prominent or distinct mottles or gleying appears

- root restricting layer: record the depth to a root restricting layer, if present
- check the “None” box if you don’t observe a restricting layer

39 Root Restriction Type

Identify and record the type of root restricting layer, if present.

40 Texture

Soil texture is defined by the size distribution of primary mineral particles (2 mm diameter or less). Determine the texture classes and codes by estimating the percentage of clay (less than 0.002 mm diameter) and sand (0.05–<2.0 mm diameter); see the soil texture triangle in Figure 3.3. See Keys 6.14, 6.15 and 6.16 for methods to assess soil texture in the field.

41 Rooting Zone Coarse Fragment %

Estimate the percentage of the total volume of coarse fragments (>2 mm diameter) in the rooting zone of the soil profile.

42 Estimated Rooting Depth

Record the depth from the ground surface where the majority of the roots stop (i.e., where rooting abundance drops from “plentiful” to “few”).

43 Plot Number

This number (numeric or alpha-numeric) identifies the plot. This number (numeric or alpha-numeric) identifies the plot, and must match the plot number entered for item 3 on the opposite side of the form. It can comprise up to 15 characters. Note that leading zeroes are required in order to sort the plot numbers consecutively in YBIS (e.g., for a project with 100 plots, plot 1 will be 001, plot 10 will be 010 and plot 100 will be 100.

44 % Cover by Stratum

Enter the total per cent cover for each stratum, listed as a percentage of the plot.

45 Species List

Check the appropriate box to indicate whether your list of identified vascular and non-vascular plants is partial or complete.

46 Observers

Record the full initials, as noted on the Biophysical/Ecological Project Description Form, of the person(s) responsible for filling out the Site Visit Form. If you wish, you can include the initials of other members of the team in parentheses; e.g., VAL (RM, DWM).

47 (C) Collected

Indicate in this column if a species has been collected. Provide a collection number if possible.

48 Dominant/Indicator Plant Species

List the dominant and indicator species under the appropriate stratum using plant species codes from YBIS. Also record the non-plant components of the plot (i.e., bare ground, rock, litter, slash, twigs and water). If you are recording a full species list, you should use the Vegetation Form.

49 % Cover

Enter the estimated per cent cover for each species and for the non-vegetated components of the plot. Tree and shrub species may fall into both the tree and shrub strata, depending on their height and size.

50 Tree Mensuration

For treed plots, if required by project objectives, select one or two representative individuals of each species and record dbh, tree height in metres and tree age from a core sample taken at breast height. Indicate whether you estimated or measured each of these variables.

51 Comments

Record any important or unusual features of the site or vegetation not already recorded. This includes wildlife sightings or wildlife sign, and rare or interesting plant species that are outside of but near the plot.

52 Photos

Record photo numbers or any information that will assist with determining correct photos for the site, such as the number of photos taken per site.

53 Diagram

A cross-sectional diagram of plot location in relation to the surrounding landscape is often most useful, although a plan view is helpful for showing distribution of plots within a wetland complex or other areas of relatively level ground. Use the diagram to provide additional information about site features, location relative to adjacent plots or to assist in locating the plot again.

6. Keys and Codes

6. Keys and Codes

Determining Soil Moisture Regime and Soil Nutrient Regime

Determining relative soil moisture regime and soil nutrient regime is a critical step in identifying ecosystems. Key 6.1 provides brief descriptions of the key terms used in determining these characteristics. For further information refer to Items 25 and 26 in Section 2.

Determining Relative Soil Moisture Regime

Read the definitions of terms in Key 6.1 carefully before using Keys 6.2 and 6.3 (relative soil moisture regime). Slope position can be difficult to assess if the line of vision of an entire slope and transitions is obstructed by taller vegetation. For this reason it is useful to examine air or ortho photos prior to going in the field in order to determine slope position. It is also useful to walk the slope in order to determine where the top and bottom of the slope are in reference to the location being assessed. It is sometimes difficult to tell if a slope break is affecting water flow. In order to do this, walk through the slope break and see if the vegetation is reflecting drier conditions (upper slope break) or wetter conditions (lower slope break). If the vegetation changes, then the break is affecting water flow.

Determining Relative Soil Nutrient Regime

Determining the relative soil nutrient regime (**S**N**R**) is generally more difficult than determining relative soil moisture regime, since some of the factors that influence SNR (e.g., soil structure) are not easily assessed. One of the key factors in determining soil nutrient regime is humus form (see Key 6.10 or Section 3). Table 2.10 in Section 2 compares site factors and soil nutrient regime, and Keys 6.4, 6.5 and 6.6 can help you determine SNR. Before you use the keys and tables in Section 6, carefully read the definitions in Key 6.1.

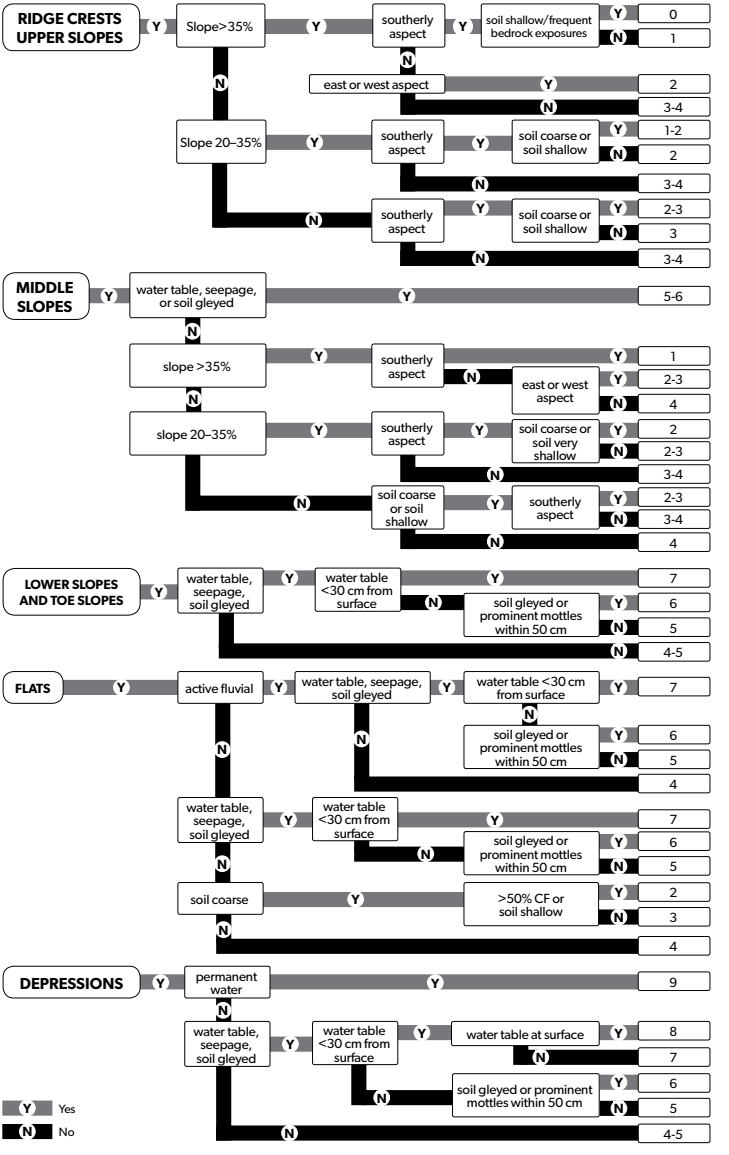
Key 6.1 Definitions of terms used in the keys

Ridge crest	Comprises the meso-scale height of land and the strongly, water-shedding convex slopes immediately adjacent
Upper slope	The uppermost portion of a meso-scale slope; slope profile generally convex; soil water mostly shedding but some water receiving from crest
Middle slope	The portion of a slope between the upper and lower slopes; soil is shedding and receiving water more or less equally
Lower slope	The moisture-receiving area towards the base of a slope; the slope profile is usually somewhat concave; sites located near the base of a slope that are not moisture-receiving are treated as middle slope positions in the keys
Toe slope	Gently sloped areas directly below the lower slope, transitioning to the level area or depression at the base of the slope
Level	Any broad level area; the surface profile is generally more or less horizontal, with no distinct aspect and minimal slope (<5%)
Depression	Profile concave in all directions; usually in flat or subdued topography or at the base of a slope
Alluvium/Fluvial landforms	Active post-glacial floodplain deposits along rivers and streams in valley bottoms; usually a series of low benches and channels
Southerly aspect	Includes S, SW and SE aspects, for slopes greater than 5%
Average soil texture	Soil texture class occupying most of the upper 50 cm of the mineral soil or to bedrock contact, or, where contrasting textures are present in equal amounts, a texture of the materials combined; where rooting is restricted to the organic horizons, use the organic material codes in Table 3.14; use Key 6.13 to determine soil texture
Coarse fragment content	The coarse fragment content (% by volume) of the upper 50 cm of mineral soil profile, or the rooting zone where it extends deeper than 50 cm, or to bedrock contact
Soil coarse	Soil contains >70% coarse fragments; or soil texture is sandy (LS, S); or loamy (SL, L), with >50% volume of coarse fragments
Soil fine	Soil is silty (SiL, Si) or clayey (SiCL, CL, SC, SiC, C), with <20% volume of coarse fragments
Soil medium	Includes the remaining soils, i.e., SL, L with ≤50% volume of coarse fragments; or fine-textured soils with ≥20% coarse fragments
Gleyed, gleying	Soils that have orange mottles that indicate periodic oxidation and reduction due to a fluctuating water table (this includes faint, distinct and prominent mottles); or, soils that are dull yellowish, blue or olive, indicating permanent saturation

Key 6.1, continued

Prominent mottles	Mottles that differ by 3 or more hues from the matrix, or by ≥2 units of value or chroma when hue varies by 2 pages (using Munsell Soil Color Charts), or by ≥3 units of value or chroma or both chroma and value differ by 2 when hue differs by 1, or by 4 units of value or chroma if hue is the same
Distinct mottles	Mottles that differ by 2 or more hues from the matrix or by 2 units of chroma and/or value when hue is the same or differs by one page (using Munsell Soil Color Charts)
Faint mottles	Mottles that do not meet the above criteria

Key 6.2 Soil Moisture Regime (SMR)



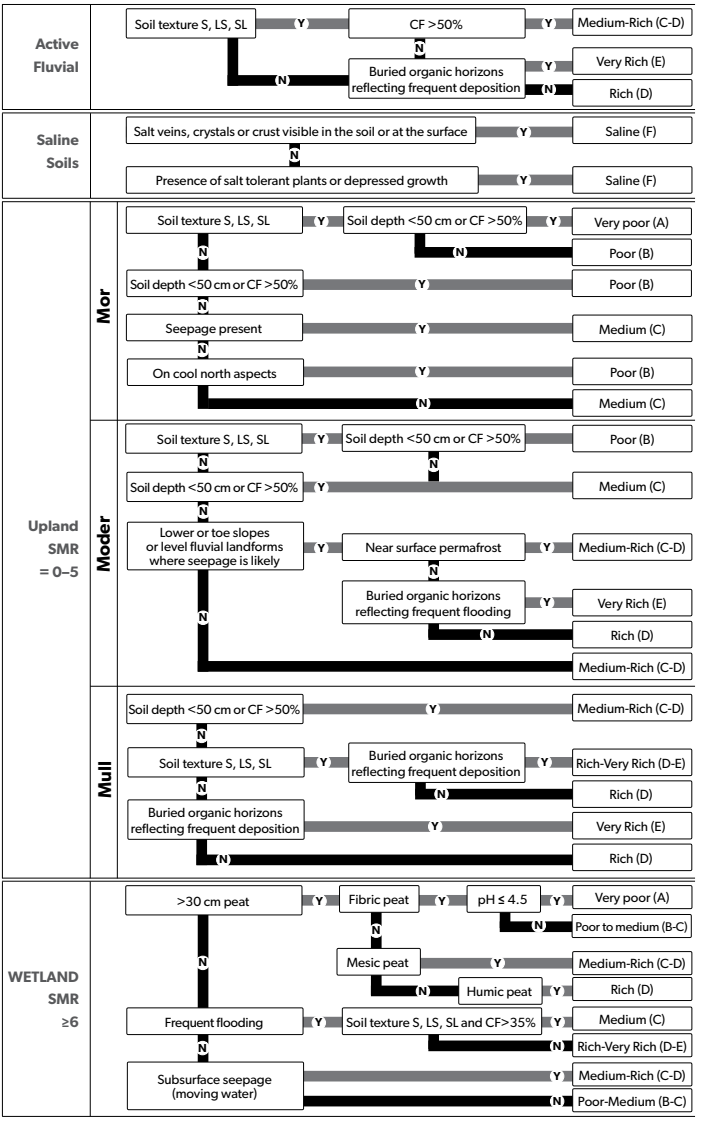
Key 6.3 Soil Moisture Regime (SMR): Additive Chart

Site factors	Factors that reduce available moisture (−)			Intermediate moisture (0)	Factors that increase available moisture (+)					
Site position	Crest -15	Upper -8		Middle or Level 0	Lower +3	Toe +5		Depression +10		
Slope gradient		>60% -4	35-60% -2	5-35% 0	0-5% +2					
SELECT ONE: Aspect – Gentle slopes ≤ 20%		S SW SE -2	SE W -1	E NW 0	N NE +1					
SELECT ONE: Aspect – Moderate slopes 20 -35%	S -3	SW SE -2	W -1	NW E 0		N NE +2				
SELECT ONE: Aspect – Steep slopes >35%	S -5	SW SE -4	W -2	NW E 0		N NE +5				
Soil texture	S -10	LS, fS -6	SL -4	SiL, L 0	Si, SCL, CL, SiCL +1		SC, SiC, C +2	Organic >30cm +3		
Coarse fragment content	>90% -10	70-90% -6	50-70% -4	35-50% -3	10-35% -1	0-10% +2				
Soil depth/brx (cm)	0-25 -18	25-50 -8	50-100 -4	>100 0						
SELECT ONE: Depth to water table				Absent 0	100-150 +5	75-100 +25	50-75 +40	30-50 +55	<30 +85	at surface +105	Permanent water >50 cm +130
SELECT ONE: Depth to prominent mottles (cm)				Absent 0	100-150 +5	50-100 +15		25-50 +25	<25 +55	
SELECT ONE: Depth to faint or distinct mottles (cm)				>100 0	50-100 +5	<50 +15				

Adapted from Lloyd et al. 1990

Soil moisture regime classes and codes	Very Xeric 0	Xeric 1	Subxeric 2	Submesic 3	Mesic 4	Subhygric 5	Hygric 6	Subhydric 7	Hydric 8	Aquatic 9
Class ranges	<-32	-32 to -21	-20 to -11	-10 to -5	-4 to +4	+5 to +39	+40 to +70	70-99	99-119	+120

Key 6.4 Soil Nutrient Regime (SNR) flow chart: Dichotomous



Key 6.5 Soil Nutrient Regime (SNR) for Upland Soils: Additive Chart

*Site factors	Factors that reduce available nutrients —			Intermediate nutrients 0	Factors that increase available nutrients +		
Site position		Crest -3	Upper slope, depression -2	Level or mid slope 0	Lower slope +3	Toe, Fluvial +5	
Soil depth (cm)	<10 -7	10-25 -5	25-50 -2	>50 0			
Soil texture	S,LS -6	fS,SL -3		SiL, L, Si 0	SCL,CL, SiCL +1	SC, SiC, C +2	Organic +3
Coarse fragment content	>70% -6		35-70% -2	10-35% -1	0-10% +1		
Humus form	Mor; Fm or Of >24 cm -8	Mor; Fm or Of 10-24 cm -4	Mor; Fm or Of <10 cm -2			Moder +3	Mull +6
A horizon		Ae >3 cm -3	Ae 1-3 cm -1	Thin or Absent 0	Ah 1-5 cm +3	Ah >5 cm +6	
pH of rooting zone		Acid <4.5 -4	Med acid 4.5-5.4 -2	Neutral pH 5.5-6.5 0	Slightly alkaline 6.5–7.4 +3		Alkaline ≥7.5 +3 *See calcareous or saline soil*
Calcareous or saline soil		Calcareous at surface -2	Calcareous within rooting zone -1	Calcareous below rooting zone 0			Salts present within 50 cm +35
Water table within 50 cm				Absent 0	Temporary seepage +3	Continuous seepage +5	Alluvial +7
Coarse fragment geology	Light colour -3	Coarse crystals -2	Hard -1	Medium 0	Soft, fine crystals +1	Dark +3	

*Totalling the values for each site factor gives an estimate of soil nutrient regime

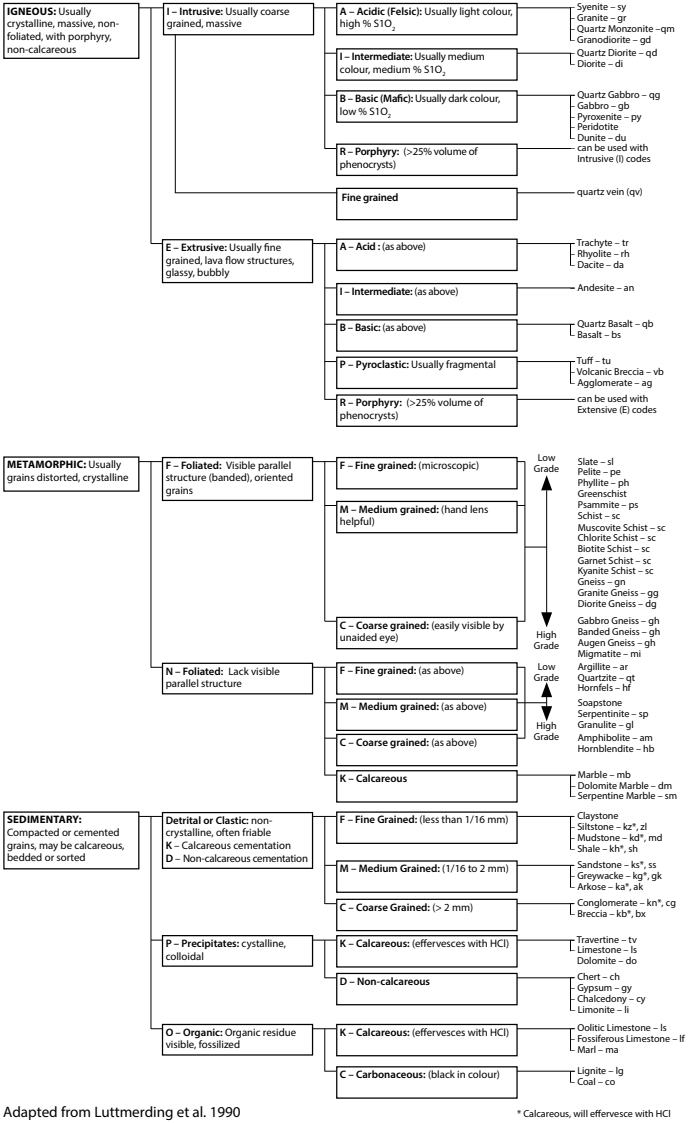
Nutrient regime classes and codes	Very Poor A	Poor B	Medium C	Rich D	Very Rich E	Saline F
Class ranges	≤ -13	-12 to -6	-5 to +5	+6 to +12	+13 to +16	≥+17

Key 6.6 Soil Nutrient Regime (SNR) for Wetland Soils: Additive Chart

Site factors	Factors that reduce available nutrients (—)		Intermediate nutrients (0)	Factors that increase available nutrients (+)	
Soil Texture	LS, S (-2)	SL, fS (-1)	SiL, L, Si (0)	SCL, CL, SiCL (+1)	SC, SiC, C (+2)
Organic materials	Fibric (-2)		Mesic (0)		Humic (+3)
Depth to mineral soil	>100 cm (-3)	30-100 cm (-2)	10-29cm (0)	2-9 cm (+1)	<2 cm (+3)
Humus form		Mor (-2)	Moder (0)	Mull (+2)	
Depth water table	>30 cm (-3)	(-1)	Intermediate (0)	(+2)	At surface (+3)
Water source	Precipitation/ permafrost (-3)			Ground-water (+3)	Rare-occ flooding; stream subirrigation (+5) / Frequent flooding; stream subirrigation (+8)
Water pH	≤ 4.5 (-3)	4.5-5.4 (-2)	5.5-6.4 (0)	6.5-7.4 (+2)	≤ 7.5 (+2) *Check for salinity* / Saline (+35)
Permafrost at <1 m		Present (-2)		Absent (+2)	

SNR classes SNR codes	Very Poor A	Poor B	Medium C	Rich D	Very Rich E	Saline F
Class ranges	≤-13	-12 to -6	-5 to +5	+6 to +12	+13 to +29	>+30

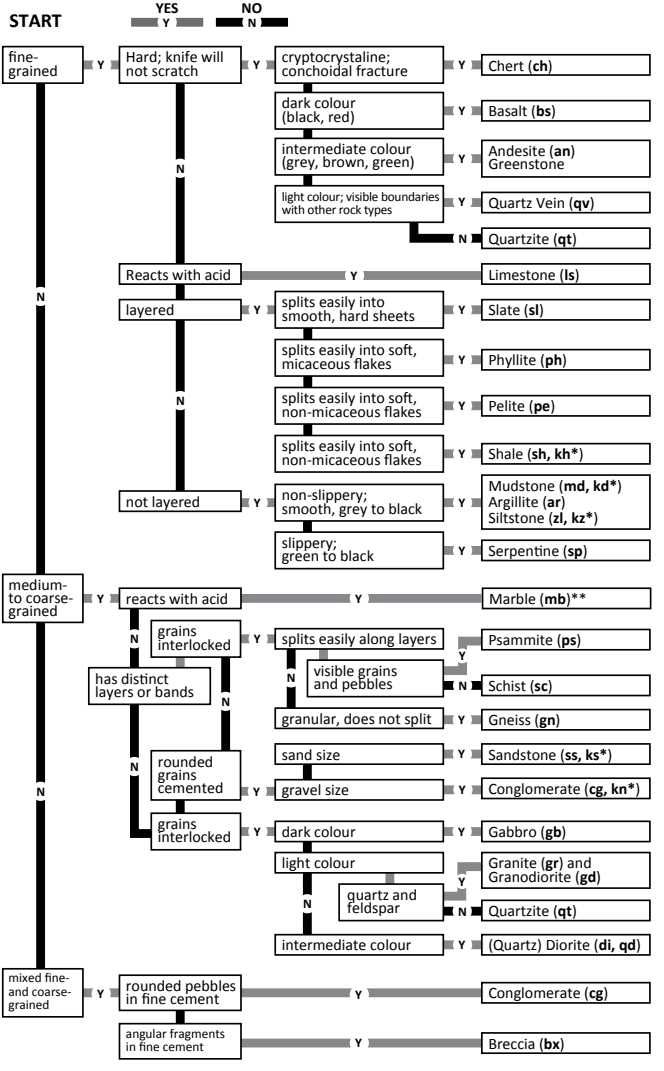
Key 6.7 Common Rock Types



Adapted from Luttmerding et al. 1990

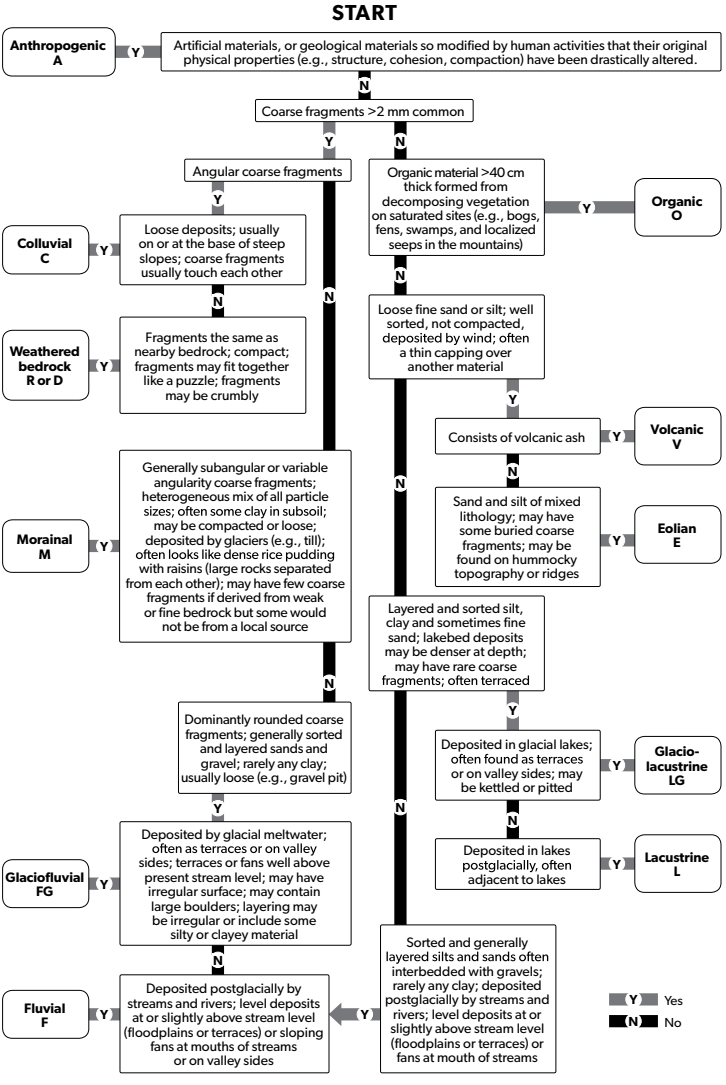
* Calcareous, will effervesce with HCl

Key 6.8 Common Rock Types of Yukon



Adapted from Braumandl and Curran (1992), and Lloyd et al. (1990).
* Both calcareous and non-calcareous rock types exist, if reacts with acid record code indicated by asterisk.
** Other rock types do react to acid, although less common in Yukon

Key 6.9 Surficial Material



Key 6.10 Humus Forms

Note: If no humus is present, treat as MOR in SNR key.

1a. Rapid to imperfectly drained sites; humus form not saturated for prolonged periods. Soil is mineral or upland Folisol.

2a. Ah horizon <2 cm and combined thickness of F and H horizons if present ≥Ah.

3a. >50% thickness of F horizon(s) is Fm ..... **MORS (R)**

4a. Decaying wood >35% of organic matter volume in humus form profile..... **Lignomor (LR)**

4b. Decaying wood ≤ 35% of organic matter volume in humus form profile.

5a. F horizon >50% of thickness of F and H horizon..... **Hemimor (HR)**

5b. Hh horizon >50% of thickness of F and H horizons..... **Humimor (UR)**

5c. Hr horizon >50% of thickness of F and H horizons..... **Resimor (RR)**

3b. F horizon(s) includes Fz and/or Fa..... **MODERS (D)**

6a. Decaying wood >35% of organic matter volume in humus form profile. ..... **Lignomoder (LD)**

6b. Decaying wood ≤ 35% of organic matter volume in humus form profile.

7a. Fa horizon >50% of thickness of F horizons; or Fm horizon present. ..... **Mormoder (RD)**

7b. Fz (or Hz) horizon >50% of thickness of F horizons..... **Leptomoder (TD)**

2b. Ah horizon ≥2cm and combined thickness of F and H horizons ≥2 ..... **MODERS (D)**

8a. Ah horizon formed by infiltration or accumulation of organic materials by mechanical intermixing (gravity, wind, flooding, ice churning or root churning)..... **Paramoder (PD)**

8b. Ah formed by soil fauna activity or root decomposition; Fa and/or Fz horizons present.

9a. F and H horizons greater than or equal to thickness of Ah horizon; ..... **Leptomoder (TD)**

9b. Ah >combined F and H horizons; ..... **Mullmoder (MD)**

2c. Combined thickness of F and H horizons <2cm and Ah horizon ≥2cm ..... **MULLS (L)**

10a. Rhizogenous Ah horizon formed from decomposition of dense fine roots ..... **Rhizomull (ZL)**

10b. Zoogenous Ah horizon formed through actions of abundant earthworms ..... **Vermimull (VL)**

10c. Ah formed by infiltration or accumulation of organic materials by mechanical intermixing (gravity, wind, flooding, ice-frost churning or root-churning) ..... **Paramull (PL)**

1b. Poor to very poorly drained sites; Humus is saturated for prolonged periods. Soils are Gleysols, Fibrisols, Mesisols, Humisols, Organic Cryosols, or Gleysolic or Histic subgroups of Turbic or Static Cryosols

11a. Combined thickness of F, H, and O horizons <2 cm and Ah horizon >2cm ..... **Hydromull (YL)**

11b. Combined thickness of F, H, and O horizons ≥2 cm.

12a. Thickness of F and H horizons ≥O horizons.

13a. F horizon(s) is Fm. ..... **Hydromor (YR)**

13b. F horizon(s) includes Fz and/or Fa, F is not present or Ah ≥2 ..... **Hydromoder (YD)**

12b. Combined thickness of O horizons greater than F and H horizons.

14a. O horizons ≤ 40cm and Ah horizon >2cm..... **Moder (D)**

14b. Of horizon >50% of thickness of O horizons..... **Fibrimor (FR)**

14c. Om horizon >50% of thickness of O horizons..... **Mesimor (MR)**

14d. Oh horizon >50% of thickness of O horizons..... **Saprimoder (SD)**

Key 6.11 Codes for Soil Orders, Great Groups and Subgroups

Brunisolic Order (B)

Melanic Brunisol MB

O.MB	Orthic
E.MB	Eluviated
GL.MB	Gleyed
GLE.MB	Gleyed Eluviated

Eutric Brunisol EB

O.EB	Orthic
E.EB	Eluviated
GL.EB	Gleyed
GLE.EB	Gleyed Eluviated

Sombric Brunisol SB

O.SB	Orthic
E.SB	Eluviated
DU.SB	Duric
GL.SB	Gleyed
GLE.SB	Gleyed Eluviated

Dystric Brunisol DYB

O.DYB	Orthic
E.DYB	Eluviated
DU.DYB	Duric
GL.DYB	Gleyed
GLE.DYB	Gleyed Eluviated

Chernozemic Order (CH)

Brown Chernozem BC

O.BC	Orthic
R.BC	Rego
CA.BC	Calcareous
E.BC	Eluviated
SZ.BC	Solonetzic
V.BC	Vertic
GL.BC	Gleyed
GLR.BC	Gleyed Rego
GLA.BC	Gleyed Calcareous
GLE.BC	Gleyed Eluviated
GLSZ.BC	Gleyed Solonetzic
GLV.BC	Gleyed Vertic

Dark Brown Chernozem DBC

O.DBC	Orthic
R.DBC	Rego
CA.DBC	Calcareous
E.DBC	Eluviated
SZ.DBC	Solonetzic
GL.DBC	Gleyed
GLR.DBC	Gleyed Rego
GLCA.DBC	Gleyed Calcareous
GLE.DBC	Gleyed Eluviated
GLSZ.DBC	Gleyed Solonetzic
GLV.DBC	Gleyed Vertic
V.DBC	Vertic

Black Chernozem BLC

O.BLC	Orthic
R.BLC	Rego
CA.BLC	Calcareous
E.BLC	Eluviated
SZ.BLC	Solonetzic
V.BLC	Vertic
GL.BLC	Gleyed
GLR.BLC	Gleyed Rego
GLCA.BLC	Gleyed Calcareous
GLE.BLC	Gleyed Eluviated
GLSZ.BLC	Gleyed Solonetzic
GLV.BLC	Gleyed Vertic

DGC Dark Grey Chernozem

O.DGC	Orthic
R.DGC	Rego
CA.DGC	Calcareous

SZ.DGC	Solonetzic
V.DGC	Vertic
GL.DGC	Gleyed
GLR.DGC	Gleyed Rego
GLCA.DGC	Gleyed Calcareous
GLSZ.DGC	Gleyed Solonetzic
GLV.DGC	Gleyed Vertic

Cryosolic Order (CY)

Turbic Cryosol TC

OE.TC	Orthic Eutric
OD.TC	Orthic Dystric
BRE.TC	Brunisolic Eutric
BRD.TC	Brunisolic Dystric
HE.TC	Histic Eutric
HD.TC	Histic Dystric
HR.TC	Histic Regosolic
R.TC	Regosolic
GL.TC	Gleysolic

Static Cryosol SC

OE.SC	Orthic Eutric
OD.SC	Orthic Dystric
BRE.SC	Brunisolic Eutric
BRD.SC	Brunisolic Dystric
HE.SC	Histic Eutric
HD.SC	Histic Dystric
HD.SC	Histic Regosolic
L.SC	Luvisolic
GL.SC	Gleysolic Static
R.SC	Regosolic Static

Organic carbon ryosol OC

FI.OC	Fibric
ME.OC	Mesic
HU.OC	Humic
TFI.OC	Terric Fibric
TME.OC	Terric Mesic
THU.OC	Terric Humic
GC.OC	Glacic

Gleysolic Order (G)

Luvic Gleysol LG

SZ.LG	Solonetzic
FR.LG	Fragic
HU.LG	Humic
FE.LG	Fera
O.LG	Orthic
V.LG	Vertic

Humic Gleysol HG

SZ.HG	Solonetzic
FE.HG	Fera
O.HG	Orthic
R.HG	Rego
V.HG	Vertic

Gleysol G

SZ.G	Solonetzic
FE.G	Fera
O.G	Orthic
R.G	Rego
V.G	Vertic

Luvisolic Order (L)

Grey-Brown Luvisol GBL

O.GBL	Orthic
BR.GBL	Brunisolic
PZ.GBL	Podzolic
V.GBL	Vertic
GL.GBL	Gleyed
GLBR.GBL	Gleyed Brunisolic
GLPZ.GBL	Gleyed Podzolic
GLV.GBL	Gleyed Vertic

Grey Luvisol GL

O.GL	Orthic
D.GL	Dark
BR.GL	Brunisolic
PZ.GL	Podzolic
SZ.GL	Solonetzic
FR.GL	Fragic
V.GL	Vertic
GL.GL	Gleyed
GLD.GL	Gleyed Dark
GLBR.GL	Gleyed Brunisolic
GLPZ.GL	Gleyed Podzolic
GLSZ.GL	Gleyed Solonetzic
GLFR.GL	Gleyed Fragic
GLV.GL	Gleyed Vertic

Organic Order (O)

Fibrisol F

TY.F	Typic
ME.F	Mesic
HU.F	Humic
LM.F	Limnic
CU.F	Cumulic
T.F	Terric
TME.F	Terric Mesic
THU.F	Terric Humic
HY.F	Hydric

Mesisol M

TY.M	Typic
FI.M	Fibric
HU.M	Humic
LM.M	Limnic
CU.M	Cumulic
T.M	Terric
TFI.M	Terric Fibric
THU.M	Terric Humic
HY.M	Hydric

Humisol H

TY.H	Typic
FI.H	Fibric
ME.H	Mesic
LM.H	Limnic
CU.H	Cumulic
T.H	Terric
TFI.H	Terric Fibric
TME.H	Terric Mesic
HY.H	Hydric

Folisol FO

HE.FO	Hemic
HU.FO	Humic
LI.FO	Lignic
HI.FO	Histic

Podzolic Order (P)

Humic Podzol HP

O.HP	Orthic
OT.HP	Ortstein
P.HP	Placic
DU.HP	Duric
FR.HP	Fragic

Ferro-Humic Podzol FHP

O.FHP	Orthic
OT.FHP	Ortstein
P.FHP	Placic
DU.FHP	Duric
FR.FHP	Fragic
LU.FHP	Luvisolic
SM.FHP	Sombric
GL.FHP	Gleyed
GLOT.FHP	Gleyed Ortstein
GLSM.FHP	Gleyed Sombric

Humo-Ferric Podzol HFP

O.HFP	Orthic
OT.HFP	Ortstein
P.HFP	Placic
DU.HFP	Duric
FR.HFP	Fragic
LU.HFP	Luvisolic
SM.HFP	Sombric
GL.HFP	Gleyed
GLOT.HFP	Gleyed Ortstein
GLSM.HFP	Gleyed Sombric

Regosolic Order (R)

Regosol R

O.R	Orthic
CU.R	Cumulic
GL.R	Gleyed
GLCU.R	Gleyed Cumulic

Humic Regosol HR

O.HR	Orthic
CU.HR	Cumulic
GL.HR	Gleyed
GLCU.HR	Gleyed Cumulic

Solonetzic Order (S)

Solonetz SZ

B.SZ	Brown
DB.SZ	Dark Brown
BL.SZ	Black
A.SZ	Alkaline
GLB.SZ	Gleyed Brown
GLDB.SZ	Gleyed Dark Brown
GLBL.SZ	Gleyed Black

Solodized Solonetz SS

B.SS	Brown
DB.SS	Dark Brown
BL.SS	Black
DG.SS	Dark Grey
G.SS	Grey
GLB.SS	Gleyed Brown
GLDB.SS	Gleyed Dark Brown
GLBL.SS	Gleyed Black
GLDG.SS	Gleyed Dark Grey
GLG.SS	Gleyed Grey

Solod SO

B.SO	Brown
DB.SO	Dark Brown
BL.SO	Black
DG.SO	Dark Grey
G.SO	Grey
GLB.SO	Gleyed Brown
GLDB.SO	Gleyed Dark Brown
GLBL.SO	Gleyed Black
GLDG.SO	Gleyed Dark Grey
GLG.SO	Gleyed Grey

Vertic Solonetz (V.SZ)

BV.SZ	Brown Vertic
DBV.SZ	Dark Brown Vertic
GLBV.SZ	Gleyed Brown Vertic
GLDBV.SZ	Gleyed Dark Brown Vertic
GLBLV.SZ	Gleyed Black Vertic

Vertisolic Order (V)

Vertisol V

O.V	Orthic
GL.V	Gleyed
GLC.V	Gleysolic

Humic Vertisol HV

O.HV	Orthic
GL.HV	Gleyed
GLC.HV	Gleysolic

Key 6.12 Determining Soil Orders, Great Groups and Subgroups

Cryosol ? Permafrost within 1 m of surface or within 2 m if strongly cryoturbated

NO ↓

Organic ? Soils composed largely of organic materials, meeting any of the following criteria:

- Of horizons at least 60 cm in depth over mineral soil
- Om, Oh, L, F, H horizons totaling at least 40 cm in depth over mineral soil
- >10 cm in total of L, F, and H horizons over bedrock or fragmental material
- <20 cm of mineral soil over bedrock with overlying organic horizons > twice as thick
- mineral horizons within 40 cm of surface, with underlying organic horizons at least 40 cm thick, where organic material occupies >40 cm of the upper 80 cm

NO ↓

Vertisol ? Formed in heavy clay materials with shrink-swell characteristics; both vertic and slickenside horizons present within 1 m of the mineral surface

Uncommon in B.C.

NO ↓

Podzol ? Podzolic B horizon (Bf, Bhf, or Bh ≥10 cm) and no Bt within 50 cm of mineral surface

NO ↓

Gleysol ? Strong evidence of saturation with water and reducing conditions continuously or during prolonged periods based on one of the following indicators within 50 cm of the mineral surface:

- chromas ≤1 with no mottling (in hues less red than 5YR)
- chromas ≤2 (in hues of 10YR and 7.5YR) with prominent mottling
- chromas ≤3 (in hues more yellow than 10YR) with prominent mottling
- hues bluer than 10Y with or without mottling
- in red soil materials (5YR or redder), distinct or prominent mottling

NO ↓

Solonetz ? Salt-affected soils with a Bn or Bnt horizon; within B.C., occur primarily in poorly drained depressions in dry areas of the southern interior, and in saline parent materials in the Peace River region

NO ↓

Chernozem ? Dark-coloured Ah, Ahe or Ap horizon ≥10 cm thick, enriched with organic matter from decomposed grass leaves and roots; associated with grass-lands and grassland-forest transitions under conditions of low rainfall, high summer temperatures, and high rates of evapotranspiration

NO ↓

Luvisol ? Bt horizon >5 cm thick anywhere in the profile

NO ↓

Brunisol ? Bm, Btj or Bfj horizon ≥5 cm thick, or a Bf <10 cm thick

NO ↓

Regosol Soil materials ≥10 cm in depth, but meeting none of the above criteria

Source: B.C. Ministry of Forests and Range and Ministry of Environment 2010

Key 6.13 Soil Great Groups and Subgroups

Synopsis of criteria for classifying soils to the subgroup level

Adapted from B.C. Ministry of Forests and Range and Ministry of Environment 2010

Brunisol

Dystric Brunisol: Bm, Bfj or Btj horizon ≥5 cm; pH <5.5 throughout upper 25 cm of B horizon

- *Orthic Dystric Brunisol* (**O.DYB**) LFH, Bm, C
- *Eluviated Dystric Brunisol* (**E.DYB**) has an Ae horizon ≥2 cm thick
- *Duric Dystric Brunisol* (**DU.DYB**) LFH, Bm or Bfj, Bc or BCc, C (has a strongly cemented horizon that does not meet the criteria of a podzolic B horizon)
- *Gleyed Dystric Brunisol* (**GL.DYB**) has faint to distinct mottling within 50 cm of surface or distinct to prominent mottling at depths of 50–100 cm
- *Gleyed Eluviated Dystric Brunisol* (**GLE.DYB**) has an Ae ≥2 cm thick and faint to distinct mottling within 50 cm of surface or distinct to prominent mottling at depths of 50–100 cm

Eutric Brunisol: Bm or Btj horizon ≥5 cm; pH ≥5.5 anywhere in upper 25 cm of B horizon

- *Orthic Eutric Brunisol* (**O.EB**) LFH, Bm, Ck or C
- Other subgroups are analogous to those listed for Dystric Brunisol, except there is no Duric subgroup

Sombric Brunisol: Ah ≥10 cm and pH <5.5 throughout upper 25 cm of B horizon

- *Orthic Sombric Brunisol* (**O.SB**) LFH, Ah, Bm or C
- Other subgroups are analogous to those listed for Dystric Brunisol

Melanic Brunisol: Ah ≥10 cm and pH ≥5.5 anywhere in upper 25 cm of B horizon

- *Orthic Melanic Brunisol* (**O.MB**) LF, Ah, Bm, Ck or C (C often calcareous)
- Other subgroups are analogous to those listed for Dystric Brunisol, except there is no Duric subgroup

Chernozem

Brown Chernozem: Sub-arid to semi-arid soil climate; associated with xerophytic and mesophytic grasses and forbs; brownish Ah horizon with colour values <3.5 moist and 4.5–5.5 dry, and chroma >1.5 dry

- *Orthic Brown Chernozem* (**O.BC**) Ah, Bm, Cca or Ck
- *Rego Brown Chernozem* (**R.BC**) Ah, Cca or Ck (lack a B horizon ≥5 cm thick)

- *Calcareous Brown Chernozem* (**C.BC**) Ah, Bmk, Cca or Ck (presence of carbonates in Bmk indicated by effervescence when 10% HCl is added)
- *Eluviated Brown Chernozem* (**E.BC**) Ah, Ae, Btj or Bt, Cca or Ck
- *Solonetzic Brown Chernozem* (**SZ.BC**) Ah, Ae, Btnj or Btjnj, Csa or Ck (grading to Solonetzic order)
- *Vertic Brown Chernozem* (**V.BC**) grading to Vertisol
- Gleyed subgroups of Brown Chernozem have faint to distinct mottling within 50 cm of mineral surface:
  - *Gleyed Brown Chernozem* (**GL.BC**) Ah, Bmgj or Ckgj
  - *Gleyed Rego Brown Chernozem* (**GLR.BC**) Ah or Ckgj
  - *Gleyed Calcareous Brown Chernozem* (**GLC.BC**) Ah, Bmkgj or Ckgj
  - *Gleyed Eluviated Brown Chernozem* (**GLE.BC**) Ah, Aej, Btjgj or Btgj, Ckgj
  - *Gleyed Solonetzic Brown Chernozem* (**GLSZ.BC**) Ah, Ae, Bnjtjgj or Csagj
  - *Gleyed Vertic Brown Chernozem* (**GLV.GL**) grading to Vertisol

Dark Brown Chernozem: Semi-arid soil climate; associated with mesophytic grasses and forbs; darker brownish Ah horizon with colour values <3.5 moist and 3.5–4.5 dry, and chroma >1.5 dry

- Subgroups are analogous to those listed for the Brown Chernozem great group

Black Chernozem: Sub-humid soil climate; associated with mixed mesophytic grasses and forbs, sometimes with tree cover; may occur under alpine grasses and shrubs; Ah darker in colour and tends to be thicker than in other great groups, with colour value <3.5 moist and dry, and chroma ≤1.5 dry

- Subgroups are analogous to those listed for the Brown Chernozem great group

Dark Grey Chernozem: Sub-humid climate; associated with forest-grassland transition zones; Ahe horizon indicates eluviation; usually has forest floor horizons overlying the Ah

- *Orthic Dark Grey Chernozem* (**O.DGC**) Ahe, Ae, Bm or Btj or Bt, Cca or Ck
- Other subgroups have an Ahe horizon, but are otherwise analogous to those listed for the Brown Chernozem great group, except there are no eluviated subgroups

Cryosol

Turbic Cryosol: Primarily mineral material; permafrost within 2 m of surface; cryoturbation indicated by disrupted, mixed or broken horizons, displaced material; usually in patterned ground

- Eutric subgroups have pH ≥5.5 in some part of B horizons
- Dystric subgroups have pH <5.5 throughout B horizons
- Brunisolic subgroups have a Bm horizon ≥10 cm thick; others may have a Bm <10 cm
- Gleysolic subgroups have strongly gleyed horizons associated with poor drainage, reducing conditions
- Histic subgroups of Turbic Cryosol have a continuous Bm or Bmy in the upper part of the profile, and either a continuous surface organic horizon ranging from >15–40 cm thick, or a combination of surface and subsurface organic horizons >15 cm thick within 1 m of surface
- *Orthic Eutric Turbic Cryosol* (**OE.TC**) Om, Bmy, BCy, Cgy, Omy or Cz
- *Orthic Dystric Turbic Cryosol* (**OD.TC**) horizons as above, pH <5.5 in B horizon
- *Brunisolic Eutric Turbic Cryosol* (**BRE.TC**) Om, Bm, Bmy or BCy, Cgy, Omy or Cz
- *Brunisolic Dystric Turbic Cryosol* (**BRD.TC**) horizons as above; pH <5.5
- *GleysolicTurbic Cryosol* (**GL.TC**) Om, Bgy and/or Cgy or Cz
- *Regosolic Turbic Cryosol* (**R.TC**) Om, Cy, Cgy or Cz
- *Histic Eutric Turbic Cryosol* (**HE.TC**) Om, Ah, Bmy and/or Bm or Cgy or Cz
- *Histic Dystric Turbic Cryosol* (**HD.TC**) horizon sequence as above, pH <5.5
- *Histic Regosolic Turbic Cryosol* (**HR.TC**) Om, Cy, Cgy or Cz

Static Cryosol: Permafrost within 1 m of surface, but lacking strong evidence of cryoturbation; formed in coarse-textured mineral parent materials or in any recently deposited or disturbed sediments; may have surface organic horizons <40 cm thick

- *Orthic Eutric Static Cryosol* (**OE.SC**) Om, LFH, Bm, BCgj, Cz
- Other subgroups are analogous to those for Turbic Cryosols, but lack cryoturbated (y) horizons, and include one additional subgroup:
  - *Luvisolic Static Cryosol* (**L.SC**) LFH, Om, Ah, or Ae, Bt, Cg or Cz (occuring in fine-textured materials under forest vegetation; Bt ≥10 cm thick)

Organic Cryosol: Primarily organic material; permafrost within 1 m of surface; >40 cm thick, or >10 cm thick over a lithic contact or an ice layer ≥30 cm thick

- Fibric, Mesic and Humic subgroups have organic layers >1 m thick, and are composed predominantly of fibric (Of), mesic (Om) and humic (Oh) horizons, respectively, below a depth of 40 cm:
  - *Fibric Organic Cryosol* (**F.OC**) Of or Om, Of or Ofz
  - *Mesic Organic Cryosol* (**M.OC**) Of or Om, Om or Omz
  - *Humic Organic Cryosol* (**H.OC**) Oh or Om, Om or Ohz

- Terric subgroups have a mineral contact ≤1 m from the surface, or a mineral layer >30 cm thick and <1m from surface; Terric Fibric, Mesic and Humic subgroups are composed predominantly of fibric (Of), mesic (Om) and humic (Oh) horizons, respectively, above the mineral contact:
  - *Terric Fibric Organic Cryosol* (**TF.OC**) Of, Ofz or Cz
  - *Terric Mesic Organic Cryosol* (**TM.OC**) Om, Omz or Cz
  - *Terric Humic Organic Cryosol* (**TH.OC**) Oh, Ohz or Cz

- The Glacic subgroup has a layer of ground ice >30 cm thick, with an upper boundary <1 m from the surface; the ice layer contains more than 95% ice by volume:*Glacic Organic Cryosol* (**GC.OC**) Of, Om or Oh, Wz

Gleysol

Gleysolic Great Group: no Ah, or Ah <10 cm thick; no Bt or Btg horizon

- *Orthic Gleysol* (**O.G**) LFH or O, Bg or Cg
- *Fera Gleysol* (**FE.G**) Bgf horizon ≥5 cm thick
- *Rego Gleysol* (**R.G**) LFH or O, Cg (lacks a B horizon ≥5 cm thick)

Humic Gleysol: Ah horizon ≥10 cm thick; no Bt horizon

- *Orthic Humic Gleysol* (**O.HG**) LFH or O, Ah, Bg, Cg
- *Rego Humic Gleysol* (**RE.HG**) LFH or O Ah, Cg

Luvic Gleysol: Btg horizon

- *Orthic Luvic Gleysol* (**O.LG**) LFH or O, Aeg, Btg, Cg
- *Humic Luvic Gleysol* (**HU.LG**) LFH or O, Ah, Aeg, Btg, Cg (Ah ≥10 cm)
- *Fera Luvic Gleysol* (**FE.LG**) LFH or O, Ah, Aeg, Bgf, Btg, Cg (Bgf ≥10 cm)
- *Fragic Luvic Gleysol* (**FR.LG**) has a fragipan (Btgx or Bgx) within or below Bt horizon

Luvisol

Grey Luvisol: Mean annual soil temperature <8°C

- *Orthic Grey Luvisol* (**O.GL**) LFH Ae, (AB), Bt, BC or C
- *Dark Grey Luvisol* (**D.GL**) also has an Ah or Ahe horizon ≥5 cm thick
- *Brunisolic Grey Luvisol* (**BR.GL**) has a Bm horizon ≥5 cm (or Bf <10 cm) over the Bt
- *Podzolic Grey Luvisol* (**PZ.GL**) has a Bf horizon ≥10 cm and Bt horizon above 50-cm depth
- *Fragic Grey Luvisol* (**FR.GL**) has a fragipan (Btx or BCx) within or below the Bt
- *Solonetzic Grey Luvisol* (**GSZ.GL**) has a Btnj horizon, indicating an intergrade to the Solonetzic order
- *Vertic Grey Luvisol* (**V.GL**) Btss or Ckss horizon within 1 m of mineral surface; may have a Btvj
- Gleyed subgroups have distinct mottling within 50 cm of mineral surface or prominent mottling at 50–100 cm:
  - *Gleyed Grey Luvisol* (**GL.GL**) LFH Ae, Btg or Cg
  - *Gleyed Dark Grey Luvisol* (**GLD.GL**) Ah or Ahe ≥5 cm thick
  - *Gleyed Brunisolic Grey Luvisol* (**GBR.GL**) Bm horizon ≥5 cm or Bf <10 cm
  - *Gleyed Podzolic Grey Luvisol* (**GPZ.GL**) Bf horizon ≥10 cm
  - *Gleyed Fragic Grey Luvisol* (**GFR.GL**) fragipan within or below the Bt
  - *Gleyed Solonetzic Grey Luvisol* (**GSZ.GL**) Btnjgj horizon
  - *Gleyed Dertic Grey Luvisol* (**GV.GL**) Btgjss or Ckgjss horizon within 1 m of mineral surface, may have a Btgjvj

Grey Brown Luvisol: Mild, humid climatic conditions; mean annual soil temp >8°C; forest mull Ah horizon or dark Ap horizon >5 cm thick; often formed on calcareous parent materials

- *Orthic Grey Brown Luvisol* (**O.GBL**) Ah, Ae, Bt or Ck
- Subgroups analogous to those for Grey Luvisols, without Dark Grey or Fragic subgroups

Organic

For wetland organic soils, the control section (upper 160 cm) is divided into three tiers: surface (0–40 cm); middle (40–120 cm); and bottom (120–160 cm); classification is based primarily on the properties of the middle tier

Fibrisol: Composed largely of relatively undecomposed fibric organic material (Of horizons —classes 1 to 4 on the von Post scale); occur extensively as peat deposits dominated by sphagnum mosses; have a dominantly fibric middle tier, or middle and surface tiers if a terric, lithic, or hydric contact occurs in the middle tier

- *Typic Fibrisol* (**TY.F**) Of or Om, Of; middle and bottom tiers, if present, are predominantly fibric material (Of); there is no humic (Oh) layer >12 cm thick or mesic (Om) layer >25 cm in the middle or bottom tier, or, if a lithic contact occurs in the middle tier, no such layers are found in the middle or surface tiers
- *Mesic Fibrisol* (**ME.F**) Of or Om, Of, Om, Of; has a subdominant mesic layer >25 cm thick in the middle or bottom tier; lacks terric, cumulic, hydric or limnic layers
- *Humic Fibrisol* (**HU.F**) Of, Om or Oh, Of, Oh, Of or Om; has a subdominant humic layer >12 cm thick in the middle or bottom tier; may have a subdominant mesic layer, but lacks terric, cumulic, hydric or limnic layers
- *Limnic Fibrisol* (**LM.F**) Of or Om, Of, Oco; limnic layer beneath the surface tier, comprised of coprogenous earth (sedimentary peat), diatomaceous earth, or marl ≥5 cm thick; may have mesic, humic or cumulic layers, but lacks terric or hydric layers
- *Cumulic Fibrisol* (**CU.F**) Of or Om, Of, C, Of; cumulic layer beneath the surface tier, consisting either or multiple layers of mineral material (alluvium) ≥5 cm thick in total, or of one layer 5–30 cm thick; may have fibric or humic layers, but lacks terric, hydric and limnic layers
- *Terric Fibrisol* (**T.F**) Of or Om, Of, C; terric layer of unconsolidated mineral soil ≥30 cm thick beneath the surface tier; may have cumulic or limnic layers, but lacks mesic, humic, or hydric layers
- *Terric Mesic Fibrisol* (**TME.F**) Of or Om, Of, Om, C; has both a terric layer beneath the surface tier and a subdominant mesic layer >25 cm thick in the control section; may have mesic, cumulic, or limnic layers, but lacks a hydric layer
- *Terric Humic Fibrisol* (**THU.F**) Of or Om, Of, Oh, C; both a terric layer beneath the surface tier and a subdominant humic layer >12 cm thick in the control section; may have mesic, cumulic or limnic layers, but lacks a hydric layer

- *Hydric Fibrisol* (**HY.F**) Of or Om, Of, W; has a layer of water extending from a depth of ≥40 cm–>1.6 m; may have mesic, humic, cumulic, terric or limnic layers

Mesisol: Organic soils predominantly at an intermediate (mesic) stage of decomposition (mainly Om horizons — class 5 or 6 on von Post scale); middle tier is dominantly mesic; if a terric, lithic, or hydric contact occurs in the middle tier, both surface and middle tiers must be dominantly mesic

- *Typic Mesisol* (**TY.M**) Of, Om or Oh, Om; lacks subdominant humic or fibric layers, with a total thickness >25 cm in the middle and bottom tiers or in the middle and surface tiers if a lithic contact occurs in the middle tier
- *Fibric Mesisol* (**FI.M**) Of, Om or Oh, Om, Of, Om; has a subdominant fibric layer >25 cm thick in the middle or bottom tiers; no humic layer >25 cm
- *Humic Mesisol* (**HU.M**) Of, Om or Oh, Om, Oh, Om; has a subdominant humic layer >25 cm thick in the middle or bottom tiers; may have a subdominant fibric layer
- *Terric Fibric Mesisol* (**TFI.M**) Of, Om or Oh, Om, Of, C, Om; has both a terric layer ≥30 cm thick beneath the surface tier and a subdominant fibric layer >25 cm thick; may have cumulic and limic layers, but lack a hydric layer
- *Terric Humic Mesisol* (**THU.M**) Of, Om or Oh, Om, Oh, C, om (has both a terric layer ≥30 cm thick beneath the surface tier and a subdominant humic layer >25 cm thick; may have fibric, cumulic or limic layers, but may lack a hydric layer)
- Other Mesisol subgroups are analogous to those in the Fibrisol great group, including *Limnic Mesisol* (**LM.M**), *Cumulic Mesisol* (**CU.M**), *Terric Mesisol* (**T.M**) and *Hydric Mesisol* (**HY.M**)

Humisol: Composed predominantly of well-decomposed organic materials (**O**h horizons — mostly class 7 or higher on the von Post scale); has a dominantly humic middle tier, or middle and surface tiers if a terric, lithic, or hydric contact occurs in the middle tier; *only minor areas of Humisols are known to occur in Canada*

- *Typic Humisol* (**TY.H**) Om or Ohm, Oh; middle and bottom tiers, if present, are dominantly humic; have neither fibric layers >12 cm thick or mesic layers >25 cm thick in the middle or bottom tiers, or in the middle and surface tiers if a lithic contact occurs in the middle tier
- *Fibric Humisol* (**FI.H**) Om or Oh, Oh, Of, Oh; has a subdominant fibric layer >12 cm in the middle or bottom tiers; may have a subdominant mesic layer

- *Mesic Humisol* (**ME.H**) Om or Oh, Oh, Om, Oh; has a subdominant mesic layer >25 cm thick in the middle or bottom tiers; lacks a subdominant fibric layer below the surface tier
- *Terric Fibric Humisol* (**TFI.H**) Of or Oh, Oh, Of, C, Oh; has both a terric layer ≥30 cm thick beneath the surface tier and a subdominant fibric layer >12 cm thick within the control section; may also have mesic, cumulic or limnic layers, but lack a hydric layer
- *Terric Mesic Humisol* (**TME.H**) Om or Oh, Oh, Om, C, Oh; has both a terric layer ≥30 cm thick beneath the surface tier and a subdominant mesic layer >25 cm thick within the control section; may have cumulic or limnic layers, but lack a subdominant fibric or hydric layer
- Other Humisol subgroups are analogous to those in the Fibrisol great group, including *Limnic Humisol* (**LM.H**), *Cumulic Humisol* (**CU.H**), *Terric Humisol* (**T.H**) and *Hydric Humisol* (**HY.H**)

Folisol: Well- to imperfectly drained upland organic soils, composed predominantly of L, F and H horizons; must be either ≥40 cm thick, or ≥10 cm thick if overlying bedrock or fragmental material, or more than twice the thickness of an underlying mineral soil layer that is <20 cm thick; in the following horizon sequences, M stands for mineral soil horizons

- *Hemic Folisol* (**HE.FO**) L, F, H, O or R (M); composed mainly of F horizons; may have subdominant H and O horizons, each <10 cm thick; commonly has a lithic contact or fragmental layers
- *Humic Folisol* (**HU.FO**) L, F. H, O or R (M); mainly composed of H horizons; may have subdominant F and O horizons, each <10 cm thick; may have a lithic contact; fragmental or mineral layers may be common in the control section; occurs most frequently in cool, moist, humid forest ecosystems
- *Lignic Folisol* (**LI.FO**) L, F, H or R (M); dominated by F or H horizons, composed primarily of moderately to well-decomposed woody materials occupying more than 30% of the surface area of the F and H horizons
- *Histic Folisol* (**HI.FO**) L, F, H, O or R (M); dominated by F or H horizons directly underlain by an O horizon ≥10 cm thick

Podzol

Ferro-Humic Podzol: Bhf horizon ≥10 cm thick

- *Orthic Ferro-Humic Podzol* (**O.FHP**) LFH or O, Ae, Bhf, Bf, BC, C
- *Luvisolic Ferro-Humic Podzol* (**LU. FHP**) also has a Bt horizon >50 cm from surface

- *Sombric Ferro-Humic Podzol* (**SM.FHP**) also has an Ah horizon ≥10 cm thick
- *Gleyed Ferro-Humic Podzol* (**GL.FHP**) also has distinct or prominent mottles (gleying) within 1 m
- *Gleyed Sombric Ferro-Humic Podzol* (**GLSM.FHP**) has an Ah ≥10 cm and evidence of gleying within 1 m
- Subgroups of Ferro-Humic Podzols have cemented horizons present in addition to a Bhf horizon ≥10 cm:
  - *Ortstein Ferro-Humic Podzol* (**OT.FHP**) strongly cemented Bfc or Bhfc horizon
  - *Gleyed Ortstein Ferro-Humic Podzol* (**GLOT.FHP**) Bhf, and Bfc or Bhfc and gleying within 1 m
  - *Placic Ferro-Humic Podzol* (**P.FHP**) a thin, hard, often vitreous cemented layer (Bfc or Bhfc horizon)
  - *Duric Ferro-Humic Podzol* (**DU.FHP**) cemented horizon that is not podzolic (BCc)
  - *Fragic Ferro-Humic Podzol* (**FR.FHP**) fragipan horizon (Bx or BCx)

Humo-Ferric Podzol: Bf or Bf + Bhf horizons ≥10 cm; no Bhf horizon ≥10 cm
- *Orthic Humo-Ferric Podzol* (**O.HFP**) LFH, Ae, Bf, BC, C
- Other subgroups are analogous to those listed for Ferro-Humic Podzols

Humic Podzol: Bh horizon ≥10 cm thick; usually has gleyed horizons
- *Orthic Humic Podzol* (**O.HP**) O or LFH, Ae, Bh, Bfgj, BCgj, Cg
- Other subgroups: Ortstein, Placic, Duric and Fragic, as described under Ferro-Humic Podzols

Regosol

Regosol great group: Ah absent or <10 cm thick
- *Orthic Regosol* (**O.R**) C; Ah absent or <10 cm; Bm absent or <5 cm
- *Cumulic Regosol* (**CU.R**) C, Ahb, C; usually due to intermittent flooding
- *Gleyed Regosol* (**GL.R**) faint to distinct mottling within 50 cm of the mineral surface
- *Gleyed Cumulic Regosol* (**GLCU.R**) Cgj, Ahb, Cgj; buried Ah and faint to distinct mottling within 50 cm of the mineral surface

Humic Regosol: Ah ≥10 cm thick

- *Orthic Humic Regosol* (**O.HR**) Ah, C; Ah horizon ≥10 cm thick
- Other subgroups are analogous to those listed under Regosol Great Group

Solonetz

Solonetz great group: hard, massive Bn or Bnt horizon; lacks a well-developed Ae; abrupt boundary between A and B horizons

- *Brown Solonetz* (**B.SZ**) Ah, Bn or Bnt, Csk; sub-arid to semi-arid climate; Ah colour value >4.5 dry
- *Dark Brown Solonetz* (**DB.SZ**) Ah, Bn or Bnt, Csk; semi-arid climate; Ah Colour value 3.5–4.5 dry
- *Black Solonetz* (**A.SZ**) Ah, Bnt, Csk; sub-humid climate; Ah colour value <3.5 wet or dry
- *Alkaline Solonetz* (**A.SZ**) Ah, Bn, Csk (pH of a horizon ≥8.5)
- Gleyed subgroups are as above, but have faint to distinct mottling within 50 cm of surface:
  - *Gleyed Brown Solonetz* (**GLB.SZ**) Ah, Bngj, Cskgj
  - *Gleyed Dark Brown Solonetz* (**GLDB.SZ**) Ah, Bngj, Cskgj
  - *Gleyed Black Solonetz* (**GLBL.SZ**) Ah, Bntgj, Cskgj

Solodized Solonetz: columnar Bn or Bnt horizon; Ae ≥2 cm; abrupt boundary between A and B horizons

- *Brown Solodized Solonetz* (**B.**SS): Ah, Ae, Bn or Bnt, Csk
- Subgroups are mostly analogous to those listed for the Solonetz great group, but include an Ae horizon in addition to an Ah; there is no Alkaline subgroup, but there are four additional subgroups:
  - *Dark Grey Solodized Solonetz* (**B.SZ**) Ahe, Ae, Bnt, Csk
  - *Grey Solodized Solonetz* (**DB.SZ**) Ahe, Ae, Bnt, Csk
  - *Gleyed Dark Grey solodized Solonetz* (**B.SZ**) Ah, Aegj, Bngj or Bntgj, Cskgj
  - *Gleyed Grey Solodized Solonetz* (**DB.SZ**) Ah, Aegj, Bntgj, Cskgj

Solod: In addition to an Ae ≥2 cm, has an AB horizon due to degradation of the upper Bn horizon; no strong columnar structure in Bn

- *Brown Solod* (**B.SO**) Ah, Ae, AB, Bnt, Ck, Csk
- Other subgroups are analogous to those listed for the Solodized Solonetz great group, but have an AB horizon in addition to the Ah or Ahe and Ae horizons

Vertic Solonetz: Intergrading to Vertisol order; slickenside horizon <1 m from surface; may have a weak vertic horizon (Bnvj or Bntvj)

- *Brown Vertic Solonetz* (**BV.SZ**) Ah, Ae or AB, Bn or Bnt, Bnvj or Bntvj, Bnss or Bntss or Cskss, Csk
- Other subgroups are analogous to those listed for the Solonetz great group, but have in addition the following horizons: Bnvj or Bntvj, Bnss or Bntss or Cskss

Vertisol

Vertisol great group: Ah absent or <10 cm thick; a vertic (Bv or Bvk) and a slickenside (ss) horizon within the top 1 m of the soil surface

- *Orthic Vertisol* (**O.V**) Ah, Bv or Bvk, Bss or Bssk or Ckss, Ck
- *Gleyed Vertisol* (**GL.V**) faint to distinct mottling within 50 cm of the mineral surface
- *Gleysolic Vertisol* (**GLC.V**) colours that indicate poor drainage or prominent mottling within 50 cm of the mineral surface

Humic Vertisol great group: Ah ≥10 cm thick, otherwise as for Vertisol great group

- *Orthic Humic Vertisol* (**O.HV**) Ah, Bv or Bvk, Bss or Bssk or Ckss, Ck
- Other subgroups are analogous to those listed under Vertisol great group

Key 6.14 Soil Texture

Soil texture refers to the relative proportions of sand, silt and clay separates within a soil. These separates have their own distinctive properties of "feel," allowing you to estimate their proportions in a sample of soil by hand-texturing. To obtain accurate results, you must carry out texturing with a sample that has the correct moisture content. A variety of texturing methods, that use a range of techniques, are described below. You should become familiar with these methods and use the one that feels most comfortable.

Procedure for hand-texturing

- Crush a small handful of soil in your hand, and remove any coarse fragments (particles >2 mm in diameter).
- Gradually add water to the soil and, with a soil knife or your fingers, work it into moist putty. The correct moisture content is important. If the putty flows with the force of gravity, it is too wet. If it crumbles when rolled, it is too dry. It should have the consistency of filler putty.
- Determine the stickiness of the soil putty by working it between your thumb and forefinger, pressing and then separating your thumb and forefinger. You can estimate the clay content in this way (see Table 6.1); clay limits below are approximate.

  non-sticky: practically no soil material adheres to the thumb or forefinger (<10% clay)

  slightly sticky: soil material adheres to only one of the thumb or forefinger and comes off the other rather cleanly; the soil does not stretch appreciably when the thumb and forefinger are separated (10–25% clay)

  sticky: soil material adheres to both the thumb and forefinger and stretches slightly before breaking when the thumb and forefinger are pulled apart (25–40% clay)

  very sticky: soil material adheres strongly to both the thumb and forefinger and stretches distinctly before breaking (>40% clay)

- Determine the graininess of the soil putty by rubbing it between your thumb and forefinger. You can estimate the sand content in this way (Table 6.1); sand limits below are approximate

  non-grainy: little or no graininess can be felt (<20% sand)

  slightly grainy: some graininess is felt, but non-grainy material (silt and clay) is dominant (20–50% sand)

grainy: sand is felt as the dominant material; some non-grainy material can be felt between sand grains (50–80% sand)

very grainy: sand is the only material felt; little or no non-grainy material is present (>80% sand).

After you have determined stickiness and graininess, use the hand texturing guide (Table 6.1) and properties of soil separates (Table 6.2) as approximate guides to the textural class of the soil. You can use the soil texture triangle (Figure 3.3) to more accurately determining the texture class; it also displays the texture class used in the site unit descriptions.

Table 6.1 Hand-texturing guide

	Non-grainy (<20% sand)	**Slightly grainy (20–50% sand)**	**Grainy (50–80% sand)**	**Very grainy (>80% sand)**
Non-sticky (<10% clay)	—	—	—	Loamy sand or sand
Slightly sticky (10–25% clay)	Silt loam or silt	Loam[1]	Sandy loam	—
Sticky (25–40% clay)	Silty clay loam	Clay loam	Sandy clay loam	—
Very sticky (>40% clay)	Silty clay	Clay	Sandy clay	—

Note: Sand and clay limits are approximate. 1: Loam contains balanced proportions of sand, silt, and clay, and exhibit physical properties intermediate among them.

Table 6.2 Properties of soil separates

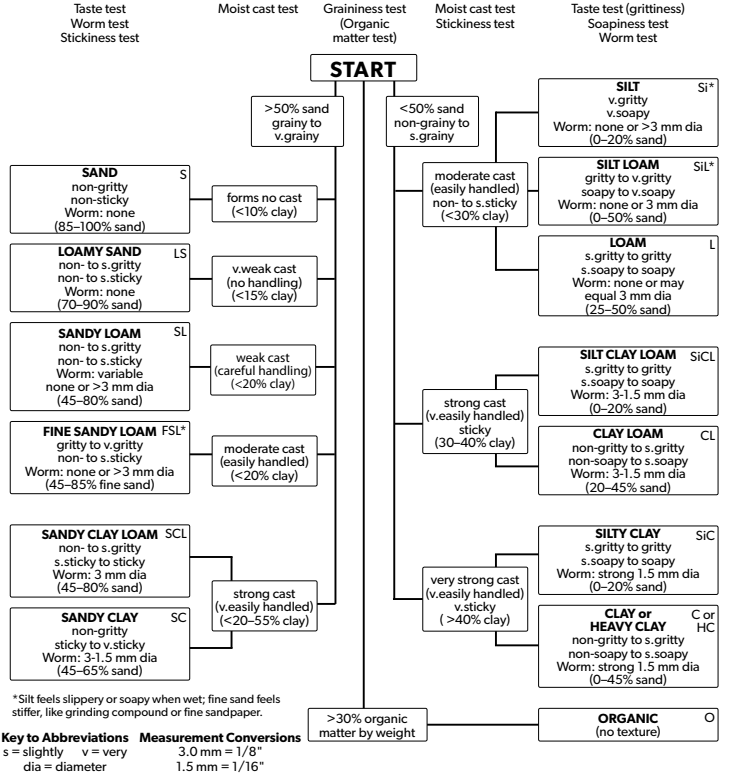
Clay	very hard when dry; feels smooth and is very sticky when wet; feels smooth when placed between teeth
Silt	slightly hard to soft when dry; powder is floury when dry; feels slippery or soapy and only slightly sticky to non-sticky when wet; silt cannot be felt as grains between thumb and forefinger, but can be felt as a fine grittiness when placed between teeth
Sand	loose grains when dry; non-sticky when wet; very grainy when felt between your thumb and forefinger

Other ways to determine soil texture

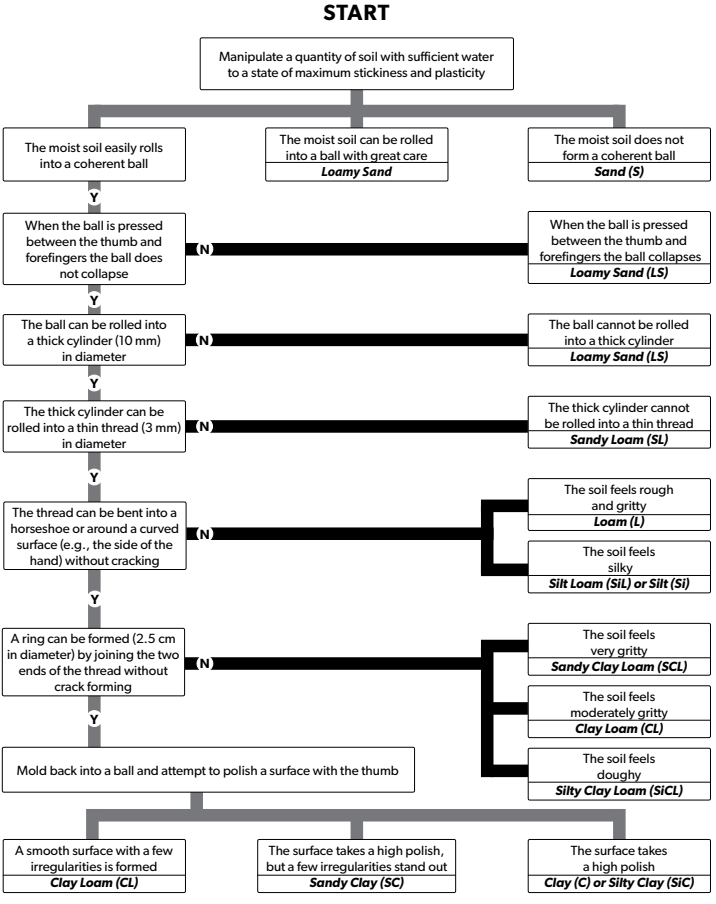
These field tests provide other ways to assist you with determining soil texture.

- Organic matter test: Well-decomposed organic matter (humus) imparts silt-like properties to the soil. It feels floury when dry and slippery or spongy when moist, but not sticky and not plastic. However, when subjected to a taste test (see below), it feels non-gritty. It is generally very dark when moist or wet, and stains your hands brown or black.
- Graininess test: Rub the soil between your fingers; it will feel grainy if sand is present. Determine whether sand comprises more or less than 50% of the sample. Sandy soil often sounds abrasive when you work it in your hand.
- Moist cast test: Compress some moist (not wet) soil by clenching it in your hand. If the soil holds together (i.e., forms a "cast"), then test the durability of the cast by tossing it from hand to hand. The more durable it is (i.e., the more like Plasticine), the more clay is present.
- Stickiness test: Wet the soil thoroughly and compress it between your thumb and forefinger. Determine the degree of stickiness by noting how strongly the soil adheres to your thumb and forefinger when you release the pressure, and by how much it stretches. Stickiness increases with clay content.
- Taste test: Work a small amount of soil between your front teeth. Silt particles are distinguished as fine grittiness (e.g., like driving on a dusty road), unlike sand, which is distinguished as individual grains (i.e., graininess). Clay has absolutely no grittiness.
- Soapiness test: Slide your thumb and forefinger over wet soil. The degree of soapiness is determined by how soapy/slippery it feels and how much resistance to slip there is (i.e., from clay and sand particles).
- Worm test: Roll some moist soil on your palm with your finger to form the longest, thinnest "worm" possible. The more clay there is in the soil, the longer, thinner and more durable the worm will be. Try with wetter or drier soil to ensure that you have the correct moisture content (best worm).

Key 6.15 Soil Texturing Using the Graininess Test



Key 6.16 Soil Texturing Using the Ball Test



Key 6.17 Flood Hazard Characteristics

Flood hazard	a) Annual or b) Frequent	c) Occasional	d) Rare	e) Never
Litter cover	No litter, to a thin layer of non-decomposed material	Thin litter cover ranging from recent to partly or completely decomposed material	Thick litter cover, lower layer completely decomposed	Thick litter cover, lower layer completely decomposed; soil profile development
Over-bank deposits, etc.	Presence of recent silt or sand deposits; occasional scour holes	Silt and/or fine sand deposits interbedded with organic litter	No evidence of recent over-bank deposits	No evidence of recent over-bank deposits
Fluvially transported debris	Fluvially deposited logs and organic debris on channel banks; occasionally debris in lower branches of trees	Fluvially deposited logs and organic debris may be present on the ground and in the lower branches of trees	Not present	Not present
Vegetation	None, or species typical of primary colonization, or species typical of wetlands	Mature trees; possibly some species typical of primary colonization	Mature trees	Mature trees
Terrain height	Low-lying areas	Areas of moderate elevation	Areas of higher elevation	Areas of higher elevation
Terrain unit	Active flood plains or fans, includes active channels, side channels, drainage channels, and areas of marsh or swamp	Valley dissected by back, side, and drainage channels	Areas of low terraces, fluvial fans, or colluvial deposits	Areas of higher terraces, fluvial fans, colluvial deposits, etc.; usually adjacent to the valley walls
Soil classification	Orthic and Cumulic Regosols	Cumulic Regosols	Cumulic Regosols, Brunisols, Cryosols	Usually not Regosolic; will depend on area surveyed

Adapted from Miles and Harding 1980

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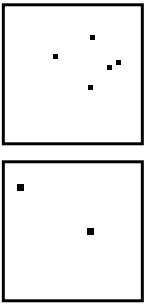

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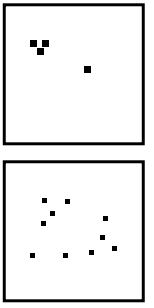

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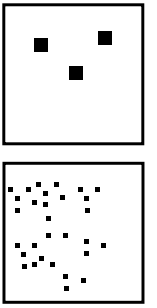

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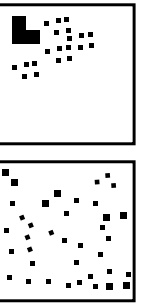

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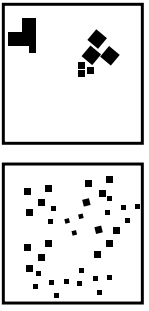

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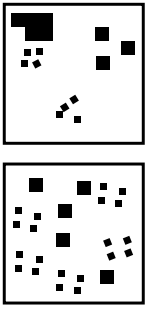

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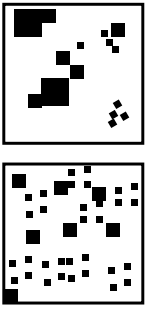

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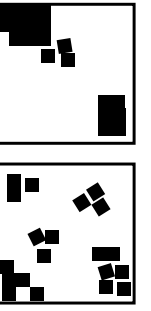

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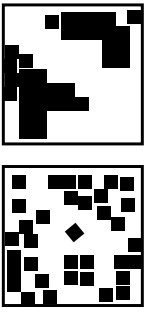

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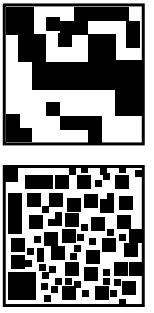

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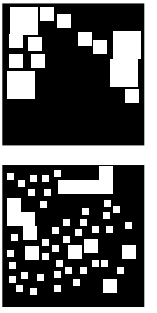

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