

Silviculture Prescription Data Collection Field Handbook

Interpretive Guide for Data
Collection, Site Stratification,
and Sensitivity Evaluation for
Silviculture Prescriptions

2000



BRITISH
COLUMBIA

Ministry of Forests
Research Program

APPENDIX 1 Silviculture prescription terminology

Anadromous – Fish that breed in fresh water, but live their adult life in the sea. On the Pacific Coast, anadromous fish include all the Pacific salmon, steelhead trout, some cutthroat trout and Dolly Varden char, lampreys, and eulachons.

Archaeological resource – Any locality that exhibits physical evidence of the past activities of a person or group of people for which the scientific methods of inquiry are the main source of information.

Aspect – Measures the orientation of a slope by means of compass points and indicates whether the slope is exposed to the north, south, east, or west, or any point between. Level ground has no aspect.

Blowdown (Windthrow) – Uprooting by the wind, as in tree or trees so uprooted.

Blue-listed specie(s) – Any indigenous species or subspecies (taxa) considered to be vulnerable in British Columbia. Vulnerable taxa are of special concern because of characteristics that make them particularly sensitive to human activities or natural events. Blue-listed taxa are at risk, but are not extirpated, endangered, or threatened.

Brushing – A silviculture activity conducted by manual, chemical, grazing, or mechanical means to control competing vegetation and to reduce competition for space, light, moisture, and nutrients with crop trees or seedlings. May also be useful in reducing mechanical damage, such as snow press, to crop trees.

Climax – In the context of ecosystems, characterizes a self-perpetuating community whose species composition is expected to be relatively stable and long term.

Coarse woody debris – Sound and rotting logs and stumps that provide habitat for plants, animals, and insects and a source of nutrients for soil development. Material generally greater than 7.5 cm in diameter.

Coast – The geographic area contained in the Vancouver Forest Region and the North Coast and Kalum forest districts within the Prince Rupert Forest Region.

Colluvial – Material produced by mass wasting or downhill movement and transported by agents other than running water. Colluvial materials include the debris of shattered bedrock, landslide deposits, and mudflows.

Community watershed – A watershed with a drainage area no greater than 500 km² that is licensed under the *Water Act* for community water use; or for domestic water use and the holder of the licence, the district manager, the designated environment official, and the Minister of Health all agree that the area should be regarded as a community watershed.

Competing vegetation – Vegetation that competes for the limited common resources (space, light, water, and nutrients) of a forest site, which are needed by future crop trees for survival and growth. It may also cause mechanical damage (similar to snow press) to crop trees.

Critical site conditions – The silviculture prescription must state any critical site conditions that affect the timing of operations, and describe how operations are affected. Only those site conditions directly related to a prescribed action, or limitations to an action, must be stated. Such conditions may be related to soil properties, drainage, periodic flooding, wildlife (e.g., nesting periods), recreational activities (e.g., hunting or fishing seasons), or any other site conditions critical to the success of the prescription.

Crop tree – A tree in a young stand or plantation selected to be carried through to maturity until an interim or final harvest.

Cultural heritage resource – An object or a site, or the location of a traditional societal practice that is of historical, cultural, or archaeological significance to the Province, a community, or an Aboriginal people.

Cutblock – A specific area, with defined boundaries, within which timber is authorized to be, or has been, harvested.

Ecosystem – A segment of the landscape that is relatively uniform in its composition and structure, and in the properties of its vegetation, animals, and physical environment, and in their interactions.

Ecosystem field guide – A Ministry of Forests Land Management Handbook available for each forest region that provides a guide to site identification and interpretation based on the Biogeoclimatic Ecosystem Classification (BEC) system developed by Dr. V.J. Krajina and adopted, modified, and expanded by the Ministry of Forests. Consult the *Silviculture Prescription Guidebook* for the appropriate field guide in your region.

Edaphic – Relating to, or determined by, conditions of the soil.

Environmental strata – Map strata that delineate differing environmental and ecological factors. The most common include physiographic factors

(e.g., aspect, slope, terrain, and landforms), biogeoclimatic (BEC) site series, and forest cover.

Eolian – Deposited by wind. Eolian materials (sands and silts) can occur anywhere, even in the alpine, but they are thickest and most extensive on terraces, fans, floodplains, and outwash surfaces.

Ephemeral stream – A stream that does not run year-round.

Field recommendations – Written descriptions of the potential techniques and treatments that can be used to accommodate other resource users and achieve a free-growing stand. Field recommendations are developed at the same time as field data are collected.

Fire hazard – The potential fire behaviour for a fuel type, regardless of its weather-influenced fuel moisture content or its resistance to fireguard construction. Fire hazard assessment is based on physical fuel characteristics (e.g., fuel arrangement, fuel load), condition of herbaceous or shrub vegetation, and presence of elevated fuels.

Fisheries-sensitive zones (see the *Timber Harvesting Practices Regulation*) – A flooded depression, pond, or swamp, that:

- either perennially or seasonally contains water, and
- is seasonally occupied by a species of fish listed in the definition of “fish stream” in the *Operational Planning Regulation*, see Riparian/Watershed Values section in front of ITEM 13, STREAMS, p. 80.
- but does not include a wetland or lake that has a riparian management area established under Part 8 of the *Operational Planning Regulation*, or a stream.

Fish stream – Any stream reach frequented by any of the following species: anadromous salmonids, rainbow trout, cutthroat trout, brown trout, bull trout, Dolly Varden char, lake trout, brook trout, Kokanee, largemouth bass, smallmouth bass, mountain whitefish, lake whitefish, arctic grayling, burbot, white sturgeon, black crappie, yellow perch, walleye, northern pike, or identified threatened, endangered, or regionally important fish determined under of the provisions in the *Operational Planning Regulation*.

All reaches of streams that have a slope gradient of less than 20% must be identified and mapped as fish streams, unless a fish inventory, carried out in accordance to the *Fish-stream Identification Guidebook*, demonstrates that none of the fish species listed above is present. (If further guidance is required, contact the local Ministry of Environment representative.) This 20% gradient rule for “default” fish-bearing status does not apply when the following three conditions occur:

- the stream is located upstream of a known barrier to fish passage, identified on a fish and fish habitat inventory map;
- all reaches upstream of the barrier are simultaneously dry at any time of the year; and
- no perennial fish habitats exist upstream of the barrier.

Floodplain – Level land bordering a stream or river and subject to flooding.

Fluvial – Produced by river or stream action. Fluvial materials consist of gravel, sand, or silt, and are generally well sorted when compared to most other surficial material.

Foliosols – Organic soils composed of upland organic materials, generally of forest origin, that are thicker than 40 cm, or are at least 10 cm thick if lying over bedrock or fragmental material.

Forest cover map – A map showing relatively homogeneous forest stands or cover types, produced from the interpretation of aerial photos and information collected in field surveys. Commonly includes information on species, age class, height class, site, and stocking level.

Forest development plan – An operational plan guided by the principles of integrated resource management (the consideration of timber and non-timber values), which details the logistics of timber development over a period of usually 5 years. Methods, schedules, and responsibilities for accessing, harvesting, renewing, and protecting the resource are set out to enable site-specific operations to proceed.

Forest health factors (agents) – Biotic and abiotic influences on the forest that are usually a naturally occurring component of forest ecosystems. Biotic influences include fungi, insects, plants, animals, bacteria, and nematodes. Abiotic influences include frost, snow, fire, wind, sun, drought, nutrients, and human-caused injury.

Forest Practices Code (FPC) – Includes the *Forest Practices Code of British Columbia Act*, Regulations, standards, and guidebooks that govern forest practices in British Columbia.

Glaciofluvial – Streams flowing from glaciers or the deposits made by such streams. Can be less sorted than fluvial deposits.

Glaciolacustrine – Produced by proglacial lakes during or shortly after deglaciation. Sediment is brought into the lakes by meltwater streams. Silt and fine sand are the most common materials, but coarser sand and gravel occur close to points of inflow.

Gradient (stream) – The general slope, or rate of vertical drop per unit of length, of a flowing stream.

Granitic rock – A coarse-grained igneous rock consisting of quartz, feldspar, and mica or other coloured minerals that cooled slowly below the earth's surface.

Guideline – A generally accepted practice developed to accommodate most common management situations.

Heritage areas – Sites of historical, architectural, archeological, paleontological, or scenic significance to the Province.

Higher-level plans – Refer to plans or portions of plans, agreements, or objectives as defined in the *Forest Practices Code of British Columbia Act* and declared by the Lieutenant-Governor-in-Council or the ministers as a higher-level plan. Higher-level plans establish the broader, strategic context for operational plans by providing objectives for managing a mix of forest resources for a given area.

Igneous rock – A rock that has solidified from molten or partly molten materials (magma). Includes granitic rocks that have cooled slowly below the surface (coarse grains), and basaltic rocks that have cooled quickly at the earth's surface (fine grains).

Incidence (of pests) – The proportion (0–1) or percentage (0–100%) of damage agent-affected sampling entities (normally a tree) within a sampling unit (normally a plot or stratum). To avoid confusion when using incidence, always indicate the sampling entity and sampling unit in order to ensure clarity.

Interior – The geographic area contained in the Cariboo, Prince George, Kamloops, and Nelson forest regions, as well as the Bulkley, Cassiar, Kispiox, Lakes, and Morice forest districts of the Prince Rupert Forest Region; the geographic area that is not the Coast.

Interpretive units – Map strata that delineate differing management strategies or site attributes. The most common of these include: Standards Units, treatment units, site sensitivity, slope categories, visual sensitivity, etc. These strata may be observable or may be an artificial delineation based on management implications (e.g., a 200 m reserve from a known source). Some interpretive units may come from other maps, plans, or documents and the exact location may be a matter of judgement.

Lacustrine – Produced by, or belonging to, lakes.

Landform – A landscape unit that denotes geologic parent material origin and shape (e.g., floodplain, river terrace, or till plain).

Landscape inventory – The identification, classification, and recording of the location and quality of visual resources and values.

Landscape sensitivity – A component of the landscape inventory that estimates the sensitivity of the landscape based on the visual prominence or importance of features, the conditions that affect visual perception, and social factors that contribute to viewer perceptions.

Limestone rock – A sedimentary rock consisting chiefly of calcium carbonate (CaCO_3), which fizzes when 10% hydrochloric acid is applied to it.

Logging – Forest harvesting activities including falling, yarding, and hauling (as well as road building).

Mappable unit – An area that can be stratified and identified on a map. This will vary with scale. For many regions, it is defined as one hectare at a scale of 1:15 000. When necessary, units of less than 1 ha can be mapped out at a scale of 1:5000. Where differing mappable units are not mapped separately, *the most limiting factors within the map strata are to be used when developing prescriptions.*

Mature layer – The layer of trees that have a stem diameter of 12.5 cm or greater, measured at a height of 1.3 m.

Metamorphic rock – Rocks that have formed in response to pronounced changes in the temperature, pressure, and chemical environment. Metamorphic rocks are produced by internal processes within the earth.

Microsite – A portion of a site that is uniform in microtopography and surface soil materials. It can range in size from less than 1 m² to occasionally over 5 m². Microsites change over time with climatic and management influences.

Morainal – Deposits originating from glacier ice. Laid down from the base, ends, sides, or melting surface of glacial ice sheets.

Mottles – Spots or blotches of different colour, or shades of colour, interspersed with the dominant colour of the soil matrix. Usually indicates a fluctuating water table.

Natural regeneration – The renewal of a forest stand by natural (e.g., seed on site, seed from adjacent stands, or seed deposited by wind, birds, or animals) rather than human means.

Noxious weed – Any weed(s) designated by the *Weed Control Regulation* and identified on a Regional District Noxious Weed Control list.

Opening – An area denuded of trees by means of harvesting, insects, disease, fire, wind, flooding, landslide, contravention of the *Forest Act* or *Forest Practices Code of British Columbia Act*, or any other similar means.

Parent material – The unaltered, or essentially unaltered, mineral or organic material from which the soil profile develops.

Perennial stream – A stream that has flowing water all year.

Pest – Any forest health agent designated as detrimental to effective resource management.

Physical features – An area, object, or condition that cannot be stratified (i.e., enclosed by a polygon) at the chosen map scale. The location of these is normally shown by using symbols (roads, fences, buildings, streams, cliffs, etc.). The symbols for most features are provided in the Ministry of Forests *Visual Identifier Standards Guidebook*.

Plant association – A community of plants. Examples of some common plant associations are: hemlock–amabilis fir–vaccinium; cedar–spruce–salmonberry; black spruce–sphagnum–Labrador tea. A plant association is generally comprised of at least the three most abundant species found growing on a site, with at least one representative from the tree layer and one or more representatives from either the shrub, herb, or bryophyte layers. Although plant associations are influenced by site series, any one site series may support numerous possible plant associations. Therefore, it is difficult to infer plant association from site series, or even site series from plant associations.

Plot – In the silviculture prescription context, a collection of data, normally within a single site series. On occasion, it may comprise two or more unmappable site series occurring within a compound stratum. The dimensions or radius of the plot will vary based on the parameter being described.

Pole layer – A layer of trees that have a stem diameter greater than or equal to 7.5 cm, but less than 12.5 cm, measured at a height of 1.3 m.

Reach – A length of a watercourse having similar channel morphology, channel dimension, and gradient.

Recreation feature – Biological, physical, cultural, or historic feature that has an ability to attract and sustain recreational use.

Recreation opportunity spectrum – A mix of outdoor settings based on remoteness, area size, and evidence of humans, which allows for a variety of recreation activities and experiences. The descriptions used to classify the settings are on a continuum and are described as rural, roaded resource, semi-primitive motorized, semi-primitive non-motorized, or primitive.

Red-listed specie(s) – Any indigenous species or subspecies (taxa) considered to be extirpated, endangered, or threatened in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reserved. Red-listed taxa include those that have been, or are being, evaluated for these designations.

Regeneration layer – The layer of trees that are less than 1.3 m in height.

Regime (treatment regime) – Regime of silviculture treatments that can reasonably be expected to produce the target stocking levels specified in the silviculture prescription by the end of the free growing assessment period specified in the silviculture prescription, as required by the *Silviculture Practices Regulation*.

Reserve – Forested patches or individual trees retained during harvesting, or other forestry operations, to provide habitat, scenic, biodiversity, regeneration, or other values. Reserves are intended to be retained for at least one rotation; in some cases, even longer.

Resident fish – Fish that remain in fresh water throughout their life cycle (i.e., non-anadromous).

Residual trees – The trees remaining after timber harvesting and any post-harvesting treatments.

Resource values – Products or commodities associated with forest lands that largely depend on ecological processes. These include, but are not limited to, water quality and quantity, forage, fish, wildlife, timber, recreation, energy, minerals, and cultural and heritage resources.

Rhizogenous – Originating in root or root-like material.

Riparian area – The land adjacent to the normal high water mark of a stream, river, or lake, extending to the portion of land that is influenced by the presence of the adjacent ponded or channelled water. Riparian areas typically exemplify a rich and diverse vegetative mosaic reflecting the influence of available surface water.

Riparian Reserve Zone (RRZ) – An area of specified width located adjacent to a stream, wetland, or lake within a Riparian Management Area, as determined by Part 8 of the *Operational Planning Regulation* (see “Note” below). Harvesting is not permitted except in special circumstances that require joint approval by the district manager and a designated BC Environment official.

Riparian Management Zone (RMZ) – An area of specified width located adjacent to any riparian reserve zone, or if there is no riparian reserve zone, located adjacent to a stream, wetland, or lake within a Riparian Management Area as determined by Part 8 of the *Operational Planning Regulation*. Constraints to forest practices apply.

Rotation – The planned number of years between the regeneration of a tree crop or stand and its final cutting at a specified stage of maturity.

Salvage harvesting – Logging operations specifically designed to recover damaged timber (dead or in poor condition), but still yield a wood product. Often carried out after fire, insect attack, or windthrow.

Sapling layer – The layer of trees that have a stem diameter of less than 7.5 cm measured at a height of 1.3 m. Previously referred to as advanced regeneration.

Sedimentary rock – Rock formed by the accumulation of sediment in water or from air. Sedimentary rocks are formed by processes that are active at the earth’s surface. A characteristic feature of sedimentary deposits is a layered structure known as bedding or stratification.

Selection harvesting – An uneven-aged silvicultural system in which trees are harvested individually or in small groups continuously at relatively short intervals.

Sensitive slopes – Any slope identified as prone to mass wasting.

Sensitive soils – Forest land areas that have a moderate to very high hazard for soil compaction, erosion, displacement, mass wasting or forest floor displacement.

Silviculture prescription (SP) – A documented process for collecting site-specific field data, and establishing site-specific management objectives and standards for producing a free-growing stand. A Silviculture Prescription is a legal requirement under Sections 22 and 23 of the *Forest Practices Code of British Columbia Act*. The content requirements are specified in the *Operational Planning Regulation*.

Silvicultural system – A planned program of treatments for the entire rotation of a stand, including harvesting, regeneration, and stand-tending.

Site preparation – Planned soil and ground vegetation disturbance through the use of machinery or prescribed fire (as much as necessary, but as little as possible) to prepare the soil surface as a favourable seedbed for either naturally or artificially disseminated seed or for planted seedlings.

Site sensitivity – An assessment of the inherent susceptibility of a site to reduced productivity by forest management activities.

Site series – A landscape position consisting of a unique combination of soil edaphic features, primarily soil nutrient and moisture regimes, within a biogeoclimatic subzone or variant. These two features define a site series that can produce various plant associations (see definition of “plant association”). In the BEC system, identified as a number (e.g., o2).

Site type – Soil texture, slope, aspect, parent material and slope gradient may also be highly variable within the range of ecosystems representing a single site series. To accommodate more site-specific interpretations (and communication of experience within a local operating area), the site series can be partitioned into site types based on one or more specific soil factors and/or physiographic features.

Slash – The tree residue left on the ground as a result of trees or other vegetation being altered by forest practices or other land-use activities. Slash includes logs, splinters or chips, tree branches and tops, uprooted stumps, and broken or uprooted trees or shrubs.

Slide – A mass movement process in which slope failure occurs along one or more slip surfaces and in which the unit generally disintegrates into a jumbled mass en route to its depositional site. A debris flow or torrent flow may occur if enough water is present in the mass.

Slump – A mass movement process in which slope failure usually occurs on a curved slip surface and the unit moves downslope as an intact block, frequently rotating outward at the bottom. Slumps appear as discrete block movements, often in place, whereas slides usually break up and travel downslope.

Soil association – A sequence of soils of about the same age, derived from similar parent materials, and occurring under similar climatic conditions, but having different characteristics due to variation in relief and drainage.

Soil check pit – An excavation through the forest floor and into the mineral soil, that is only of sufficient depth to determine that the texture in the top

30 cm, apparent soil development, and parent material are similar enough to the last sampled “full” soil pit within a stratum, to justify that another plot is not required.

Soil hazard assessment – An assessment of the susceptibility of a soil to adverse impacts on its productive capability due to soil compaction, soil puddling, surface erosion, mineral soil displacement, mass wasting, or forest floor displacement.

Soil pit – An excavation into the mineral soil that is of sufficient depth to allow a soil hazard assessment and to characterize the variability in soil physical properties within a defined area of land.

Spacing – The removal of undesirable trees within a young stand to control stocking, to maintain or improve growth or health, to increase wood quality and value, or to achieve other resource management objectives including species diversity.

Stand – An even- or uneven-aged community of trees sufficiently uniform in species composition, arrangement, and condition to be distinguishable as a group from the forest or other growth on the adjoining area, and thus forming a silviculture or management entity.

Stand structure – The distribution of trees in a stand, which can be described by species, vertical or horizontal spatial patterns, size of trees or tree parts, age, or a combination of these.

Standards Unit (SU) – An area that will be managed through the uniform application of silvicultural system, stocking standards, and soil conservation standards. These standards will be used to determine if regeneration, free-growing, and soil conservation obligations are met. Standards Units are normally used to develop strata within an SP and are mappable.

Stocking – A measure of the area occupied by trees, usually measured in terms of well-spaced trees per hectare, or basal area per hectare, relative to an optimum or desired level.

Stocking standard – The required range, in species composition, density, and heights, of healthy, well-spaced, preferred, and acceptable trees.

Stratum (singular) (plural: strata) – A general term applied to an area that is a logical expression of relatively uniform environmental, and interpretive characteristics. Examples include SUs or BEC site series of 1 ha and larger. By definition they are different and therefore are based on separate sets of field data.

Stream – Any reach, flowing on a perennial or seasonal basis, with a continuous channel bed (whether or not the bed or banks of the reach are locally obscured by overhanging or bridging vegetation or soil mats) that is either scoured by water or contains observable deposits of mineral alluvium.

Stream bank – The rising ground bordering a stream channel.

Streambed – The bottom of the stream below the usual water surface.

Stream channel width – The horizontal distance between the tops of the stream banks as determined by the normal high water mark on opposite sides of the stream, measured at right angles to the general orientation of the banks.

Stream gradient – The general slope, or rate of vertical drop per unit of length, of a flowing stream.

Surveyor – In the context of this handbook, the person conducting the examination and comprehensive collection of on-site data for a silviculture prescription.

Tenure holder – An individual, group, or company that holds a licence agreement, as defined in Section 10 of the *Forest Act*, or Section 3 of the *Range Act*.

Terrain stability assessment – An assessment or characterization of unstable, or potentially unstable, slopes on forested lands. A determination of the relative potential of landslide initiation and the type of landslide that may occur on different types of terrain, based on the data obtained from the review of available maps, photos, site data, and field observations.

Texture – In soil, texture refers to the relative proportions of sand, silt, and clay particles less than 2 mm in size.

Threatened / endangered species – Species identified as “red listed” by the B.C. Ministry of Environment, Lands and Parks. Indigenous species that are either threatened or endangered.

Tolerance – The allowable variation in the accuracy of the data or description that will be used for audit or review purposes. Tolerances are used in situations where a distinction is necessary between natural variability and error. Tolerances may be applied by the surveyor who wishes to indicate specific criteria under which the information can be interpreted to be either correct or incorrect. Specifications of tolerances are generally not

mandatory, except where specifically required under the Forest Practices Code, and are left to the discretion of the surveyor.

Traditional use site – Any geographically defined site that has been traditionally used by one or more groups of people for certain types of activities. These sites often lack the physical evidence of human-made artifacts or structure, but will maintain cultural significance to a living community of people. Traditional use sites are usually documented with the assistance of oral, historical, and archival sources. Examples include: sacred sites, resource-gathering sites such as berry grounds, and sites of legendary or past events of cultural significance.

Treatment unit (TU) – An area within a cutblock that is managed through uniform application of harvesting techniques or silviculture treatments, or both. Stratification for treatment units commonly occurs after regeneration surveys have identified areas that require specific treatments. Treatment units are normally used to develop treatment plans or contracts and are not generally used to develop SPs.

Understorey – Any plants growing under the canopy formed by another layer of plants; in particular, herbaceous, bryophyte, shrub, and grass vegetation under a tree canopy.

Upland areas – Terrain not affected by water table or surface water, or else affected only for short periods so that riparian (hydrophilic) vegetation or aquatic processes do not persist.

Veterans (Vets) – The layer of trees with less than 6% crown closure that are more than 40 years older than the mature layer. Veterans are usually isolated in distribution and may extend well above the main tree canopy.

Visual quality objectives (VQOs) – Objectives or targets for managing visual values (i.e., “what we see”) that represent a spectrum of allowable visual change ranging from no change due to forest management activities to maximum allowable change. Visual change or visual impact is measured against the natural-appearing landscape. VQOs are also an indication of the amount of visual impact that is publicly acceptable. They may evolve over time because of changing access, changing levels of public viewing, creation of new viewpoints, changes in vegetation screening, and changes in public concerns and social attitudes.

Volcanic rock – Rock resulting from volcanic activity (e.g., lava, volcanic glass, pumice, and certain pyroclastic rocks).

Watercourse – A natural stream or source or supply of water, whether usually containing water or not, such as a lake, river, creek, spring, ravine, swamp, or gully.

Wetland complex – A wetland complex consists of two or more individual wetlands with overlapping riparian management areas and a combined wetland area of 5 ha or more. Two wetlands have overlapping riparian management areas if they are:

- separated by 60 m or less and both are <5 ha, or
- separated by 80 m or less if one is <5 ha and the other is >5 ha, or
- separated by 100 m or less if both are >5 ha.

The individual wetlands of a wetland complex should be sufficiently large that they would otherwise be classed as W₁, W₂, W₃, or W₄. Wetland complexes have a riparian class of W₅.

Zoogenous – Originating in or produced by animals.

APPENDIX 2 Silviculture Prescription Plot Card (FS39A)



SILVICULTURE PRESCRIPTION PLOT CARD

NUMBERS REFER TO LAND MANAGEMENT HANDBOOK 47

REF.	1. LICENCE NO.		2. LICENSEE			3. C.P.		4. BLOCK		5. STRATUM		6. PLOT NO.									
	7. SURVEYOR(S) (PRINT)						YYYY - MM - DD		8. LOCATION												
SITE	9. ELEVATION (m)		10. ASPECT		11. SLOPE %		12. BGC ZONE		SUB.		VAR.		PH.		SITE SERIES		13. MOIST.		14. NUT.		
	15. SLOPE POSITION <input type="checkbox"/> crest <input type="checkbox"/> middle <input type="checkbox"/> toe <input type="checkbox"/> level <input type="checkbox"/> upper <input type="checkbox"/> lower <input type="checkbox"/> depression				16. SURFACE SHAPE <input type="checkbox"/> convex <input type="checkbox"/> straight <input type="checkbox"/> concave <input type="checkbox"/> hummocky				17. SLOPE LEN. / UNIF. <input type="checkbox"/> short <input type="checkbox"/> broken <input type="checkbox"/> long <input type="checkbox"/> uniform				18. SLOPE CONT. <input type="checkbox"/> discontinuous <input type="checkbox"/> continuous				19. GULLIES/100m <input type="checkbox"/> 0 <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> >2				
UNDERSTOREY	20. UNDERSTOREY (INDICATOR / ABUNDANT SPECIES) (Area 20 m x 20 m ² or ___ x ___ m)																				
	LAYER		% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C	SPECIES	% C
	SHRUB																				
	HERB																				
	MOSS																				
	LAYER		SPECIES	% C	SPECIES	% C	SPECIES	% C	21. COARSE WOODY DEBRIS (Note type, features, size, etc. found in the plot)												
	SHRUB																				
	HERB																				
	MOSS																				
	22. COMPETING VEGETATION / NOXIOUS WEEDS																				
SPECIES								23. COMMENTS (Expected problem vegetation, potential encroachment from adjacent areas)													
PRESENT HEIGHT (cm)																					
EXPECTED HEIGHT (cm)																					
PRESENT % COVER																					
EXPECTED % COVER																					
OVERSTOREY	24. OVERSTOREY																				
	LAYER		SPECIES % (Stems/ha)		AGE	HEIGHT	DBH	STEMS/ha	25. LAYER CONDITION / % ACCEPTABLE / COMMENTS												
	VETS				+ 40 over Mature																
	MATURE (M) 12.5 cm +																				
	POLES (P) 7.5 -12.5 cm																				
	SAPLING (S) 1.3 m-7.5 cm																				
	REGEN. (R) < 1.3 m																				
	26. SAMPLE TREE DATA (mature layer)																				
	SPECIES																				
	TOTAL AGE																				
HEIGHT																					
dbh																					
CRN. CLASS																					
% LIVE CR.																					
10-YR. GR.																					

Plot Card (FS 39A-2)

SOILS		SOILS																	
		27. FOREST FLOOR DEPTH (cm)		28. HUMUS FORM		SOIL HORIZONS (pit depth _____ cm)													
SOILS		$\frac{\quad}{L} + \frac{\quad}{F} + \frac{\quad}{H} = \frac{\quad}{TOTAL}$				29. HORIZON	30. DEPTH (cm)	31. TEXTURE	32. PLASTICITY	33. C. FRAGMENTS %	34. COL./MOIST.								
		35. ROOTING DEPTH (cm)		36. DRAINAGE															
		37. SEASONAL SOIL FACTORS (dates: dry, wet, frozen, snow)																	
SOILS		38. UNFAVOURABLE SUBSTRATES																	
		SEEPAGE (MOTTLES / GLEYING) ...		Y / N		Depth it begins _____ cm		SPECIFY RESTRICT LAYER TYPE (compact or dense material, bedrock, permanent, seasonal)											
		CARBONATES				_____ cm													
		WATER-RESTRICT LAYER				_____ cm													
Bt or DENSE PARENT MATERIAL				_____ cm															
SANDS / GRAVELS				_____ cm															
FRAGMENTAL (> 70% CF)				_____ cm															
ROOT-RESTRICT LAYER				_____ cm															
SOILS		OPTIONAL SOILS INFORMATION																	
		39. LANDFORM / PARENT MATERIAL							40. SOIL CLASSIFICATION / ASSOCIATION										
		41. SURFACE ORGANIC MATTER / SOIL CHARACTERISTICS									42. C.F. BEDROCK / LITHOLOGY								
COMP.		43. SOIL HAZARD ASSESSMENT (circle and rate)																	
		13. MOISTURE (27. FOREST FLOOR)		XERIC TO MESIC OR SUBHYGRIC & H HORIZON < 20 cm										SUBHYGRIC & H HOR. > 20 cm OR HYGRIC TO HYDRIC					
		33. COARSE FRAGMENTS		0 - 70%										> 70%	0 - 70%	> 70%			
		31. TEXTURE (0 - 30 cm)		Clayey ¹	Si, SIL, Loam	SL, f SL ²	LS, S	all		all		all							
RATING		VH	H	M	L	L	VH	M											
SOIL DISPLACEMENT		11. SLOPE %		0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
		POINTS		0	1	1	2	3	3	4	5	6	8	10	12	16	20	26	32
		PLUS FOR GULLIED TERRAIN ONLY. ADD: (2 or more > 2 m deep / 100 m)		SLOPE GRADIENT										16. PLUS, FOR HUMMOCKY TERRAIN. ADD: (broken terrain, small steep knolls)					
		POINTS		N/A	< 30% slope	30 - 45%	> 45%	N/A	0		2								
SOIL EROSION		38. UNFAVOURABLE SUBSTRATE depth (cm)		< 30		30 - 60		61 - 90		> 90									
		Hardpan; dense parent material; clean S / gravel; fragmental; carbonates; seepage; bedrock points		12		8		4		0									
		Point Total RATING		< 7 points LOW		7 - 14 points MODERATE		15 - 24 points HIGH		> 24 points VERY HIGH									
		ORGANIC SOIL COMPOSED OF ≥ 40 cm WET ORGANIC MATERIAL								HIGH									
		FOREST FLOORS OVER BEDROCK OR SKELETAL MATERIALS (e.g., Follisols)								VERY HIGH									
SOIL EROSION		PRECIPITATION FACTOR points		Low	2	Moderate	4	High	6	Very high	8								
		11. SLOPE % points		0 - 10	1	11 - 20	3	21 - 50	6	> 50	9								
		17. LENGTH / UNIFORMITY points		short broken	1	short uniform	2	long broken	3	long uniform	4								
		38. WATER-RESTRICTING LAYER points		> 90 cm	1	61 - 90 cm	2	30 - 60 cm	3	< 30 cm	4								
		31. TEXTURE (0 - 15 cm) points		SC, C, SIC	1	SiCL, CL, SCL	2	SL, L	4	Si, SIL, fSL, LS, S	8								
		33. % COARSE FRAG. (0 - 15 cm) points		> 60	1	31 - 60	2	16 - 30	3	< 16	4								
		31. SUBSOIL TEXTURE (16-60 cm) points		S, LS, SL, fSL	1	L, SIL, Si	2	CL, SCL, SiCL	3	C, SC, SiC	4								
Point Total RATING		< 16 points LOW		16 - 22 points MODERATE		23 - 31 points HIGH		> 31 points VERY HIGH											

FS 39A-2 HRE 00/11 1 All textures with Clay in the name (i.e., SC, SiCL, SCL, CL, SiC, C).
 2 f SL = fine sandy Loam, like SIL but slightly coarser.

APPENDIX 3 Silviculture Prescription Stratum Card (FS39B)



NUMBERS
REFER TO
LMH 47

SILVICULTURE PRESCRIPTION STRATUM CARD

REF.	1. LICENCE NO.		2. LICENSEE		3. C.P.	4. BLOCK	5. STRATUM AREA (ha)		6. STRATUM			
	7. SURVEYOR(S) (PRINT)						YYYY - MM - DD		8. PLOT NUMBERS IN STRATUM			
SITE	9. BGC ZONE				SUB.	VAR.	PH.	10. ELEVATION (m)			11. SLOPE %	
								min.	max.	min.	max.	avg.
12. CRITERIA-DEFINING STRATUM (e.g., BEC site series, forest health factor, soil sensitivity, etc.) DESCRIBE COMPLEX STRATUM IN SUFFICIENT DETAIL TO PERMIT INDIVIDUAL UNITS TO BE IDENTIFIED.												
RIPARIAN / WATERSHED VALUES	13. STREAMS (<input type="checkbox"/> already assessed, <input type="checkbox"/> N/A) — an alluvial sediment bed between definable banks											
	NAME / IDENTIFICATION			REACH (Average)			FISH STREAM Y / N / ?	STREAM CLASS (S?)	RRZ WIDTH (m)	RMZ WIDTH (m)		
				Length (m)	Width ¹ (m)	Gradient %						
	14. OTHER WATER BODIES (<input type="checkbox"/> not applicable) NUMBER AND TYPE OF WATER BODY											
	<input type="checkbox"/> LAKE <input type="checkbox"/> WETLAND <input type="checkbox"/> SPRING / SEEP <input type="checkbox"/> OFF-CHANNEL / INTERMITTENT <input type="checkbox"/> OTHER											
	COMMENTS FOR ITEMS 13 AND 14. Describe any water body and determine an appropriate riparian reserve and management zone, if applicable. INCLUDE ANY SPECIAL MANAGEMENT CONSIDERATIONS. For streams, describe bank and streambed materials / characteristics (bank height, shallow, steep, deep, eroding, stable, windthrow, etc.). Describe any distinct riparian vegetation by structure, species, etc.											
15. GULLIES ² (<input type="checkbox"/> not applicable <input type="checkbox"/> already assessed)												
COAST (gullies > 3 m deep, > 100 m long, > 50% sidewall)						INTERIOR (optional)						
GULLY NO.	CHANNEL					ANY RECENT/ OLD DEBRIS TORRENT?	GULLY WALL					
	% Gradient	Width (m)	Depth (m)	Length (m)	Surficial Materials		% Slope	Height (m)				
16. WATERSHED VALUES (Domestic use? <input type="checkbox"/> Yes <input type="checkbox"/> No)												
MIGHT HARVESTING / ROAD-BUILDING ACTIVITIES IMPAIR WATER QUALITY OR CAUSE SEDIMENT DELIVERY IN, OR DOWNSTREAM FROM, THE STRATUM?												

FS 39B-1 HRE 00/11 1 Horizontal distance between bank tops as determined by the normal high water mark.
 2 Gully systems >5 m deep should be typed out and assessed separately for soil disturbance hazard assessment during data collection in the Interior. On the Coast, gullies are subject to a separate gully assessment procedure.

17. RESERVES (<input type="checkbox"/> not applicable)		
DISCUSS ANY PLANNED RESERVES (riparian, lakeshore, wildlife, single tree, patch, etc.) IF WITHIN OR ADJOINING STRATUM		
18. SOIL HAZARD / INSTABILITY SUMMARY ³		19. FIRE HAZARD ABATEMENT
	POINTS	RATING
COMPACTION		
SOIL DISPLACEMENT		
SURFACE EROSION		
FOREST FLOOR DISPLACEMENT		
MASS WASTING (Interior)		
ANY SLOPE INSTABILITY INDICATORS PRESENT? <input type="checkbox"/> YES <input type="checkbox"/> NO <i>(Refer to FS 39A Plot cards)</i>		WILL SLASH REDUCTION BE A CONSIDERATION? <input type="checkbox"/> YES <input type="checkbox"/> NO PREDICT SLASH LOADING AFTER HARVEST.
Consult Slope Instability Specialist if any slope instability indicators were identified <u>or</u> slope is > 60% and no terrain mapping has been done <u>or</u> in the Interior if Mass Wasting Hazard is VERY HIGH.		20. WINDTHROW HAZARD
		ANY WINDTHROW EVIDENCE? <input type="checkbox"/> YES <input type="checkbox"/> NO NOTE ANY TREE, STAND, SOIL, OR TOPOGRAPHIC FACTORS THAT MAY BE AFFECTED BY STORMS <i>(refer to FS 39D)</i>
21. SILVICULTURAL SYSTEMS / MANAGEMENT OBJECTIVES		
WITH REFERENCE TO INFORMATION COLLECTED ON-SITE, ESPECIALLY SITE-LIMITING FACTORS AND OPERATIONAL CONSTRAINTS, DISCUSS MANAGEMENT OBJECTIVES FOR THE STRATUM, ALONG WITH DETAILS OF THE CHOSEN SILVICULTURAL SYSTEM, INCLUDING: <ul style="list-style-type: none"> • leave trees, • estimated rotation age • stand structure and composition • size of openings for group selection, • cutting cycle, • residual BA, etc. 		
22. HARVESTING		
INDICATE MOST APPROPRIATE METHOD SUITED TO THE SELECTED TREE SPECIES AND STAND STRUCTURE GOALS, CONSIDERING ALL THE RESOURCE VALUES IDENTIFIED.		
OPERATIONAL CONSTRAINTS (weather, site, seasonal, soil conditions, resource values)		
ANY PROPOSED ROUTE(S) LAYOUT CONCERNS (benches, wetlands, etc.)		

FS 39B-2 HRE 00/11 3 Where the rating varies (i.e., between plots within the stratum), record the range of ratings obtained.

23. FOREST HEALTH FACTOR INCIDENCE (for agents present at the time of this survey)						
FOREST HEALTH	AGENT NAME	TREE SPECIES AFFECTED	% INCIDENCE			MAGNITUDE OF RISK (L, M, H, VH)
			OF HOST TREES	AND OF TOTAL TREES	OR AREA (ha)	
COMMENTS / SPECIAL CONSIDERATIONS (e.g., clarify distribution in or adjacent to stratum, occurrence as continuous or intermittent, tree layer affected, number of dead trees; describe impact to the host, expected future hazard or susceptibility)						
24. LIMITING FACTORS						
IDENTIFY POSSIBLE FACTORS THAT WILL LIMIT CROP TREE ESTABLISHMENT, SURVIVAL, AND GROWTH						
SOILS		HEALTH		CLIMATIC		
<input type="checkbox"/> cold soils	<input type="checkbox"/> pests	<input type="checkbox"/> air temperature extremes	<input type="checkbox"/> growing-season length			
<input type="checkbox"/> shallow soils	<input type="checkbox"/> root disease	<input type="checkbox"/> summer frost	<input type="checkbox"/> moisture deficit / drought			
<input type="checkbox"/> deep organic layer	<input type="checkbox"/> wildlife damage	<input type="checkbox"/> frost heaving	OTHER			
<input type="checkbox"/> high % coarse fragments	<input type="checkbox"/> livestock damage	<input type="checkbox"/> snow press / damage	<input type="checkbox"/> vegetation (light)			
<input type="checkbox"/> wet soils	_____	<input type="checkbox"/> cold-air ponding	<input type="checkbox"/> veg. (moisture / nutrient)			
<input type="checkbox"/> nutrient-deficient soils	_____	<input type="checkbox"/> winter desiccation	<input type="checkbox"/> heavy slash			
<input type="checkbox"/> _____	_____	<input type="checkbox"/> wind	<input type="checkbox"/> _____			
EXPLAIN AND COMMENT						
25. TREE ESTABLISHMENT						
<input type="checkbox"/> NATURAL		<input type="checkbox"/> PLANT		<input type="checkbox"/> COMBINATION		
ACCEPTABILITY CRITERIA FOR SAPLINGS:			SAPLINGS COUNTABLE? <input type="checkbox"/> YES <input type="checkbox"/> NO			
IF PLANTING, INDICATE MOST SUITABLE STOCK TYPE(S) AND SPECIES, ALONG WITH ACCEPTABLE MICROSITE CRITERIA AND SEASON.						
IF NATURAL, INDICATE FACTORS (e.g., cones, seed trees, saplings, seedbed) THAT MAKE IT A VIABLE METHOD.						
26. SITE PREPARATION						
IS IT NECESSARY TO AMELIORATE SITE-LIMITING FACTORS THAT CANNOT BE OVERCOME BY STOCKTYPE OR SPECIES CHOICE? <input type="checkbox"/> YES <input type="checkbox"/> NO						
INDICATE LIMITING FACTOR AND METHOD(S) TO AMELIORATE, WITH CONSIDERATION FOR ANY NECESSARY SITE, SOIL, AND SEASONAL CONDITIONS.						
FOR PHOTOCOPIY PURPOSES:	LICENCE NO.	CP	BLOCK	STRATUM		

Stratum Card (FS 39B-4)

STAND TENDING	27. VEGETATION COMPETITION (BRUSHING)	
	ANTICIPATED? <input type="checkbox"/> YES <input type="checkbox"/> NO <i>(Refer to competing vegetation/noxious weeds identified on FS 39A Plot Card)</i>	TIMING
CONSTRAINTS / METHOD(S)		
RESOURCE	28. SPACING / PRUNING / FERTILIZATION	
	SPACING ANTICIPATED? <input type="checkbox"/> YES <input type="checkbox"/> NO	PRUNING ANTICIPATED? <input type="checkbox"/> YES <input type="checkbox"/> NO
CONSTRAINTS / METHOD(S)		
RESOURCE VALUES / CONCERNS		
For each Section below, consider values in and adjacent to Stratum.		
29. PLANT DIVERSITY		
EXISTING VALUES (e.g., standing deadwood, large living trees, species diversity, structural diversity, wildlife trees, CWD, surface organic matter)		
30. FAUNAL DIVERSITY		
EXISTING WILDLIFE AND HABITAT (name(s) of identified species, trails, droppings, tracks, browsing, etc.)		
31. FIRST NATIONS / TRADITIONAL USE / CULTURAL HERITAGE		
WAS NEW ON-SITE EVIDENCE FOUND? <input type="checkbox"/> YES <input type="checkbox"/> NO	IF YES, PROVIDE DETAILS	
32. LANDSCAPE / RECREATION		
ANY FEATURES / CONCERNS NOT PREVIOUSLY IDENTIFIED IN HIGHER-LEVEL PLANS		
33. OTHER		
EVIDENCE OF WATER IMPROVEMENTS, TRAPPERS, INTEREST GROUPS, GUIDE / OUTFITTERS, NEARBY RESORTS, LANDOWNERS, MINING CLAIM, BOTANICAL FOREST PRODUCTS, HISTORICAL SITES OR TRAILS		
34. RANGE (<input type="checkbox"/> not applicable)		
EXISTING RANGE VALUES (barriers, structures, range improvements, noxious weeds, evidence of use by livestock, grazing intensity, etc.)		
GRASS SEEDING ACCEPTABLE? <input type="checkbox"/> YES <input type="checkbox"/> NO	WHERE (landings, whole cutblock)?	

FS 39B-4 HRE 00/11

APPENDIX 4 Precipitation factors for biogeoclimatic subzones by forest region

Forest Region	Precipitation Factor			
	Low	Moderate	High	Very high
Cariboo	All BG, PPxh, IDFXm, IDFXw, IDFDk, MSxk, SBSdw, SBSmc*, SBPSxc, SBPSdc, ESSFvx	IDFmw, MSxc, SBSmh, SBSmc*, SBSmw, SBSwk, SBPSmc, SBPSmk, ESSFwk*, ICHdk, ICHmk, ICHwk*	ESSFwc, ESSFwk*, ICHwk*	
Kamloops	All BG, PPxh, IDFxh, IDFXw, IDFDk, IDFDm, MSxk, SBSdh, SBSdw, SBPSmk, ESSFxc	IDFmw, IDFww, MSdc, MSdm, MSmm, SBSmm, ESSFdV, ESSFdc, ICHmk, ICHmw	ESSFwc, ESSFmw, ICHwk, CWHds, CWHms	ESSFvc, ESSFvv, ICHvk
Nelson	PPdh1, PPdh2, IDFm1, IDFDm2, IDFun, IDFxh1	MSdk, MSdm1, ESSFdc1, ESSFdk, ICHdw, ICHmk1, ICHmw1, ICHmw2, ICHmw3, ICHxw	ESSFwc1, ESSFwc2, ESSFwc4, ESSFwm, ICHwk1	ESSFvc, ICHvk1
Prince George	SBSdh, SBSdk, SBSdw, SBSmk1, SBSmc*, BWBSdk, BWBSmw2, BWBSwc3	SBSmh, SBSwk, SBSmw, SBSmk2, SBSmc*, BWBSmw1, BWBSwc1, BWBSwc2, ESSFmm, ESSFmv, ESSFwk*, All SWB, ICHmc, ICHmm, ICHwk*	SBSvk, ESSFwc, ESSFwk*, ICHvk, ICHwk*	ESSFvc
Prince Rupert	SBSdk, SBSmc*, SBPSmc, BWBSdk2, BWBSmw2	SBSmc*, ESSFmc, ESSFmk, all SWB, ICHmc	ESSFwv, ICHvc	CWHws1, CWHws2, MHm
Vancouver	All CDF	IDFww	CWHxm, CWHds1, CWHms1, CWHwh1, ESSFmw	CWHdm, CWHds2, MHmm1, CWHvh1, CWHvh2, CWHvm1, CWHvm2, MHmm2

* These subzones/variants encompass two precipitation factor ranges. Use local experience when deciding on the appropriate precipitation factor to apply.

APPENDIX 5 Forest floor displacement hazard key

Forest floor displacement is the mechanical movement of the upper organic materials by equipment and movement of logs. It involves excavation, scalping, mineral soil exposure, and burial of the forest floor.

Effects range from beneficial to detrimental, depending on site factors (e.g., mineral soil characteristics) and degree of forest floor displacement (e.g., how far the displaced forest floor is from the seedlings).

Two aspects of forest floor displacement can produce soil degradation:

- redistribution and loss of nutrients
- exposure of unfavorable rooting medium.

Site factors determining hazards:

- forest floor
 - type
 - depth
- soil texture
- coarse fragment per cent
- slope gradient
- slope complexity
- soil depth to:
 - unfavorable subsoil
 - bedrock
 - seepage
 - carbonates.

Management considerations:

- harvesting system
- silviculture system
- site preparation
 - type
 - pattern
 - prime mover
 - implement
- operating gradient
- depth of scalping
- operator experience, instructions
- seasonal soil moisture content
- ground freezing
- compressibility/depth of snow.

Forest floor displacement hazard key definitions

Close gully spacing – 2 or more >2 m deep, sharp-edged gullies occur per 100 m along the contour. Gentler, rounder gullies are not a concern, since extra excavation would not be involved in crossing such gullies with a bladed structure.

Hummocky terrain – broken terrain with small, but steep-sided knolls or ridges, (e.g., eskers, rocky knobs and drumlins).

Unfavorable subsoils – includes subsoil conditions that produce unfavorable growing conditions when exposed by displacement. Unfavorable subsoils include:

- dense parent materials – compact glacial till, silt, or clay-textured glaciolacustrine, or other soil parent materials that cannot be readily dug into with a shovel (i.e., a pick or pulaski is required to loosen before digging).
- dense, clayey Bt horizons – clay-enriched subsoils of Luvisols >5 cm thick and with clayey textures that cannot be readily dug with a shovel.
- sandy materials with sand or loamy sand texture – granular materials with a low content of silt and clay, and low water-holding and nutrient-storing capacity.
- fragmental materials – subsoils comprised of >70% coarse fragments (i.e., fragments >2 mm diameter).

Carbonate – a soil layer containing appreciable calcium carbonate (lime) in which the soil particles <2 mm in diameter effervesce (fizz) when contacted with 10% HCl (muriatic acid). These calcareous soils may have white coatings on coarse fragments; they may have powdery white deposits in the soil.

Seepage – consider seepage only for subhygric, hygric, and subhydric sites, as indicated by vegetation (site series). For these sites, estimate typical depth of seepage by direct observation of seepage or water table (make allowances for recent weather and spring break-up); or by inference, using soil colors, either mottling or gleying.

Forest floor displacement hazard key^a

Forest floor

LFH ^b	<6	6–10	11–20	>20	<5	5–10	>10	<10	<10	all
Ah	<1	<1	<1	<1	1–2	1–2	1–2	3–5	6–10	>10
Points	12	8	6	4	9	6	4	4	2	0

Soil matrix (top 30 cm) ^c		S, LS, SL	fSL, Si	SiL, Loam	all Clayey
Coarse	<30%	4 (coarse)	2 (med)	2 (med)	8 (fine)
fragments	30–70%	8 (v. coarse)	4 (coarse)	2 (med)	2 (med)
Points	>70%	8 (v. coarse)	8 (v. coarse)	4 (coarse)	2 (med)

Depth to unfavorable subsoil, bedrock, seepage, or carbonates		<15 cm	15–30 cm	30–60 cm	>60 cm
Points		12	8	2	0

Slope ^d		>60 %, gullied, or hummocky terrain	30–60%	<30%
Points		6	3	0

Ratings	Low	Moderate	High	Very high
Point total	<9	9–14	15–25	>25

- a The forest floor displacement hazard rating is determined from the total of points added up for: forest floor LFH depth/Ah depth; soil “matrix” (texture/coarse fragments); depth to unfavorable subsoil, bedrock, seepage, or carbonates; and slope/hummocky terrain.
- b Not including rotten wood. The three boxes generally correspond to Mor, Moder, and Mull humus forms, respectively.
- c If first or top soil horizon is 15 cm or more thick, use it, otherwise use thickest layer in the top 30 cm of mineral soil.
- d Use average slope to determine a rating, but in formulating prescriptions also consider the upper end of the slope range.

Soil texture abbreviations:

S – sand	LS – loamy sand
SL – sandy loam	fSL – fine sandy loam*
Si – silt	SiL – silt loam

All clayey consist of the following textures:

C – clay	CL – clay loam
SC – sandy clay	SiC – silty clay
SCL – sandy clay loam	SiCL – silty clay loam

- * For the purposes of this key fSL (fine sandy loam), means the soil contains 30% or more fine or very fine sand, or more than 40% fine and very fine combined. Fine sand is 0.10 – 0.25 mm in diameter, very fine sand is 0.05 – 0.10 mm in diameter.

Mass wasting hazard

Mass wasting hazard assesses susceptibility to small, disturbance-related slope failures—it is *not the same as landslide likelihood* (landslide likelihood is determined in accordance with the procedures specified in the *Mapping and Assessing Terrain Stability Guidebook*). **Mass wasting hazard** refers primarily to small-scale failures, which mainly cause on-site degradation, while landslide likelihood primarily refers to larger events, which are of concern because of possible off-site impacts. The two hazards are correlated; a very high mass wasting hazard may indicate a potentially unstable slope, and such sites must be checked by a person qualified to assess slope stability. In addition, small, disturbance-related slope failures can lead to larger landslides through drainage diversion or failure of “stacked” excavations up a hillside, such as in switchbacks.

Gully systems >5 m deep should be typed out and assessed separately for soil disturbance hazard assessment during data collection in the Interior. On the Coast, gullies are subject to a separate gully assessment procedure.

The mass wasting hazard key has two parts. The first part has two keys that rate the hazard for dry ravelling in non-cohesive soils and the hazard for cutslope or fill slope failures in more cohesive soils. The second part has a table of field indicators of potential slope instability to help field data collectors identify areas that require a detailed terrain stability site assessment.

Dry ravelling (use on dry Interior sites only) occurs on oversteepened slopes underlain by non-cohesive, granular and fragmental materials.

Cutslope or fill slope failure (use on Interior sites only) These excavation-related slumps may be triggered by removal of supporting slope segments, oversteepening of fill/sidecast slopes, overloading of fill slopes, and/or concentration of drainage waters. **These failures can lead to larger landslides if they cause drainage diversion—this is a common problem in the Interior.** This rating IS NOT used on the Coast.

Site factors determining hazards:

- climate (precipitation factor)
 - rain intensity/duration
 - spring break-up
- topography
 - slope per cent

- slope length
- slope continuity
- soil properties
 - texture
 - coarse fragments
 - soil moisture regime
 - restricting layers.

Management considerations:

- logging system
 - ground, cable or helicopter
 - extent of cut and fill
- roads
 - width, cut height, and sidecast
 - drainage structures
 - maintenance
 - deactivation.

Mass wasting hazard key definitions

Precipitation factor – integrates precipitation type, frequency, intensity and duration and the biogeoclimatic subzone/variant. Extract appropriate class from tables in Appendix 4.

Continuous slopes – >150 m slope length between slope segments at least 20 m wide and <30% slope gradient, or between ridge crests and valley bottoms.

Discontinuous slopes – <150 m slope length between slope segments at least 20 m wide and <30% slope gradient (i.e., variable, complex, or benchy slopes), or between ridge crests and valley bottoms.

Gullied – two or more >2 m deep sharp-edged gullies occur per 100 m along the contour.

Water-restricting layer – restricting to downward flow of water, but not necessarily to root growth. Includes impermeable, dense, compact, or cemented layers; bedrock; or permanent water table.

Texture groupings – Use predominant textural group overlying the restricting layer or the most limiting soil texture in the profile.

Clayey = SC, SiC, SCL, SiCL, CL, C.

Mass wasting hazard key

Dry raveling (use on dry Interior sites only): is a concern if the site is underlain by non-cohesive materials (e.g., sands [S, LS]), gravels, volcanic pumice or fragmental material with >70 % coarse fragment content (e.g., rubbly talus).

Non-cohesive or fragmental materials (sand or >70% coarse fragments)	Slope %			
	<30	30-45	46-60	>60
Sands or coarse fragments that are rounded, subrounded, flat/platy, or fine gravelly angular	<30	30-45	46-60	>60
Angular, interlocking coarse fragments, or compacted/cemented/consolidated materials	<40	40-55	56-70	>70
Rating	Low	Moderate	High	Very high

Key continued on page 138

Mass wasting hazard key Continued

Cutslope or fill slope failure (use on Interior sites only): add the points for each of the following site factors to determine the hazard for excavation-related cutslope and fill slope failures in more cohesive soil materials.

Precipitation factor Points	low 0	moderate 3	high 6	very high 9		
Soil moisture regime ^a Points	very xeric-submesic 0	mesic 10	subhygric-hygric 18	subhydric 22		
Slope % Points	<30 0	30-40 3	41-50 6	51-60 12	61-70 24	>70 36
Slope gullying/ continuity ^b Points	slopes <30%		slopes ≥30 %			
	not gullied 0	gullied 4	discontinuous 2	continuous 5	gullied 10	
Soil texture ^c Points	S, LS 0	SL, fSL 5	Si, SiL, L 10	clayey 15		
Depth to water restricting layer ^d Points	>90 0	61-90 2	30-60 3	<30 4		
Point total Rating	<22 Low	22-38 Moderate	39-53 High	>53 Very high		

- a It is acceptable to assign moisture regime ratings part way between values, as long as your actions are defensible and the wetter conditions in the standards unit are the ones being rated.
- b The continuity of the underlying bedrock is also important on some sites.
- c Use the predominant soil texture grouping overlying the restricting layer or the most limiting texture in the profile (which ever is rated highest).
- d Deep materials can also pose a hazard, but this is somewhat compensated for by texture (deep deposits that are of concern on slopes are often finer textured).

In addition to the main references cited in the text, the following section lists some of the many useful references available to a silviculture prescription surveyor. Any number of topics covered in this handbook can be researched in further detail by consulting this list.

1. Ecosystem classification

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APPENDIX 8 Forest Practices Code Guidebooks referenced in the text

These guidebooks are integral to the process of conducting silviculture prescription data collection. Readers are advised to reference the most current version of the Forest Practice Code Guidebooks. These may be found at: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm>.

Bark Beetle Management Guidebook

Biodiversity Guidebook

Defoliator Management Guidebook

Dwarf Mistletoe Management Guidebook

Establishment to Free Growing Guidebook(s)

Fertilization Guidebook

Fire Management Guidebook

Fish-stream Identification Guidebook

Forest Health Surveys Guidebook

Gully Assessment Procedure Guidebook

Hazard Assessment Keys for Evaluating Site Sensitivity to Soil
Degradation Processes Guidebook

Landscape Unit Planning Guide

Management of Terminal Weevils Guidebook

Mapping and Assessing Terrain Stability Guidebook

Pine Stem Rust Guidebook

Pruning Guidebook

Range Management Guidebook

Riparian Management Area Guidebook

Root Disease Management Guidebook

Silvicultural Systems Guidebook

Silviculture Prescription Guidebook

Site Preparation Guidebook

Soil Conservation Guidebook

Soil Rehabilitation Guidebook

Vegetation Management Guidebook

Visual Identifier Standards Guide

Visual Impact Assessment Guidebook