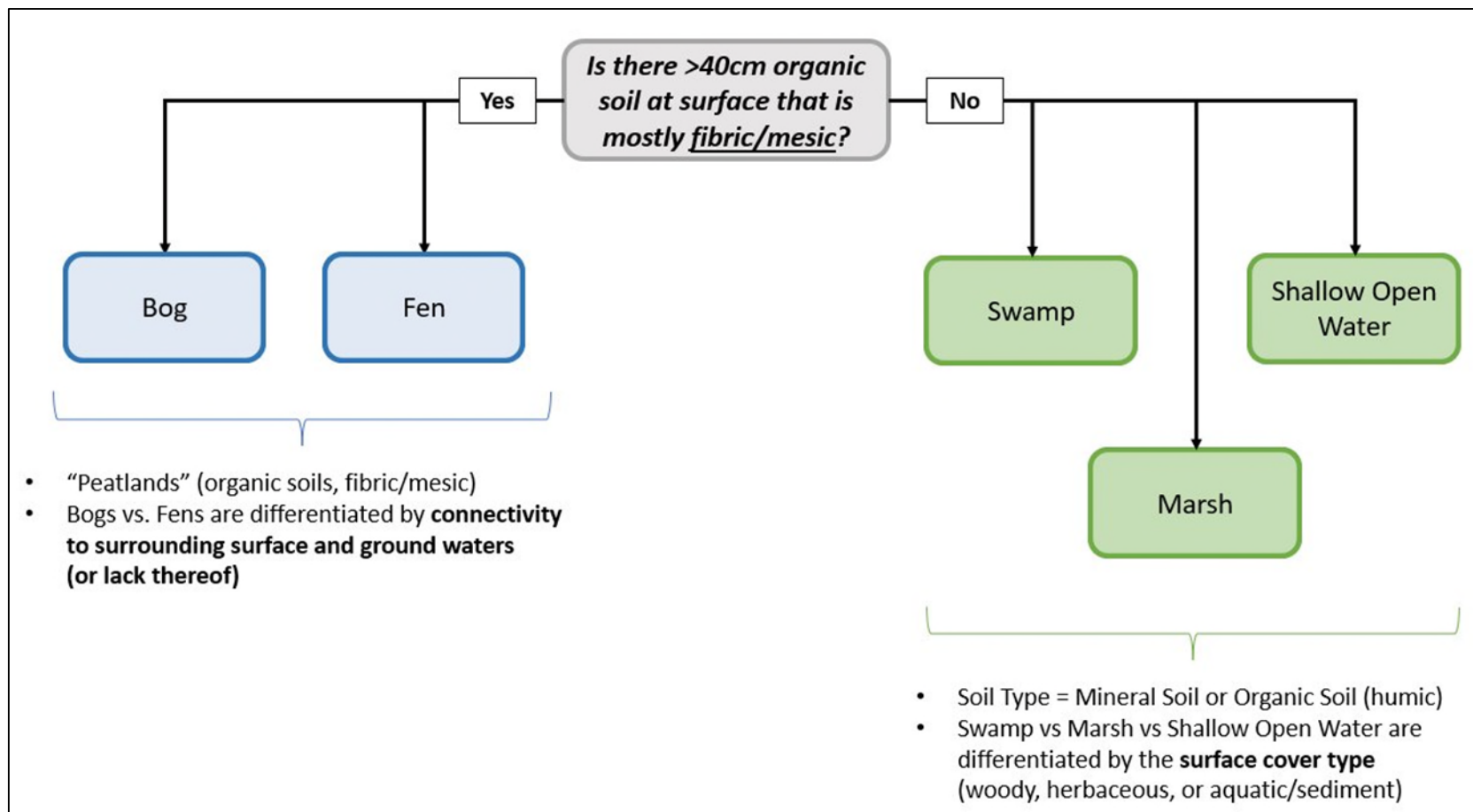
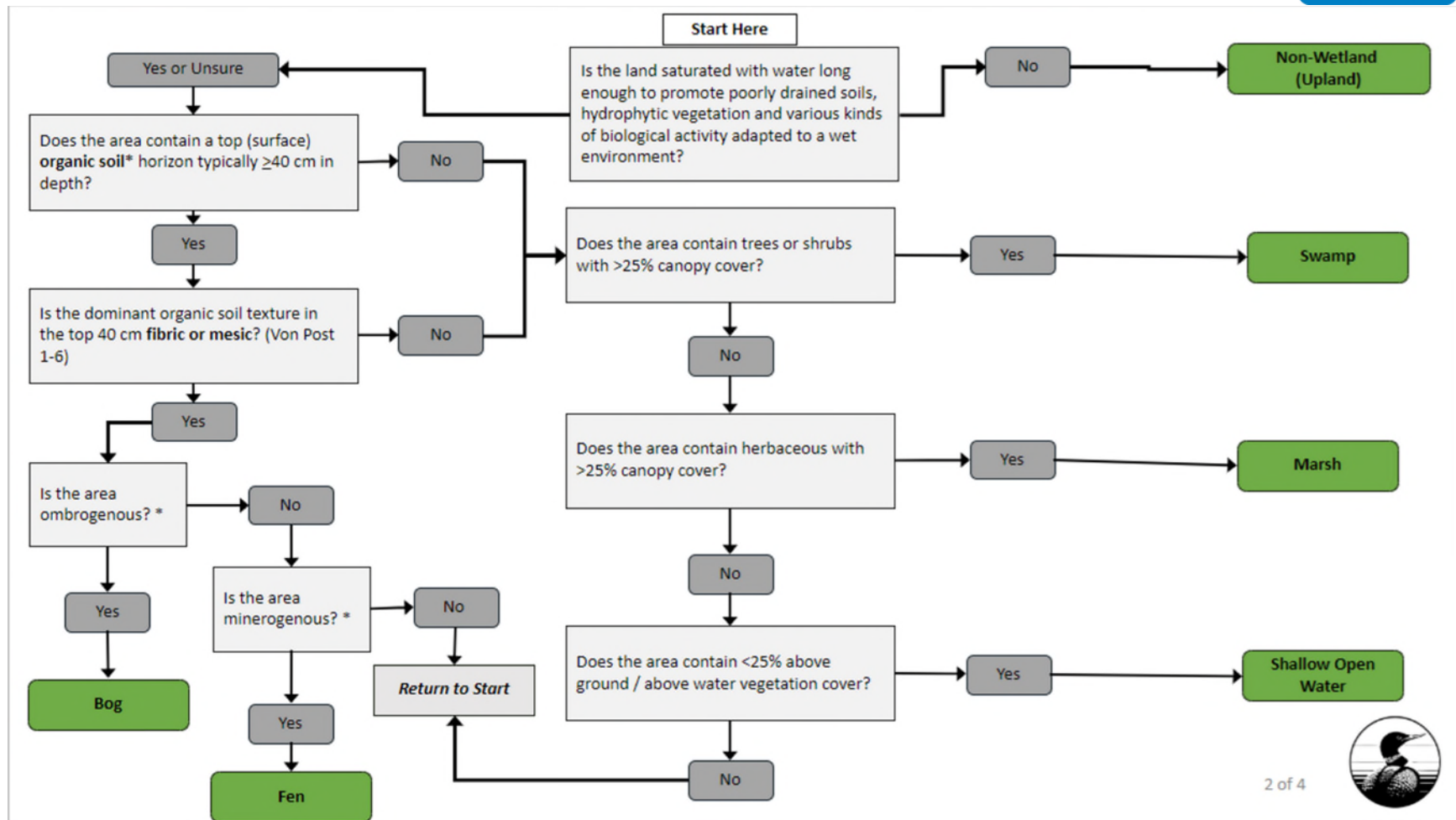


## List of CNWI BC Field Keys

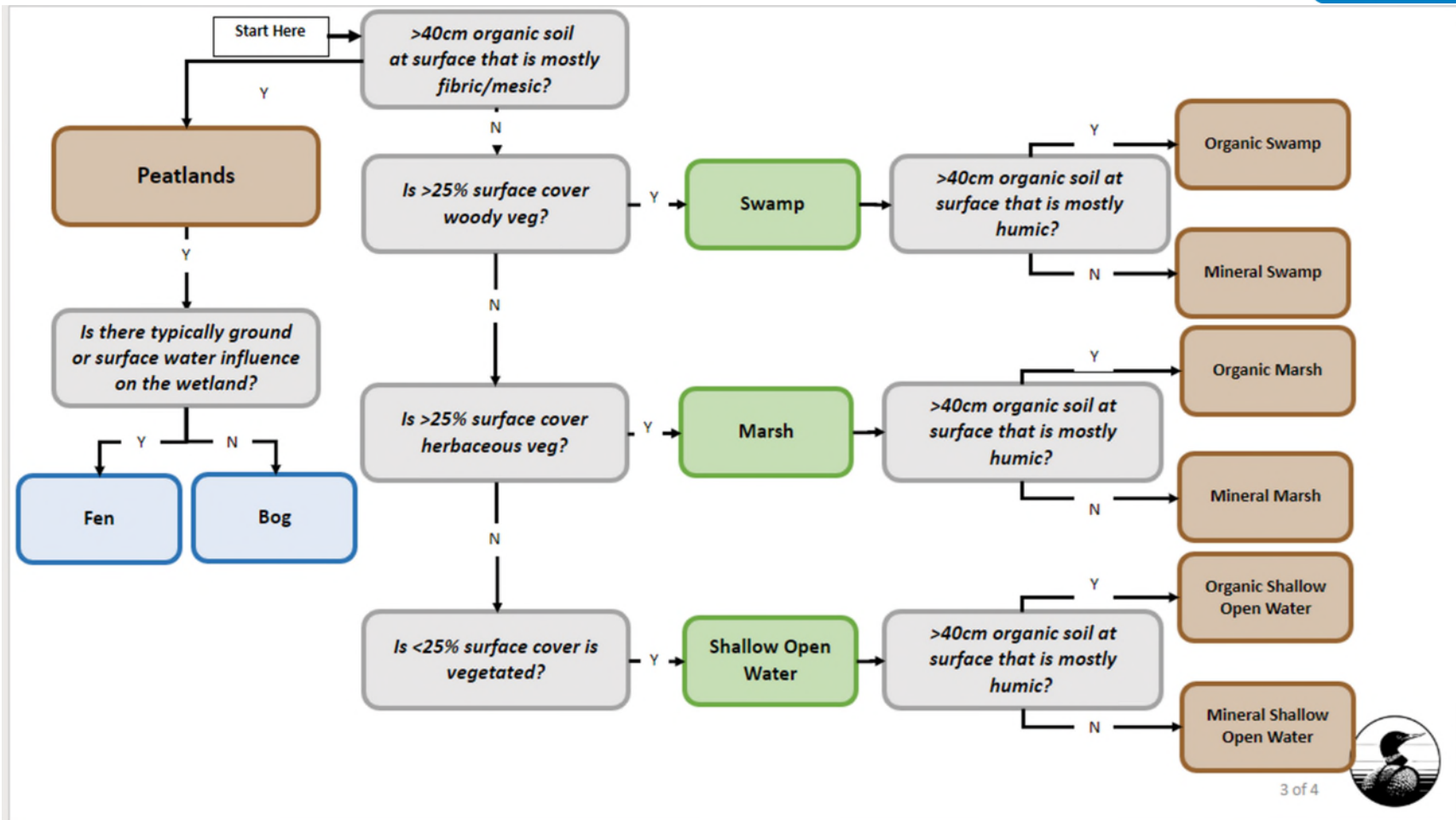
Page #	Name of Field Key
1	Wetland Class Flow Chart (Figure 2-1 in Field Guide)
2	Wetland Class Flow Chart (Detailed) (Figure 2-2)
3	Wetland Class Flow Chart (Soil Types) (Figure 2-3)
4	Surface Cover (Table 2-3)
5	Wetland Class and Surface Cover (Table 2-2) & Soil Type (Table 4.2)
6	Hydrological System (Figure 2-4)
7	Hydroperiod Type (Table 2-6) Growing Season (Table 2-7)
8	Hydroperiod and Seasonality (Figure 2-5) & Nutrients (Table 2-8)
9	Field Plot Survey Level Intensity (for polygon validation projects) (Table 3-1)
10	Determining Area of Assessment Example (Figure 4-1) Drone Flight and Photo Capture Example (Figure 4-2)
11	Plot Locations Example (Figure 4-3) Types of Plot Assessments (Table 4-1)
12	Recommended Plot Assessment (By Scenario) (Table 4-2)
13	Methods to Estimate Vegetation Cover % (Figure 4-4) Methods to Estimate Vegetation Height (Figure 4-5)
14	Depleted Soil Material Colour Example (Figure 4-9)
15-16	Dwarf and Low Woody Veg List
17	CNWI Soil Texture Guide – Mineral Soil
18	CNWI Soil Texture Guide – Organic Soil
19	Mineral Soil Texture Key 1 (LMH25)
20	Mineral Soil Texture Key 2 (LMH25)



**Wetland Class Flow Chart** (Figure 2-1 in Field Guide)



**Wetland Class Flow Chart (Detailed)** (Figure 2-2)



Wetland Class Flow Chart (Soil Types) (Figure 2-3)

Table 2.3. Surface Cover

Woody Vegetation		
1	Is >25% of the surface area covered by trees? Trees are woody vegetation greater than 5 meters in height. <b>Note:</b> if unable to discern height; code to “Woody”.	Yes – <b>Treed</b> No – Go to 2 Unsure – Go to 3.
2	Is >25% of the surface area covered by shrubs? Shrubs are woody vegetation less than 5 meters in height. <b>Note:</b> Do not include dwarf woody vegetation bog rosemary [ <i>Andromeda polifolia</i> ] bog laurel [ <i>Kalmia microphylla</i> ], labrador tea [ <i>Rhododendron groenlandicum</i> ] in the shrub or woody surface cover category. Stunted trees & shrubs (e.g. black spruce [ <i>Picea mariana</i> ] or lodge pole pine [ <i>Pinus contorta</i> ]) should still be included in tree/shrub surface cover category. <b>Note:</b> if unable to discern height; code to “Woody”.	Yes – <b>Shrub</b> No – Go to 3.
3	Is >25% of the surface area covered by woody vegetation? ( <b>Do not include dwarf woody vegetation</b> )	Yes – <b>Woody</b> No – Go to 4
Ground Vegetation		
4	Is > 25% of the ground covered by vegetation (i.e., bryophytes, lichen and/or herbaceous vegetation)?	Yes – Go to 5 No – Go to 7
5	Is >25% of the ground vegetation covered by herbaceous species? (e.g., grasses, rushes sedges, reeds, ferns, fern allies, grass-like plants, and forbs)	Yes – <b>Herbaceous</b> No – Go to 6
6	Is >25% ground surface covered by bryophytes (mosses, liverworts, hornworts) and/or lichens?	Yes – <b>Bryophyte</b> No – Got to 7
Aquatic and Exposed		
7	Is >25% of the surface area covered with floating or submerged aquatic vegetation?	Yes – <b>Aquatic Vegetation</b> No – Go to 8
8	Is the surface area covered with water or exposed sediment with eelgrass (e.g., <i>Zostera marina</i> , <i>Ruppia maritima</i> ) at densities >1 shoot /m <sup>2</sup> ?	Yes – <b>Eelgrass</b> No – Go to 9
9	Is >25% of the surface area covered with macro algae?	Yes – <b>Macro Algae</b> No – Go 10
10	Is the surface area dominated with exposed sediment with <25% vegetation cover of any type and no eelgrass? Exposed sediment is sand, silt, clay, gravel or small boulders, or other particle inorganic substrates. <b>Note:</b> un-vegetated intertidal areas should always be coded to exposed sediment or exposed bedrock as opposed to open water regardless of the high of the tide at the time of survey.	Yes – <b>Exposed Sediment</b> No – Go to 11
11	Is the surface area dominated with exposed bedrock with <25% vegetation cover of any type and no eelgrass? <b>Note:</b> un-vegetated intertidal areas should always be coded to exposed sediment or exposed bedrock as opposed to open water regardless of the high of the tide at the time of survey.	Yes – <b>Exposed Bedrock</b> No – Go to 12
12	Is the surface area dominated with open water with <25% vegetation surface cover and no eelgrass?	Yes – <b>Water</b> No – Go to 13
13	Is the surface area dominated with snow, ice, glaciers with <25% vegetation surface cover?	Yes – <b>Snow/Ice</b> No – Go to 14
Other		
14	Is the surface area in a non-natural state – e.g., covered with roads, buildings, structures, resource extraction (mines), parking lots, etc.	Yes – <b>Anthropogenic</b> No – Go to 15
15	Is the surface area covered by other vegetation or ground cover types not explicitly included above?	Yes – <b>Other</b>

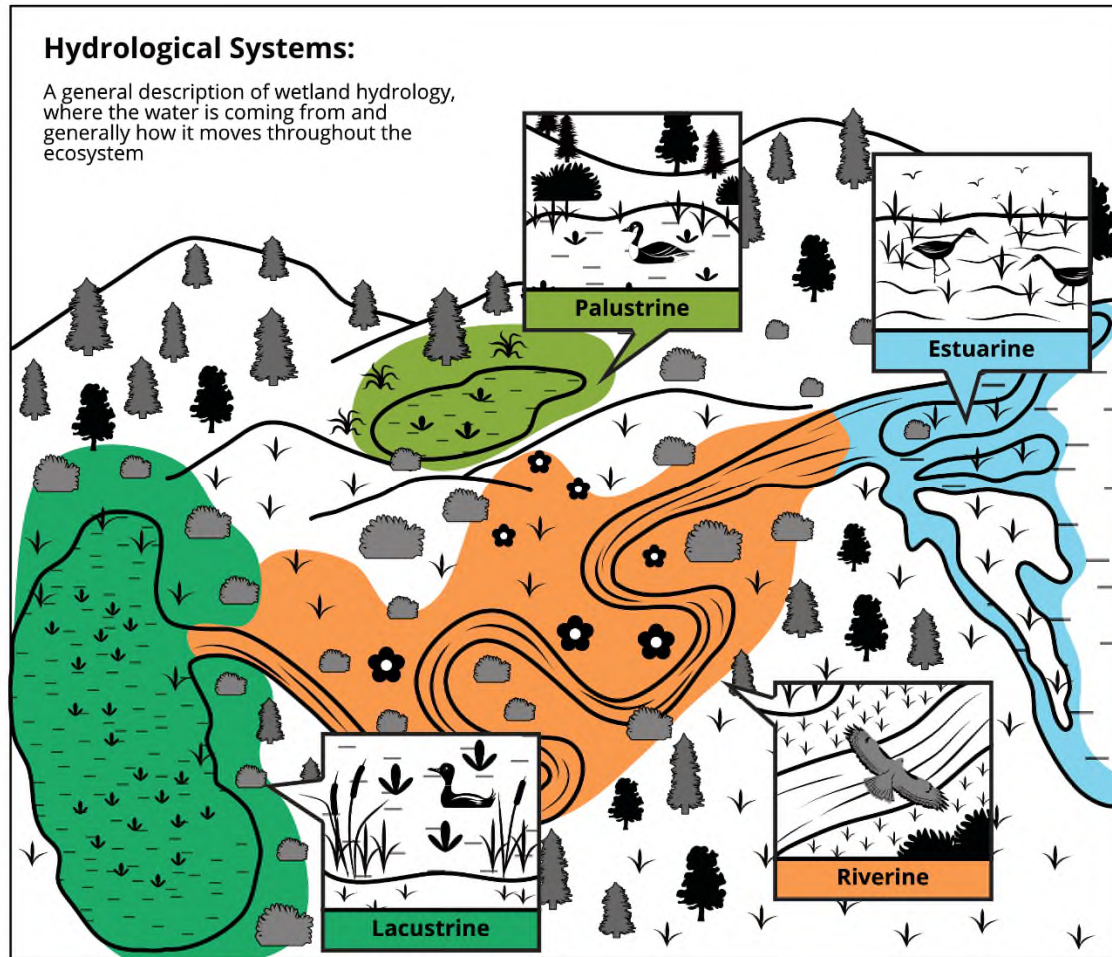
Table 2.2. Wetland Class and Surface Cover

Wetland Class	Typical Surface Cover Type
Bog	Tree, Shrub, Bryophyte, Water
Fen	Tree, Shrub, Herbaceous, Bryophyte, Water
Swamp	Tree, Shrub
Marsh	Herbaceous
Shallow Open Water	Aquatic Vegetation, Algae, Eelgrass, Exposed Sediment, Water

Table 2.4. Soil Type

Soil type	Description
Organic soil (fibric / mesic)	Soil profile with a surface organic soil horizon of at least 40cm. Most of the organic soil in the top 40 cm has a fibric or mesic soil texture (Von Post 1-6).
Organic soil (humic)	Soils profile with a surface organic horizon of at least 40cm. Most of the organic soil in the top 40 cm has a humic organic soil texture (Von Post 7-10).
Shallow organic on bedrock	Soils profile with a surface organic soil horizon <40cm (typically fibric/mesic) and is underlain by a bedrock layer.  <b>Note:</b> this soil type is typically used for certain coastal bogs.
Organic soil over water	Organic soils (typically fibric/mesic) underlain by a water layer  <b>Note:</b> This soil type is typically assigned for a “floating” wetland such as a floating fen or floating bog. There is often water found on above of the organic soil (as well as in the subterrain/below).
Organic soil	Soils profile with an organic horizon of at least 40cm (any texture).  <b>Note:</b> Only use this soil type where texture and subterrain type is not known.
Mineral hydric	Soil derived from minerals or rocks containing little or no organic matter, that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper 40 cm (e.g., signs of redox concentrations/depletions, gleying or mottling present).  <b>Note:</b> A surface organic horizon may be present, but it is less than 40cm.
Young mineral hydric	Soil derived from minerals or rocks and containing little humus or organic matter that does not show typical hydric soil indicators (e.g., mottling, gleying, etc.). Wetland hydrology signs must be present.  <b>Note:</b> This soil type includes gravel bars or areas with rapid drainage or disturbed soils that do not show evidence to qualify as ‘hydric mineral soil, but are likely wetlands based on the frequency of flooding or fluctuating water table.
Non-wetland soil	A soil that is not a wetland soil (e.g., not mineral hydric soil or organic hydric soil). Non-hydric soils lack flooding or fluctuating water table.
<b>NOTE:</b> To qualify as an organic soil horizon, the soil must contain > 17% organic C (approximately ≥ 30% organic matter) by weight.	





**Hydrological System** (Figure 2-4)

Table 2 6. Hydroperiod Type

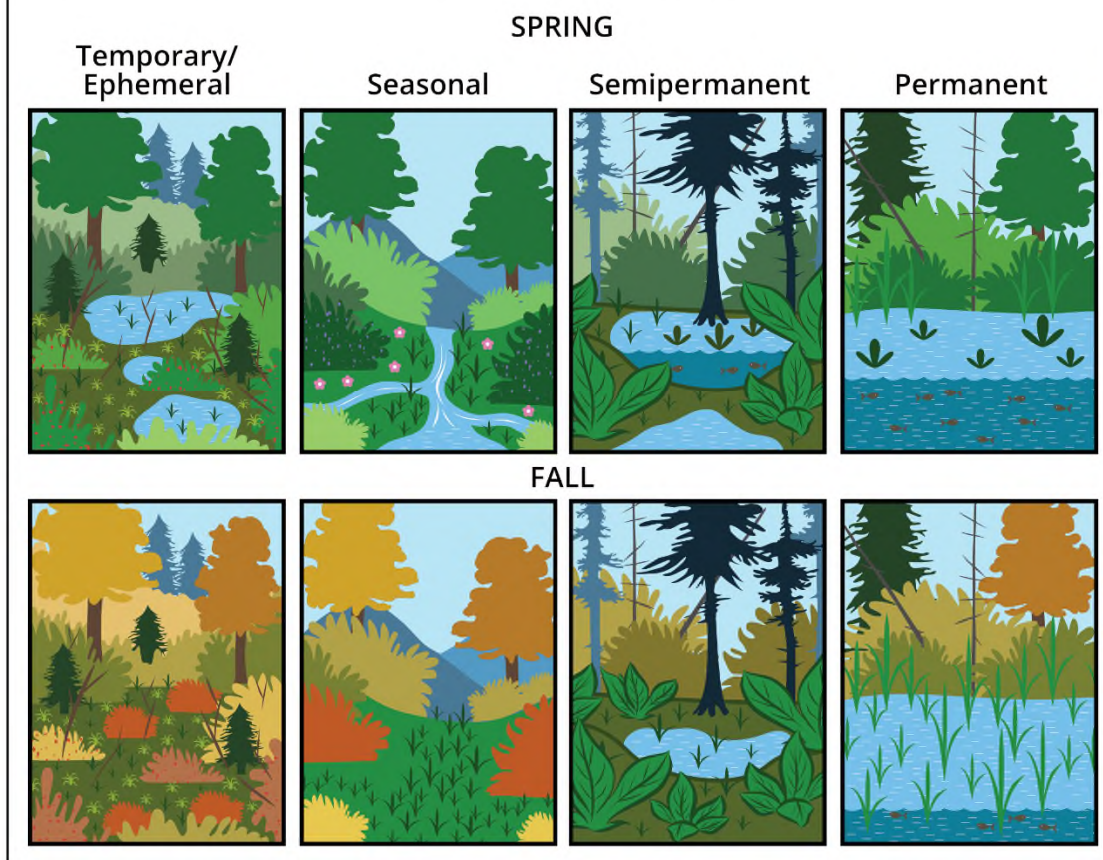
Type	Definition
	<b>In most years, surface water (or saturated soils at the surface) is present for...</b>
Ephemeral	...a very short time (>2 weeks) in the early growing season, or after heavy rains.
Temporary	...a short period of time (~25%) in the growing season. Topsoil is typically dry by the end of the summer.
Seasonal	...approximately half (~50%) the growing season. Topsoil is typically moist by the end of the summer.
Semi-permanent	...most (~75%) of the growing season. Topsoil is typically quite moist or wet by the end of summer.
Permanent	...present throughout (~100%) the growing season.
Not applicable	The hydroperiod field may not apply to some bogs (sloping high elevation bogs) or tidal wetlands (as tidal wetlands are influenced by daily hydroperiods).
References: Stewart and Kantrud 1971; ESRD 2015; MacKenzie and Moran, 2004.	

Table 2 7. Growing Seasons

City	First Frost	Last Frost	Approximate Growing Season	Approximate Growing Season Months	Approximate 50% growing season period ("Seasonal")
Cranbrook	May 24	Sept 14	112 days	4 months	8 weeks
Dawson Creek	Jun 8	Aug 24	76 days	2.5 months	5-6 weeks
Fort Nelson	May 26	Sep 5	101 days	3.5 months	7-8 weeks
Golden	Jun 2	Sep 8	97 days	3 months	6-7 weeks
Kamloops	May 3	Oct 3	152 days	5 months	10-11 weeks
Kelowna	May 8	Oct 6	150 days	5 months	10-11 weeks
Nanaimo	May 4	Oct 15	163 days	5.5 months	11-12 weeks
Prince George	May 20	Sep 18	120 days	4 months	8-9 weeks
Prince Rupert	May 14	Oct 7	145 days	5 months	10-11 weeks
Port Hardy	Apr 23	Oct 22	181 days	6 months	12-13 weeks
Williams Lake	Jun 2	Sep 7	96 days	3 months	6-7 weeks
Vancouver	Apr 21	Oct 19	180 days	6 months	12-13 weeks
Victoria	Apr 14	Nov 9	208 days	7 months	14-15 weeks
Last and first frost dates are 33% probability. Calculated using 1981-2010 Climate Normals from Environment Canada. Data aggregated by: <a href="https://www.almanac.com/">https://www.almanac.com/</a>					



**Hydroperiod:** Amount of time water is held in the wetland



**Hydroperiod and Seasonality (Figure 2-5)**

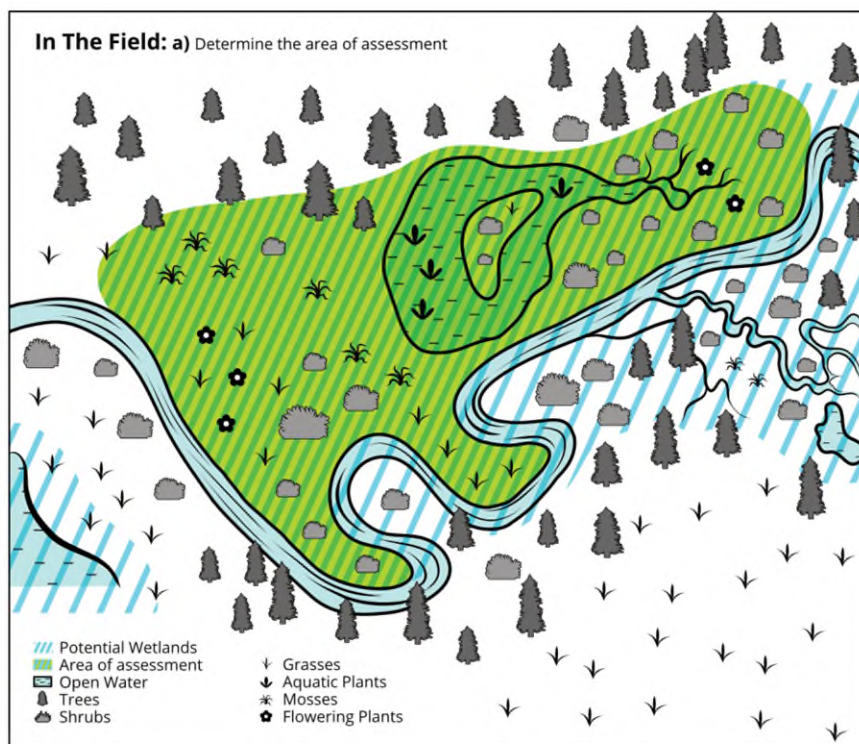
Table 2 8. Nutrients	
Category	Examples
Poor / Very Poor	<ul style="list-style-type: none"> <li>• Very poor (&lt;4.5 pH) <ul style="list-style-type: none"> <li>○ Typical high cover of peat moss (<i>Sphagnum spp.</i>)</li> <li>○ Stunted trees and shrubs such as black spruce (<i>Picea mariana</i>), and specialized species such as sundew (<i>Drosera rot</i>),</li> </ul> </li> <li>• Poor (4.5 – 5.5 pH) <ul style="list-style-type: none"> <li>○ Same as very poor nutrient species but also with some other diversity including brown mosses, sedge (<i>Carex spp.</i>), willow (<i>Salix spp.</i>), hardhack (<i>Spirea douglasii</i>), lodgepole pine (<i>Pinus contorta</i>), western hemlock (<i>Tsuga heterophylla</i>), buckbean (<i>Menyanthes trifoliata</i>).</li> </ul> </li> </ul>
Medium/Rich	<ul style="list-style-type: none"> <li>• Medium (5.5-6.4 pH) <ul style="list-style-type: none"> <li>○ Vegetation similar to poor and rich sites, often contains both poor and rich species.</li> </ul> </li> </ul>

**Table 2 8. Nutrients**

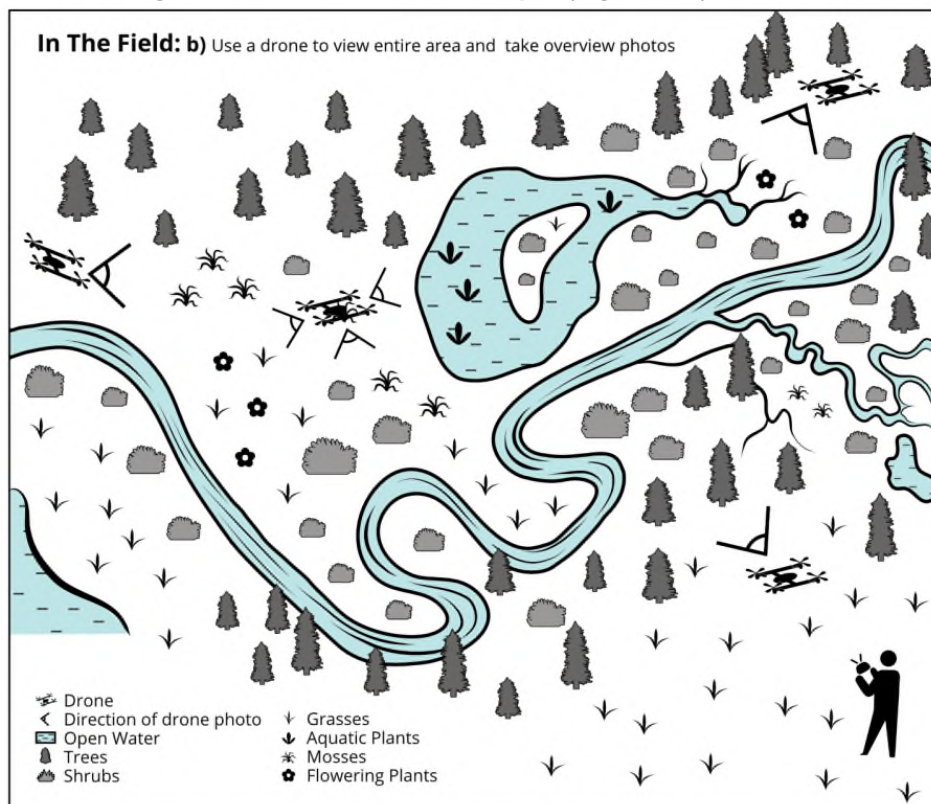
Category	Examples
	<ul style="list-style-type: none"> <li>Rich (6.5-7.4 pH) <ul style="list-style-type: none"> <li>Cattail (<i>Typha</i> spp.), skunk cabbage (<i>Lysichiton americanus</i>), birch (<i>Betula</i> spp.), salmonberry (<i>Rubus spectabilis</i>), blue berry (<i>Vaccinium ovalifolium</i>), western red cedar (<i>Thula plicata</i>), baltic rush (<i>juncus balticus</i>), great bull rush (<i>Schoenopletuc acutus</i>).</li> </ul> </li> <li>Very rich (&gt;7.5 pH) <ul style="list-style-type: none"> <li>Vegetation often similar to rich sites but likely more abundant/larger</li> <li>Site could be eutrophic or alkaline.</li> </ul> </li> </ul>
<p>Note: Nutrients are generally measured when there is open water available. Some wetlands will not have water availability OR sometimes when assessing soils, the water table will be revealed where the soil auger was dug in. If there is no water availability, vegetation is another adequate way of determining nutrient richness.</p>	

**Table 3 1. Survey Level Intensity**

Project Goal <sup>1</sup>	Project Uses	% of Wetland Polygons Inspected	Plot Ratio Quantitative: Qualitative	Suggested Scales	Range of Study Area (ha)
Detailed Wetland Mapping	Restoration, management planning, conservation lands, parks	51-100	10:90	1:5,000	1-10,000
Landscape Wetland Mapping	Wetland inventory with limited management objectives	15-50	10:90	1:10,000-1:20,000	10,000-500,000
<p><sup>1</sup>Plot Ratios, Scales, and Range of Study area are preliminary suggestions. These should be refined based on CWS Pacific staff input and consultation with the project lead.</p>					

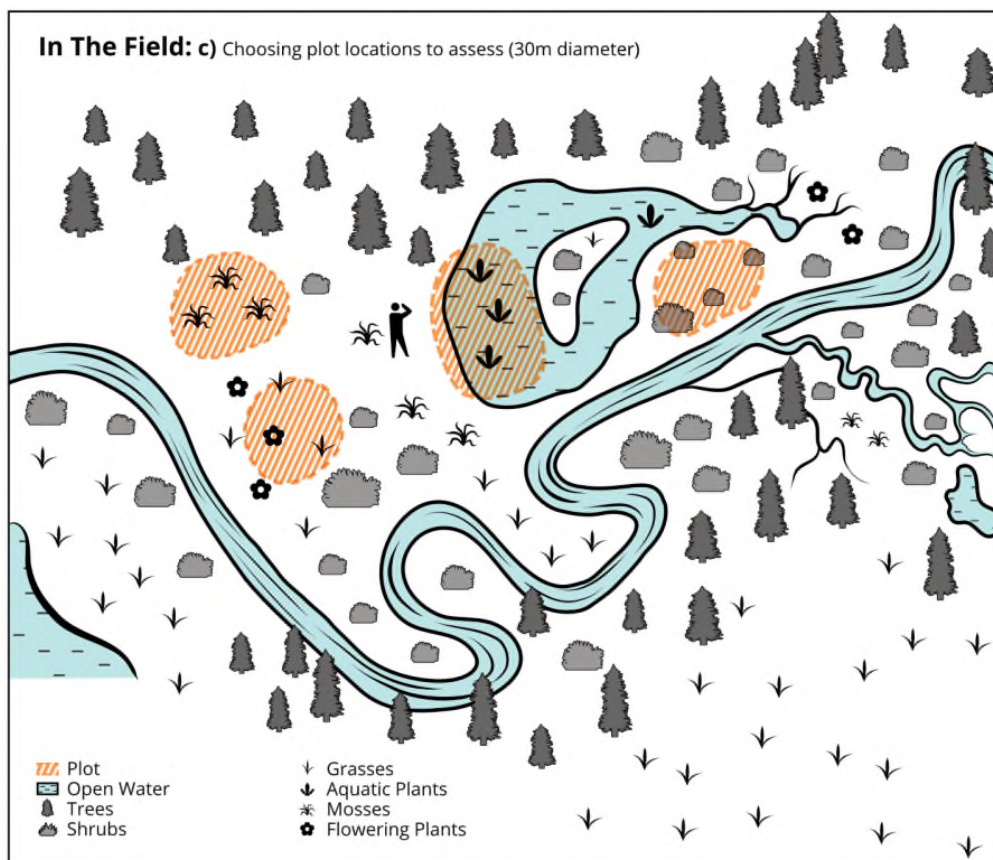


**Determining Area of Assessment Example (Figure 4-1)**



**Drone Flight and Photo Capture Example (Figure 4-2)**



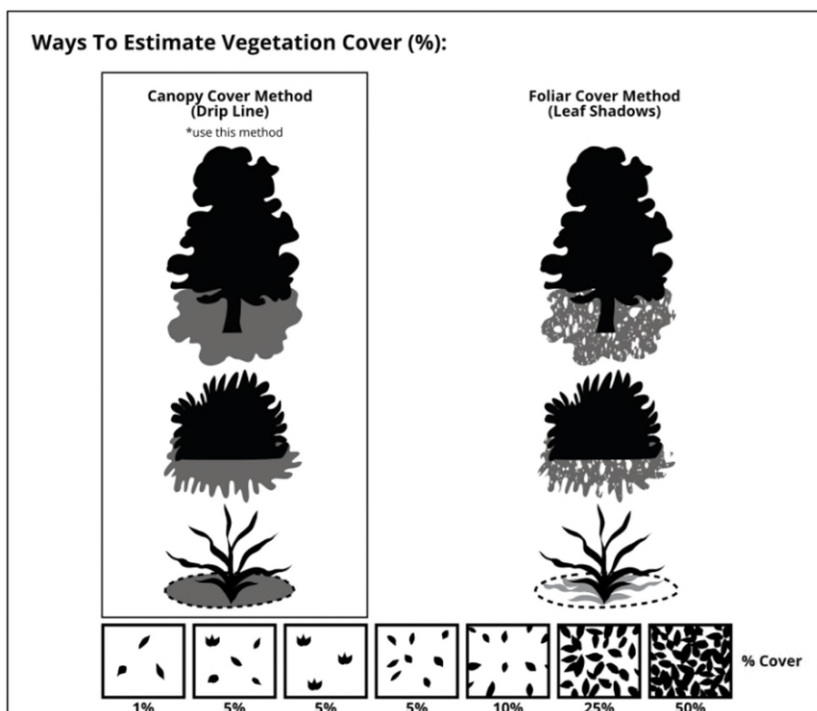


**Plot Locations Example** (Figure 4-3)

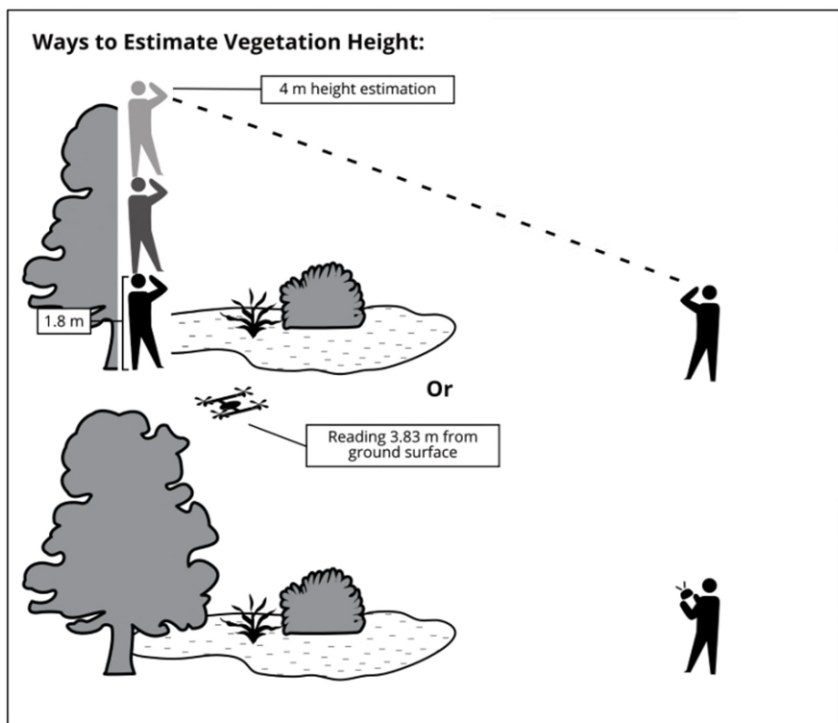
Table 4 1 Types of Plot Assessments			
Type of Assessment	Soil/Veg Forms Required?	Form	ESRI Data Collector Application
Quantitative Ground	Yes	Detailed Plot (if faint indicators / low confidence in classification)	Survey123
		Rapid Plot (typically use)	Survey123 or Field Maps
Qualitative Ground <sup>1</sup>	No	Rapid Plot	Survey123 or Field Maps
Qualitative Air <sup>2</sup>	No	Rapid Plot	Survey123 or Field Maps
<p>1 Option to complete from a distance, with the location of the plot corrected. – e.g., from viewing platform or road or with binoculars, etc.</p> <p>2 These plots are completed from a distance in the air with the location of the plot corrected. - e.g., from drone imagery or helicopter.</p>			

Table 4.2. Recommended Plot Assessment (By Scenario)

#	Scenario	Example	Recommended Plot Assessment Method	Alternate Method 1	Alternate Method 2
1	For an area that is very “transitional”, or with faint indicators of wetland hydrology, vegetation, soil or where the surveyor has low confidence in the wetland classification.	An area that has mostly facultative vegetation, hydric soil indicators are faint, and it is not immediately obviously if the area is a wetland or upland. E.g., is it meadow or marsh? Swamp or mesic forest?	Quantitative Ground Assessment, Detailed Plot Form.	Quantitative Ground Assessment, Rapid Plot Form.	n/a
2	For a wetland class that has not been yet assessed in the project.	First time seeing a fen in the project.	Quantitative Ground Assessment, Rapid Plot Form.	If time constraints - Qualitative Ground Assessment.	If time constraints - Qualitative Air Based Assessment.
3	For a wetland class that has been assessed in this project area during this survey, but the surface cover, hydroperiod, soil type, and/or hydrological system are <i>quite different</i> .	Second time seeing a swamp in the project. But the first one was shrubby surface cover and next to a river, and this swamp is treed and in a basin.	Quantitative Ground Assessment, Rapid Plot Form.	If time constraints access - Qualitative Ground Assessment.	If time constraints access - Qualitative Air Based Assessment.
4	For a wetland class that has been assessed in this project area during this survey, and the surface cover, hydroperiod, soil type, and/or hydrological system are <i>fairly similar</i> to the original.	Observing a new fen, and it looks very similar to the first fen observed (which had a quantitative ground assessment) but the new fen has slightly different herbaceous vegetation.	Qualitative Ground Assessment.	If time constraints access – Qualitative Air Based Assessment.	n/a
5	Completed the required ratio for Quantitative Plots: #study plots and are not seeing any new wetland classes or notable features.	Seeing more repeating marshes & swamps in an area that has already been well sampled with quantitative assessments.	Qualitative Ground Assessment.	If time constraints - Qualitative Air Based Assessment.	n/a
6	For an area with all obligate or facultative-wet vegetation that is a classic, obvious wetland.	Classic cattail marsh. Lilypond pond, etc.	Qualitative Ground Assessment.	If time constraints - Qualitative Air Based Assessment.	n/a

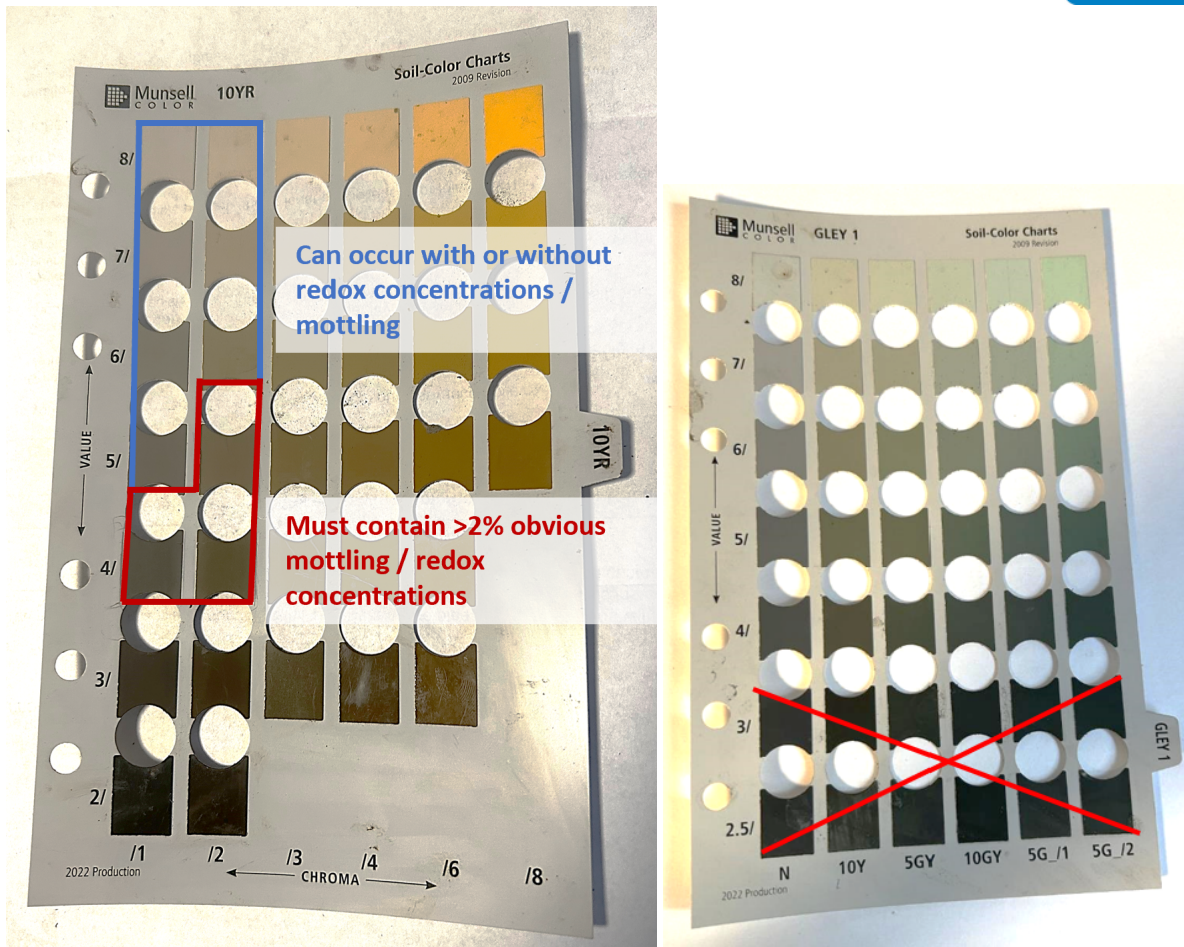


Methods to Estimate Vegetation Cover % (Figure 4-4)



Methods to Estimate Vegetation Height (Figure 4-5)





Depleted Soil Material Colour Example (Figure 4-9).

**CNWI BC Field Guide Appendix D – List of dwarf shrubs, low shrubs to include in the ground vegetation stratum on the CNWI Vegetation Plot Form**

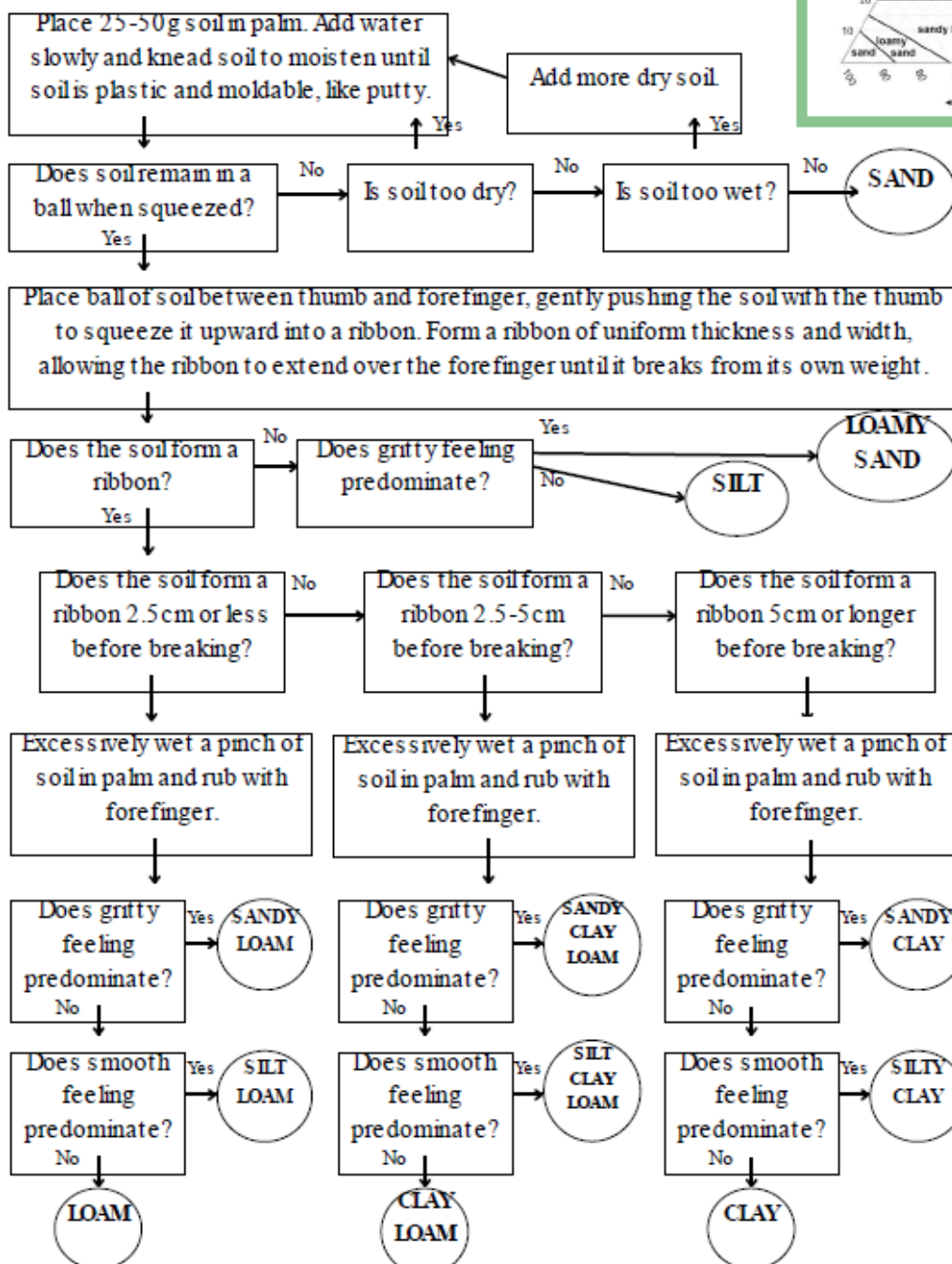
Scientific Name	English Name	Synonyms	2024 BC Wetland Plant Ranking
<u><b>Andromeda polifolia</b></u>	<u><b>bog rosemary</b></u>		<b>OBL</b>
<b>Arctostaphylos uva-ursi</b>	kinnikinnick		FACU
<b>Arctous alpinus</b>	alpine bearberry		FACU
<b>Arctous ruber</b>	red bearberry		FAC
<b>Cassiope lycopodioides</b>	club moss mountain heather		FACU
<b>Cassiope mertensiana</b>	white mountain heather		FACU
<b>Cassiope tetragona</b>	four angled mountain-heather		FACU
<b>Chimaphila menziesii</b>	Menzies'prince's pine		UPL
<b>Chimaphila umbellata</b>	common prince's pine		UPL
<b>Dryas drummondii</b>	yellow mountain avens		UPL
<b>Dryas integrifolia</b>	entire leaved mountain-avens		UPL
<b>Dryas octopetala</b>	mountain avens		UPL
<b>Empetrum nigrum</b>	black crowberry		FAC
<b>Gaultheria hispidula</b>	creeping-snowberry		FAC
<b>Gaultheria humifusa</b>	alpine teaberry		FAC
<b>Gaultheria ovatifolia</b>	western teaberry		FACU
<b>Harrimanella stelleriana</b>	Alaska moss-heather		FACU
<b>Kalmia microphylla</b>	western bog-laurel		FACW
<b>Linnaea borealis</b>	twinline		FACU
<b>Loiseleuria procumbens</b>	alpine azalea		not ranked
<b>Luetkea pectinata</b>	partridge foot		FACU
<b>Oxycoccus macrocarpus</b>	<b>large cranberry</b>	<b>Vaccinium macrocarpon</b>	<b>OBL</b>
<b>Oxycoccus oxycoccus</b>	<b>bog cranberry</b>	<b>Vaccinium oxycoccus</b>	<b>OBL</b>
<b>Penstemon davidsonii</b>	Pdavidson's penstemon		UPL
<b>Penstemon ellipticus</b>	oval-leaved penstemon		UPL
<b>Phyllodoce empetrifomis</b>	pink mountain heather		FAC
<b>Phyllodoce glanduliflora</b>	yellow mountain-heather		FACU
<b>Polygonum cuspidatum</b>	japanese knotweed	Fallopia japonica	not ranked
<b>Polygonum paronychia</b>	black knotweed		UPL
<b>Polygonum polystachyum</b>	milkwort knotweed		FACU
<b>Polygonum sachalinense</b>	Giant knotweed	Reynoutria sachalinensis	not ranked
<b>Rhododendron groenlandicum</b>	<b>labrador tea, trappers' tea</b>		<b>FACW</b>
<b>Rhododendron lapponicum</b>	lapland rhododendron		UPL
<b>Rubus nivalis</b>	snow bramble		UPL
<b>Rubus pedatus</b>	five-leaved bramble		FACU
<b>Rubus pubescens</b>	dwarf raspberry		FACU
<b>Rubus ursinus</b>	training blackberry		FACU
<b>Salix arctica</b>	arctic willow		FAC
<b>Salix cascadiensis</b>	Cascade willow		UPL

Scientific Name	English Name	Synonyms	2024 BC Wetland Plant Ranking
<b>Salix nivalis</b>	dwarf snow willow		UPL
<b>Salix petrophila</b>	<b>tea-leaved willow</b>		<b>FACW</b>
<b>Salix polaris</b>	poldar willow		UPL
<b>Salix reticulata</b>	net-veined willow		FAC
<b>Salix stolonifera</b>	creeping willow		FACU
<b>Vaccinium caespitosum</b>	dward blueberry		FAC
<b>Vaccinium myrtillus</b>	velvet-leaved blueberry		UPL
<b>Vaccinium scoparium</b>	grouseberry		UPL
<b>Vaccinium vitis-idaea</b>	lingonberry		FAC
<b>Adapted from:</b> B.C. Ministry of Forests and Range and B.C. Ministry of Environment. 2023. Field Manual for Describing Terrestrial Ecosystems 2nd Edition. Land Manage. Handb. No. 25.			

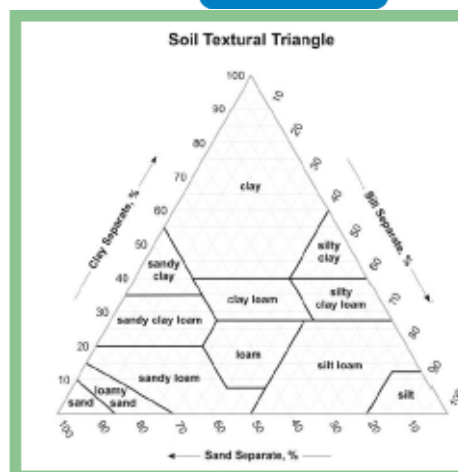
## Soil Classification

Soil develops very slowly, formed by environmental forces acting on mineral, rock, and organic compounds. Soils can be divided into two groups: organic soils and mineral soils. Organic soils are formed from sedimentation and are primarily organic matter. Mineral soils are formed from the weathering of rocks and are primarily inorganic material. To classify a mineral soil, use the Ribbon Test. To classify an organic soil, use the Von Post Scale Test.

### START Mineral Soils - Ribbon Test



Adapted from: Thien, Steve J.; Kansas State University, 1979 Jour. Agronomy Education.



### Definitions

**Mineral soil:** Soil with an organic content of less than 30%

**Organic soil:** Soil with an organic content of greater than 30%.

**Sand:** 0.06 – 2mm

**Silt:** 0.004 – 0.06 mm

**Clay:** <0.004 mm

**Loam:** Relatively equal parts sand, silt, and clay

### Hint

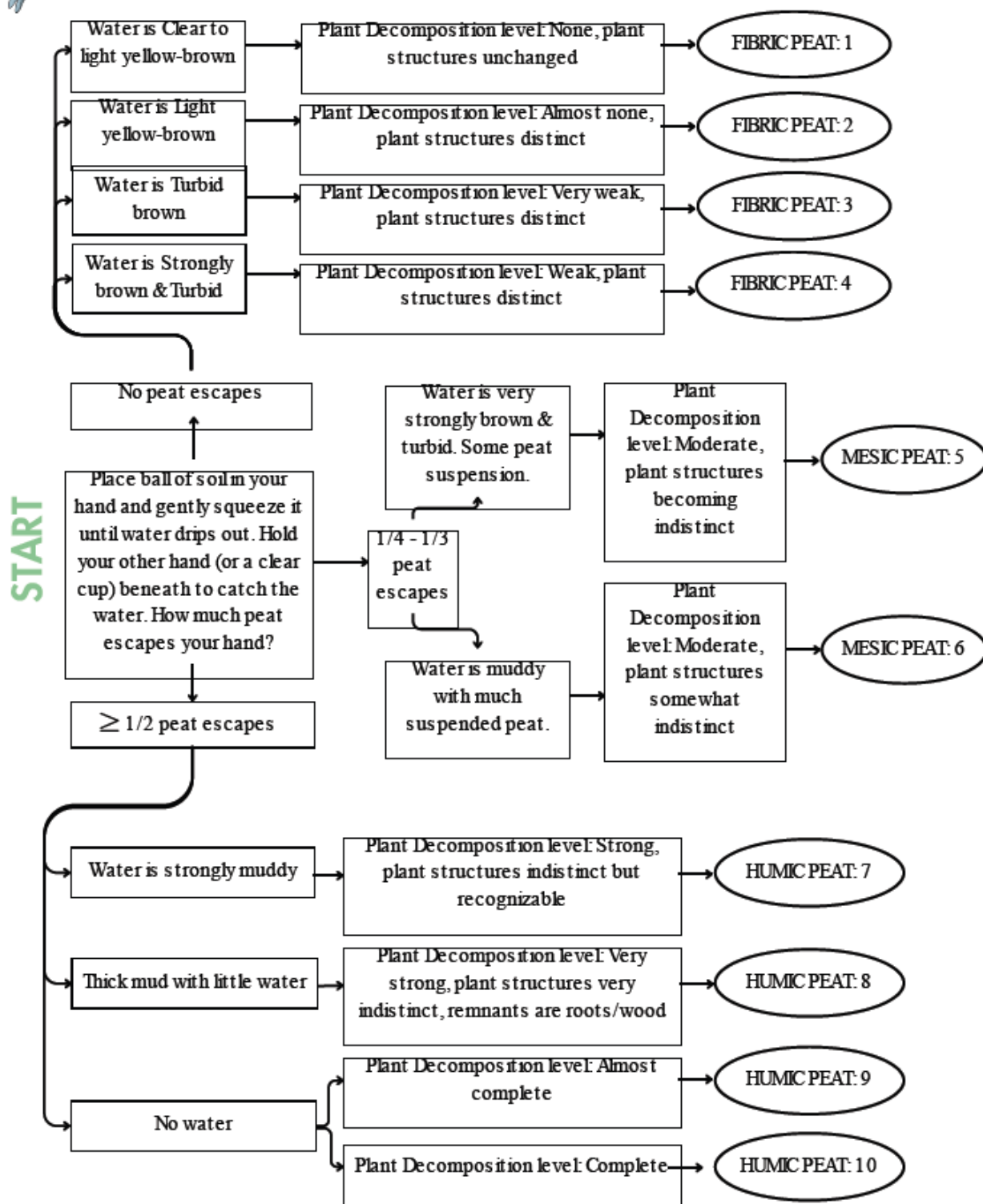
Clay tends to feel sticky, like a ball of sticky-tack/pottery.

Silt tends to feel soapy/floury.

Sand tends to feel gritty.



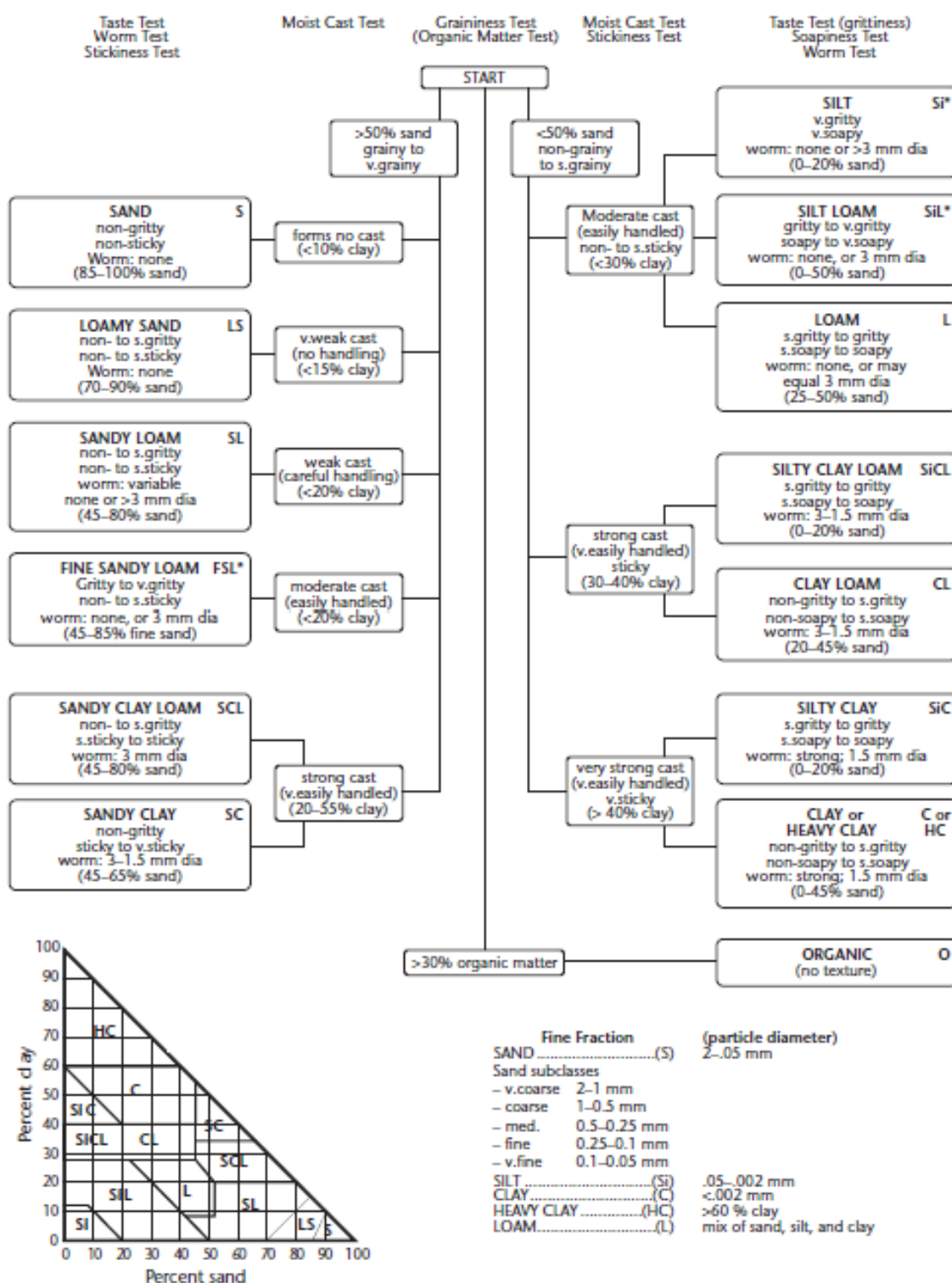
## Soil Classification Organic Soils - Von Post Scale







## Soil Texturing Key 1



From LMH25 (2023).



## Soil Texturing Key 2

