

Canada's National Forest Inventory

Land Cover Classification Scheme

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The following was adopted from the B.C. Land Cover Classification Scheme, 1999.

1. Classifying Land Cover

The Land Cover Classification Scheme is based on current cover. Cover may be vegetated or non-vegetated. Vegetated cover is either treed or non-treed; non-vegetated cover is either land or water. In most cases, uniform areas (polygons) are delineated on mid-scale aerial photographs (1:10 000 to 1:20 000). Each polygon is then assessed using hierarchical classes, first into Vegetated or Non-Vegetated, then by cover type, landscape position, and so on, to the lowest level identifiable.

Below is a decision chart for the classification scheme. Figure 1 illustrates the classification scheme structure for vegetated and non-vegetated areas.

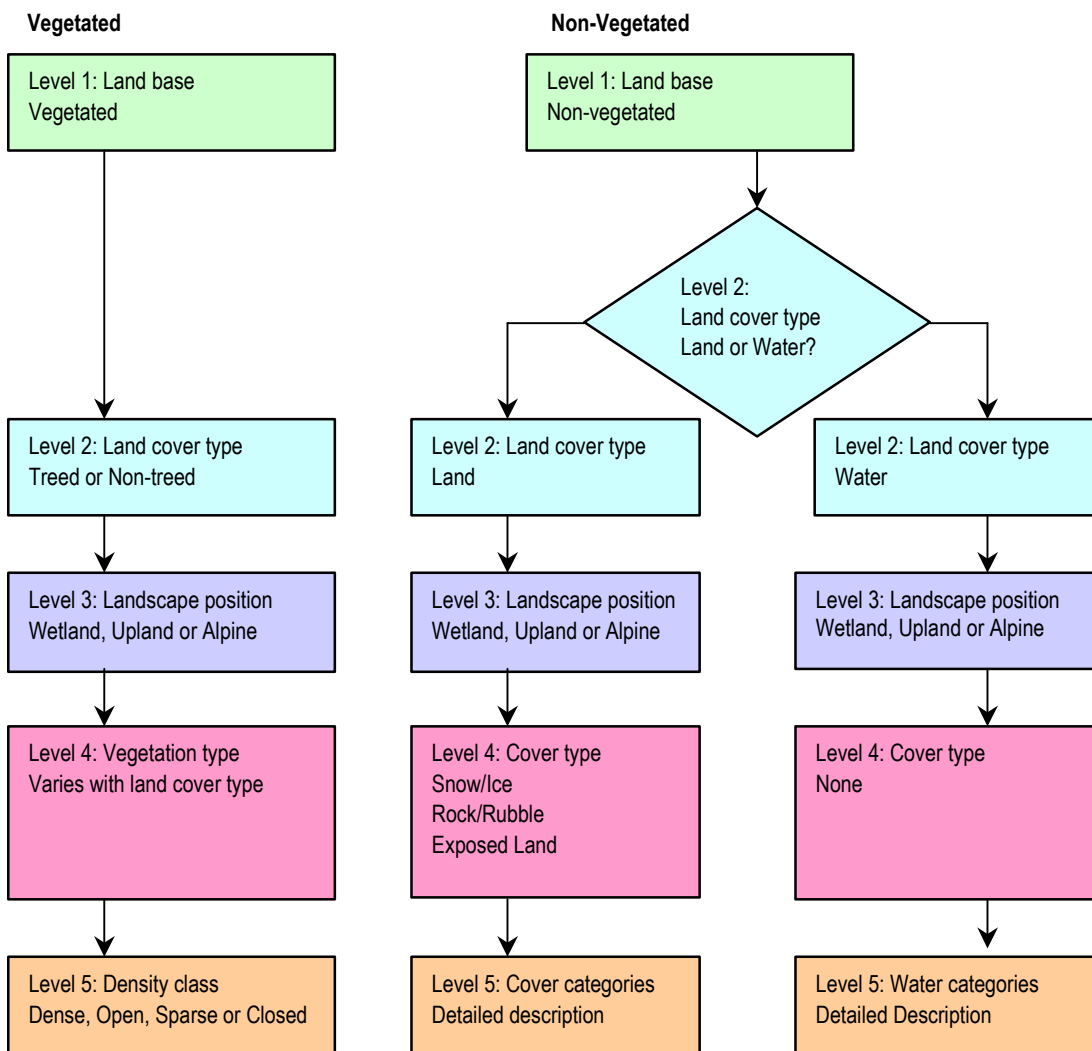


Figure 1. The Land Cover Classification Scheme Process Map.

Polygon Attribute - The Information Source for the Cover Designation

Application of the Land Cover Classification Scheme provides a land cover designation based on the categories described below. The cover for each polygon is derived from polygon attributes estimated by photo interpretation and calibrated based on air and ground surveys.

The land cover designation provides a categorization of the polygon based on the Land Cover Classification Scheme. Lower layer (such as shrubs, herbs, and bryoids) vegetation information is not provided when a higher layer (such as trees) exists.

The Coding System

The land classification of each polygon is summarized as a seven-letter code to facilitate broad land classification reporting. Code letters are given in the detailed descriptions that follow.

The following is an example of the derivation of the seven-letter Land Cover Class Code:

Level	Estimated attributes	Code assigned
1	Vegetated crown closure $\geq 5\%$	V (Vegetated)
2	Tree crown closure $\geq 10\%$	T (Treed)
3	Not Alpine or Wetland	U (Upland)
4	Coniferous $\geq 75\%$ of total Crown Closure	TC (Coniferous)
5	Tree crown closure = 80%	DE (Dense)

The Land Cover Class code for this polygon would be VTUTCDE.

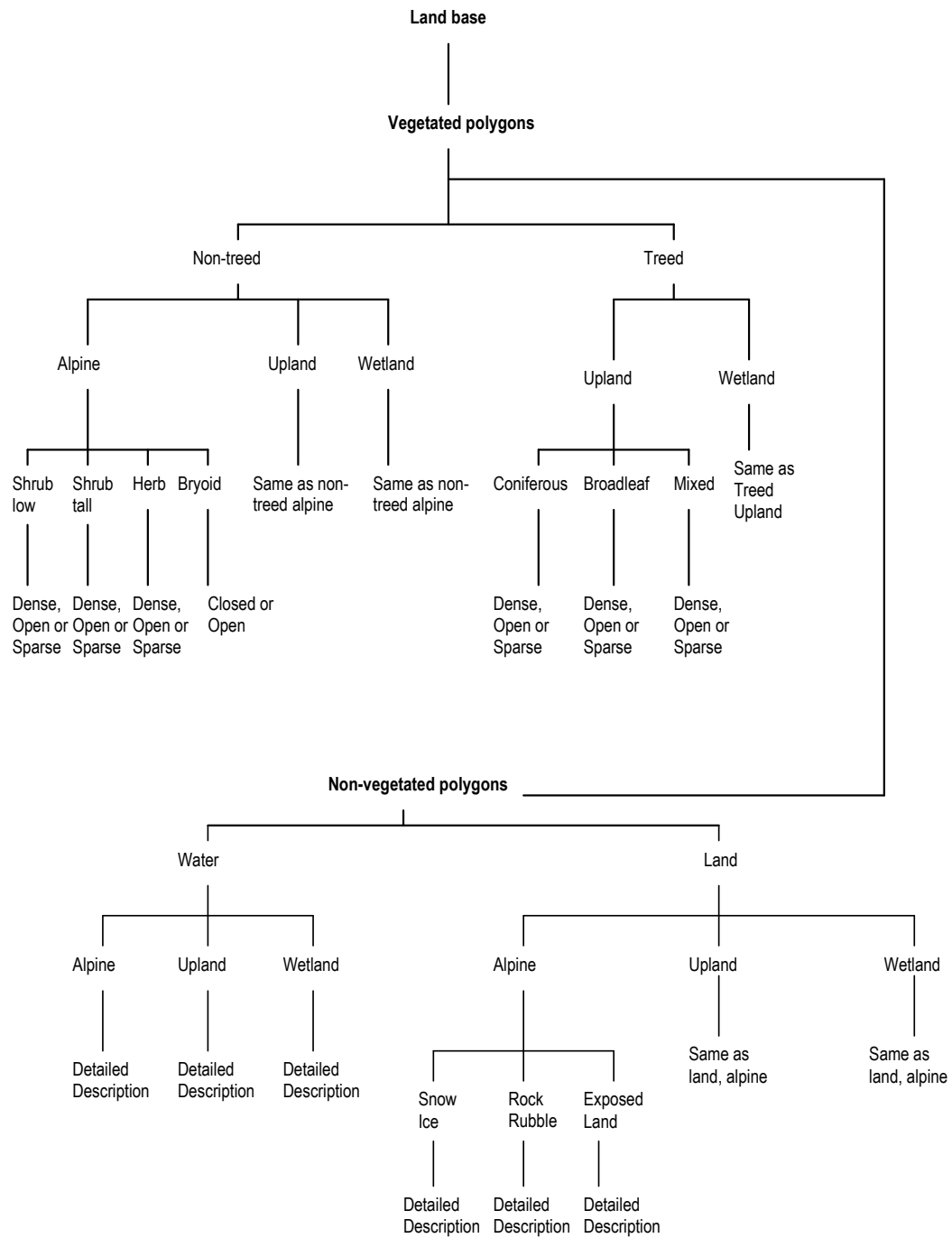


Figure 2. Structure of the Land Cover Classification Scheme.

2. Level 1 - Classifying the Land Base

The first level of the classification scheme classifies the presence or absence of vegetation, as Vegetated or Non-Vegetated.

V = Vegetated

A polygon is considered Vegetated when the total cover of trees, shrubs, herbs, and bryoids (other than crustose lichens) covers at least 5% of the total surface area of the polygon.

N = Non-Vegetated

A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon. Bodies of water are to be classified as Non-Vegetated.

Classifying Vegetated Polygons

If the polygon is classed as Vegetated the following levels apply.

(If classified as Non-Vegetated see *Classifying Non-Vegetated Polygons* for a description of further levels.)

Level 2 - Land Cover Type

The first determination for Vegetated polygons is whether they are Treed or Non-Treed.

T = Treed

A polygon is considered Treed if at least 10% of the polygon area, by crown cover, consists of tree species of any size. Refer to the *NFI Tree Species List* for a list of tree species.

N = Non-Treed

A polygon is considered Non-Treed if less than 10%, by crown cover, of the polygon area consists of tree species of any size.

Level 3 - Landscape Position

Once the polygon has been classified as Treed or Non-Treed, the location relative to elevation and drainage is determined.

W = Wetland

Wetland has numerous definitions in the literature. The definition used for the classification is taken from Fraser et al. (1995):

Wetland is defined as land having the water table at, near or above the soil surface, or which is saturated for a long enough period of time to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See wetland definitions later in this document for a more complete description.

U = Upland

A broad class that includes all non-wetland ecosystems that range from very xeric to hygric soil moisture regimes.

A = Alpine

A polygon is considered Alpine when it is treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with alpine vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Rock, ice, and snow dominate much of the Alpine. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification level of Non-Treed areas above the tree line only.

Level 4 - Vegetation Type

Once the polygon is classed as Treed or Non-Treed and determined to be Wetland or Upland, it is further classified by the type of vegetation within the unit:

Vegetated Treed

Treed units can be Coniferous, Broadleaf, or Mixed.

TC = Coniferous

Defined as those trees classified botanically as Coniferae; cone-bearing trees having needles or scale-like leaves, usually evergreen. These species are commonly referred to as conifer or softwoods. Refer to the *NFI Tree Species List* for a list of species and species codes.

The polygon is classified as Coniferous when trees cover a minimum of 10% of the total polygon area by crown cover, and coniferous trees are 75% or more of the total tree basal area.

TB = Broadleaf

Defined as those trees classified botanically as Angiospermae in the subclass Dicotyledoneae. These species are commonly referred to as deciduous or hardwoods. Refer to the *NFI Tree Species List* for a list of species and species codes.

The polygon is classified as Broadleaf when trees cover a minimum of 10% of the total polygon area by crown cover, and broadleaf trees are 75% or more of the total tree basal area.

TM = Mixed

The polygon is classified as Mixed when trees cover a minimum of 10% of the total polygon area by crown cover, but neither coniferous nor broadleaf trees account for 75% or more of the total tree basal area.

Vegetated Non-Treed Units

Non-Treed units can be Shrub, Herb, or Bryoid.

Shrub

Shrubs are defined as woody perennial plants, both evergreen and deciduous, that have a relatively low growth habit, and are generally multi-stemmed, rather than having one bole. They differ from a tree by their low stature (generally less than 10 m) and non-treelike form. A reporting break is made between Tall (greater than or equal to 2 m) and Low (less than 2 m) for wildlife management interpretation purposes. Other breaks may be used if preferred, as height data are estimated as a continuous variable.

For a polygon to be classed as Shrub, it must have a minimum of 10% ground cover of shrubs, or shrubs must constitute more than 1/3 of the total vegetation cover.

ST = Shrub Tall

A Shrub polygon with average height greater than or equal to 2 m.

SL = Shrub Low

A Shrub polygon with average shrub height less than 2 m.

Herb

Herbs are defined, for this system, as vascular plants without a woody stem, including ferns, fern allies, grasses, and grass-like plants.

The Herb class has two further subdivisions based on the proportion of forbs and graminoid plants. The subclasses Forbs and Graminoids are used when any one group accounts for greater than 50% of the herb cover.

Graminoids are defined as herbaceous plants with long, narrow leaves characterized by linear venation; including grasses, sedges, rushes, and other related species.

Forbs are defined as herbaceous plants other than graminoids, including ferns, club mosses, and horsetails.

If a polygon does not meet the definition of Shrub, then it can be classed as Herb if it has a minimum of 20% ground cover of herbs, or herbs constitute more than 1/3 of the total vegetation cover.

HE = Herb

A Herb polygon with no distinction between forbs and graminoids.

HF = Herb – Forbs

A Herb polygon with forbs greater than 50% of the herb cover.

HG = Herb – Graminoids

A Herb polygon with graminoids greater than 50% of the herb cover.

Bryoid

Bryoids are defined as bryophytes (mosses, liverworts, and hornworts) and lichens (foliose or fruticose; not crustose).

If a polygon does not meet the definition of Shrub or Herb, then it can be classed as Bryoid if it has greater than 50% of the vegetation cover in bryoids, and herb and shrub cover must each constitute less than 20%.

The Bryoid class has two further subdivisions based on the proportion of bryophytes and lichens. The class is subdivided into Bryophyte or Lichen when any one group accounts for greater than 50% of the bryoid cover.

BY = Bryoids

A Bryoid polygon with no distinction between mosses and lichens by cover.

BM = Bryoid – Moss

A Bryoid polygon with mosses, liverworts, and hornworts greater than 50% of the bryoid cover.

BL = Bryoid – Lichens

A Bryoid polygon with lichens (foliose or fruticose; not crustose) greater than 50% of the bryoid cover.

Level 5 - Density Class

Once a Vegetated polygon is classed up to Level 4, density is reported using the following density classes available by vegetation type. Note that these are reporting breaks only; interpreters can estimate density in a continuous manner (from 0% to 100%).

The density classes for Treed, Shrub, or Herb polygons are as follows:

DE = Dense

Tree, shrub, or herb cover is between 61% and 100% crown closure for the polygon.

OP = Open

Tree, shrub, or herb cover is between 26% and 60% crown closure for the polygon.

SP = Sparse

Tree cover is between 10% and 25% crown closure for treed polygons or cover is between 20 and 25% for shrub or herb cover polygons.

The density classes for Bryoid polygons are as follows:

CL = Closed

Cover of bryoids is greater than 50% of the polygon.

OP = Open

Cover of bryoids is less than or equal to 50% of the polygon.

Classifying Non-Vegetated Polygons

A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon.

Level 2 - Land Cover Type

The first decision is whether a polygon is considered to be Land or a Water body. The cover type occupying greater than 50% of the polygon area is the cover type assigned.

L = Land

The portion of the landscape not covered by water (as defined below), based on the percentage cover area.

W = Water

A naturally occurring, static body of water, two or more metres deep in some portion, or a watercourse formed when water flows between continuous, definable banks. These flows may be intermittent or perennial; but do not include ephemeral flows where a channel with no definable banks is present. Islands within streams that have definable banks are not part of the stream; gravel bars are part of the stream. Interpretation is based on the percentage area covered.

Classifying Non-Vegetated Land Polygons

If the polygon is classed as Land the following steps and levels apply.

(If classed as Water see Land Cover Type - Water for a description of further levels.)

Level 3 - Landscape Position (Land)

This level describes the location of the polygon relative to drainage, and is described as Wetland or Upland.

W = Wetland

Land having a water table near, at, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See wetland definitions later in this document for a more complete description.

U = Upland

A broad class that includes all non-wetland ecosystems that range from very xeric to hygric soil moisture regimes.

A = Alpine

A polygon is considered Alpine when it is treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with alpine vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Rock, ice, and snow dominate much of the Alpine. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification level of Non-Treed areas above the tree line only.

Level 4 - Non-Vegetated Cover Type (Land)

Once the polygon is classed as Non-Vegetated and determined whether it is Wetland, Upland or Alpine, it is further classified by the type of non-vegetated condition within the unit. Non-Vegetated polygons are divided into three groups: Snow/Ice, Rock/Rubble, and Exposed Land.

SI = Snow/Ice
Defined as either glacier or snow cover.

RO = Rock/Rubble
Defined as bedrock or fragmented rock broken away from bedrock surfaces and moved into its present position by gravity or ice. Extensive deposits are found in and adjacent to alpine areas and are associated with steep rock walls and exposed ridges; canyons and cliff areas also contain these deposits.

EL = Exposed Land
Contains all other forms of Exposed Land identified by a range of subclasses.

Level 5 - Non-Vegetated Categories (Land)

The dominant material or feature of the non-vegetated area defines classes.

Snow/Ice has two subclasses - **Glacier** and **Snow Cover**:

GL = Glacier
A mass of perennial snow and ice with definite lateral limits, typically flowing in a particular direction.

SC = Snow Cover
Snow or ice that is not part of a glacier, but is found during summer months on the landscape.

Rock/Rubble has four subclasses:

BR = Bedrock
Unfragmented, consolidated rock contiguous with the underlying material.

RT = Rubble, Talus, Blockfield
Fragmented rock, broken away from bedrock surfaces and moved into its present position by gravity or ice.

MS = Rubbly Mine Spoils
Discarded overburden or waste rock moved to extract ore during a mining operation.

LB = Lava Bed
An area where molten rock has flowed from a volcano or fissure and cooled and solidified to form rock.

Exposed Land has 16 subclasses:

RS = River Sediments
Silt, gravel, and sand bars associated with former river channels and present river edges.

ES = Exposed Soil
Any exposed soil not covered by the other categories, such as areas of recent

disturbance including mud slides, debris torrents, avalanches, or disturbances such as pipeline rights-of-way or cultivated fields, where vegetation cover is less than 5%.

LS = Pond or Lake Sediments

Exposed sediments related to dried-up lakes or ponds.

RM = Reservoir Margin

Land exposed by a drained or fluctuating reservoir. It is found above "normal" water levels and may consist of a range of substrates including gravel, cobbles, fine sediments, or bedrock.

BE = Beach

An area with sorted sediments reworked in recent time by wave action. It may be formed at the edge of fresh or salt water bodies.

LL = Landing

A compacted area adjacent to a road used for sorting and loading logs.

BU = Burned Area

Land showing evidence of recent burning, either natural or prescribed. Vegetation of less than 5% crown cover is present at the time of polygon description.

RP = Road Surface

An area cleared and compacted for the purpose of transporting goods and services by vehicles. Older roads that are used infrequently or not at all may cease to be classified as non-vegetated.

MU = Mudflat Sediment

Flat plain-like areas associated with lakes, ponds, rivers, or streams, dominated by fine-textured sediments. They can be associated with freshwater or estuarine sources.

CB = Cutbank

Part of a road corridor created upslope of the road surface by excavation into the hillside. "Natural" forces may also create Cutbanks.

MO = Moraine

An area of debris transported and deposited by a glacier.

GP = Gravel or Borrow Pit

An area exposed through the removal of sand and gravel.

TS = Tailings

An area containing the solid waste material produced by the mining and milling of ore.

RR = Railway Surface

A roadbed with fixed rails, may contain single or multiple rail lines.

BP = Buildings and Parking

Buildings and associated developments such as roads and parking areas.

- AP = Airport**
A permanently paved or gravelled area, and associated buildings and parking, used by airplanes.
- PM = Open Pit Mine**
An exposed area used to extract ore during a mining operation. This may contain associated buildings and any tailing produced by the mining and milling process.
- OT = Other**
A Non-Vegetated polygon where none of the other exposed land categories can be reliably chosen.

Classifying Non-Vegetated Water Polygons

If the polygon is classed as Water the following categories apply:

Level 3 - Landscape Position (Water)

The landscape position relative to drainage is determined.

- W = Wetland**
Land having a water table near, at, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See wetland definitions later in this Appendix for a more complete description.
- U = Upland**
A broad class that includes all non-wetland ecosystems that range from very xeric to hygric soil moisture regimes.
- A = Alpine**
A polygon is considered Alpine when it is treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with alpine vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Rock, ice, and snow dominate much of the Alpine. Alpine does not typically include the parkland and krummholz forest types. Alpine is a classification level of Non-Treed areas above the tree line only.

Level 4 - Water

- WA = Water**
A naturally occurring, static body of water, two or more metres deep in some portion, or a watercourse formed when water flows between continuous, definable banks. These flows may be intermittent or perennial; but do not include ephemeral flows where a channel with no definable banks is present. Islands within streams that have definable banks are not part of the stream; gravel bars are part of the stream. Interpretation is based on the percentage area covered.

Level 5 - Water Categories

Four categories have been identified: Lake, Reservoir, River/Stream, and Salt Water.

- LA = Lake**
A naturally occurring static body of water more than two metres deep in some portion. The boundary for the lake is the natural high water mark.
- RE = Reservoir**
An artificial basin affected by impoundment of water behind a human fabricated structure such as a dam, berm, dyke, or wall.
- RI = River/Stream**
A watercourse formed when water flows between continuous, definable banks. Flow may be intermittent or perennial, but does not include ephemeral flow where a channel with no definable banks is present. Gravel bars are part of a stream, while islands within a stream that have definable banks are not.
- SW = Salt Water**
A naturally occurring body of water containing salt or generally considered to be salty.

3. Definitions

The following terms are defined for use in the Land Cover Classification Scheme.

Vegetated Land Definitions

Alpine: Treeless (for practical purposes less than 1% tree cover can be included within the Alpine category), with alpine vegetation dominated by shrubs, herbs, graminoids, bryoids, and lichens. Rock, ice, and snow dominate much of the Alpine. Alpine does not typically include the parkland and krummholz forest types. Alpine is, by definition, treeless, therefore there is no further classification level of Treed/Non-Treed under this category.

Broadleaf: trees classified botanically as Angiospermae in the subclass Dicotyledoneae (Bones 1993). These species are referred to as hardwoods. These species are commonly referred to as deciduous or hardwoods.

Bryoids: are defined as bryophytes (mosses, liverworts, and hornworts) and lichens (foliose or fruticose; not crustose).

Coniferous: trees classified botanically as Coniferae; cone-bearing trees having needles or scale-like leaves, usually evergreen. These species are commonly referred to as conifer or softwoods.

Forbs are defined as herbaceous plants other than graminoids, including ferns, club mosses, and horsetails.

Graminoids are defined as herbaceous plants with long, narrow leaves characterized by linear venation; including grasses, sedges, rushes, and other related species.

Herbs: vascular plants without a woody stem, including ferns, fern allies, grasses, and grass-like plants.

Krummholz: scrubby, stunted growth form of trees, often forming a characteristic zone at the limit of tree growth at high elevations.

Non-Treed: a polygon is considered Non-Treed if less than 10%, by crown cover, of the polygon area consists of tree species of any size.

Parkland: landscape characterized by strong clumping of trees due to environmental factors.

Shrubs: woody perennial plants, both evergreen and deciduous, that have a relatively low growth habit, and are generally multi-stemmed, rather than having one bole. It differs from a tree by its low stature (generally less than 10 m) and non-treelike form. A reporting break is made between Tall (greater than or equal to 2 m) and Low (less than 2 m) for wildlife management interpretation purposes. Other breaks may be used if preferred, as height data are estimated as a continuous variable.

Treed: a polygon is considered Treed if 10% or more of the polygon area, by crown cover, consists of tree species of any size.

Upland: a broad class that includes all non-wetland ecosystems that range from very xeric to hygric soil moisture regimes.

Vegetated: a polygon is considered Vegetated when the total cover of trees, shrubs, herbs, and bryoids (other than crustose lichens) covers at least 5% of the total surface area of the polygon.

Wetland: is defined as land having the water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. See Wetland definitions later in this section for a more complete description.

Non-Vegetated Land Definitions

Beach (Exposed Land): an area with sorted sediments reworked in recent time by wave action. It may be formed at the edge of fresh or salt-water bodies.

Bedrock (Rock/Rubble): unfragmented, consolidated rock contiguous with the underlying material.

Buildings and Parking (Exposed Land): buildings and associated developments such as roads and parking areas.

Burned Area (Exposed Land): land showing evidence of recent burning, either natural or prescribed. Vegetation of less than 5% crown cover is present at the time of polygon description.

Cutbank (Exposed Land): part of a road corridor created upslope of the road surface by excavation into the hillside. "natural" processes may also create Cutbanks.

Exposed Land: contains all other forms of exposed land identified by a range of 16 subclasses: Beach; Buildings and Parking; Burned Area; Cutbank; Exposed Soil; Gravel Pit; Landing;

Moraine; Mudflat Sediment; Other; Pond or Lake Sediments; Railway Surface; Reservoir Margin; River Sediments; Road Surface; Tailings.

Exposed Soil (Exposed Land): any exposed soil not covered by the other categories (e.g., areas of recent disturbance including mud slides, debris torrents, avalanches, or disturbances such as pipeline rights-of-way or cultivated fields) where vegetation cover is less than 5%.

Glacier (Snow/Ice): a mass of perennial snow and ice with definite lateral limits, typically flowing in a particular direction.

Gravel Pit (Exposed Land): an area exposed through removal of sand and gravel.

Lake: a naturally occurring static body of water more than two metres deep in some portion. The boundary for the lake is the natural high water mark.

Land: the portion of the landscape not covered by water (as defined below) based on the percentage area cover.

Landing (Exposed Land): a compacted area adjacent to a road used for sorting and loading logs.

Lava Bed: an area where molten rock has flowed from a volcano or fissure and cooled and solidified to form rock.

Moraine (Exposed Land): an area of debris transported and deposited by a glacier.

Mudflat Sediment (Exposed Land): flat plain-like areas associated with lakes, ponds, rivers, or streams, dominated by fine-textured sediments. They can be associated with freshwater or estuarine sources.

Non-Vegetated: A polygon is considered Non-Vegetated when the total cover of trees, shrubs, herbs, and bryoids covers less than 5% of the total surface area of the polygon. Bodies of water are to be classified as Non-Vegetated.

Other (Exposed Land): a Non-Vegetated polygon where none of the other exposed land categories can be reliably chosen.

Pond or Lake Sediments (Exposed Land): exposed sediments related to dried-up lakes or ponds.

Railway Surface (Exposed Land): a roadbed with fixed rails; may contain single or multiple rail lines.

Reservoir: an artificial basin affected by impoundment of water behind a human fabricated structure such as a dam, berm, dyke, or wall.

Reservoir Margin (Exposed Land): land exposed by a drained or fluctuating reservoir. It is found above "normal" water levels, and may consist of a range of substrates including gravel, cobbles, fine sediments, or bedrock.

River/Stream: a watercourse formed when water flows between continuous, definable banks. Flow may be intermittent or perennial, but does not include ephemeral flow where a channel with

no definable banks is present. Gravel bars are part of a stream, while islands within a stream that have definable banks are not.

River Sediments (Exposed Land): silt, gravel, and sand bars associated with former river channels and present river edges.

Road Surface (Exposed Land): an area cleared and compacted for the purpose of transporting goods and services by vehicles. Older roads that are used infrequently or not at all may cease to be classified as non-vegetated.

Rock/Rubble: bedrock or fragmented rock broken away from the bedrock surface and moved into its present position by gravity or ice. Extensive deposits are found in and adjacent to alpine areas and are associated with steep rock walls and exposed ridges. Canyons and cliff areas also contain these deposits.

Rubble, Talus, Blockfield (Rock/Rubble): fragmented rock, broken away from the bedrock surface, and moved into its present position by gravity or ice.

Rubby Mine Spoils (Rock/Rubble): discarded overburden or waste rock moved to extract ore during a mining operation.

Salt Water: a naturally occurring body of water containing salt or generally considered to be salty.

Snow Cover (Snow/Ice): snow or ice that is not part of a glacier, but is found during summer months on the landscape.

Tailings (Exposed Land): an area containing the solid waste material produced by the mining and milling of ore.

Water: a naturally occurring, static body of water, two or more metres deep in some portion, or a watercourse formed when water flows between continuous, definable banks. These flows may be intermittent or perennial; but do not include ephemeral flows where a channel with no definable banks is present. Islands within a stream with definable banks are not part of the stream; gravel bars are part of the stream. Interpretation is based on the percentage area covered.

Wetland Definitions

This section is taken from Fraser et al. (1995). The wetland classification was under review at the time of this report.

Wetland: Land having a water table at, near, or above the soil surface, or which is saturated for a long enough period to promote wetland or aquatic processes. These wetland processes are indicated by the presence of Organic or Gleysolic soils and hydrophytic vegetation. Sites with subhydric soil moisture regime and wetter are generally considered to be wetlands; sites with deeper waters are aquatic ecosystems. Wetlands must have one of the following four attributes (adapted from Cowardin et al. 1979):

1. At least periodically, the land supports predominantly hydrophytic plant species.
2. The substrate is predominantly poorly drained subhydric or wetter soil. Soils may be organic or mineral; in mineral soils, gleying occurs within the top 30 cm.
3. The substrate is non-soil and is saturated with water covered by shallow water at some time during the growing season.
4. A water body less than two metres in depth.

Wetlands can be bogs, swamps, marshes, fens, hot springs and hot pools, alkali ponds, shrub carrs, swamps, shallow (less than 2 m) open water, and includes both forested and non-forested ecosystems. As an example, the wetland realm can be subdivided into a number of classes.

Bogs: a peat-dominated class of wetland. They are wetlands covered or filled with poorly to moderately decomposed Sphagnum-derived peats. They are nutrient poor. Soils are usually Fibrisols, Mesisols, or Humisols. In the Fort Nelson Lowlands, bogs can have Organic Cryosolic soils.

Swamps: wooded wetlands dominated by 25% or greater cover of trees or tall shrubs and characterized by periodic flooding and nearly permanent subsurface water flow through various mixtures of mineral sediments and peat. Swamps, like fens, are rich in minerals and nutrients, but the characteristic water movement through swamps tends to make them better aerated than fens. Swamp waters thus have sufficient levels of dissolved oxygen to support either tall shrubs or trees.

Marshes: wetlands that are permanently or seasonally inundated with nutrient-rich water, and support extensive cover of emergent herbaceous vegetation rooting in a mineral-rich substrate. The water level of marshes varies seasonally, and from marsh to marsh. Marshes that dry by late summer expose matted vegetation and unvegetated mudflats or sandflats, but saturation persists near the surface. The substrate ranges from dominantly mineral materials to shallow, well-decomposed peat, derived primarily from marsh vegetation. The substrate is strongly influenced by water chemistry, which in turn reflects basin geology and regional climate.

Fens: wetlands composed of accumulations of well to poorly decomposed, non-sphagnum peats. Most fens have more than 40 cm of peat accumulation. Fen waters come mostly from groundwater and runoff from adjacent mineral uplands. As a result, fens are less acid and more mineral-rich than are bogs. Fen peat is well to moderately decomposed. Associated soils are Mesisols and Humisols. Fen vegetation can be dominated by grasses, sedges, rushes, low shrubs, or trees, and often underlain by mosses.

Wet Meadows: seasonally inundated wetlands, dominated by grasses, sedges, or rushes. They generally occur on mineral soils and have little or no peat accumulation. Tree cover is less than 10%.

Shrub Carrs: wetlands that are seasonally flooded, but dry out at the soil surface during the growing season. They occur on mineral soils that are typically gleyed within the top 30 cm.

Shallow Open Water: permanent, shallow (less than 2 m midsummer levels), standing water that lacks extensive emergent plant cover. Vegetation can be absent or emergent plants can cover up to 10% of the surface. Shallow Open Waters often include various submerged and floating

aquatic macrophytes. Submerged aquatic plants are common. Shallow Open Water is also found around the edges of many lakes.

4. References

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