

Large Scale Biogeoclimatic Mapping in the Quesnel and Canim PEM Project Areas

(Review Draft)

Ray Coupé & Ordell Steen

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Introduction

The Canim and West Quesnel Predictive Ecosystem Mapping (PEM) projects were initiated by the Cariboo-Chilcotin forest industry in 2002 and 2003 respectively. Biogeoclimatic subzone and variant maps are an essential basis for detailed predictive ecosystem mapping. Prior to completion of the regional PEM projects, the legacy biogeoclimatic map (Coupé and Steen 1998) needs to have its biogeoclimatic lines localized and updated, using large scale mapping methodology, as described by Eng and Meidinger (1999). The project described in this report was initiated to conduct large scale biogeoclimatic mapping in portions of the 100 Mile TSA and the Quesnel TSA west of the Fraser River.

This report is an abstraction and expansion of two internal reports produced by Ordell Steen (2003) and forms a summary of the 2003 large scale biogeoclimatic mapping projects in the Canim Lake and West Quesnel PEM projects.

Objectives

The objectives of this report are to:

- describe the methodology used for large scale biogeoclimatic mapping in the Canim and Quesnel PEM project areas and
- document proposed mapping rules and proposed boundary or biogeoclimatic classification changes made to the legacy map within these project areas.

Study Areas

Canim PEM

The study area includes ten 1:20,000 scale map sheets northeast of 100 Mile House, B.C. The project area extends from approximately Mount Timothy in the west to the Pendelton Lakes in the east (Fig. 1).

Biogeoclimatic units shown on the regional legacy map for the study area (Fig 1) include:

- SBPSmk on low to mid elevations of Little Timothy Mountain and near Tillicum Lake;
- IDFmw2 at lowest elevations adjacent to Canim Lake;
- SBSdw1 at low elevations from Murphy Lake to nearly Canim Lake; south of Canim Lake to Bowers Lake
- SBSmc1 on mid elevations of Little Timothy and Big Timothy mountains;
- ICHmk3 at low elevations east of Lang Lake, in the lower Boss Creek, Hendrix Creek and Deception Creek valleys, and southeast of Canim Lake;
- ESSFwk1 at high elevations of Little Timothy and Big Timothy mountains and the mountains to the east and southeast of Hendrix Lake;
- ESSFwc3 at highest forested elevations above the ESSFwk1(>1500 m) on Big Timothy Mountain and mountains to the east;
- AT on the summit of Big Timothy Mountain and mountains to the east;
- ICHmw3 at low elevations in the Pendelton Lakes area
- SBSmm at low to mid elevations north and east of Bowers Lake

- ESSFdc2 at high elevations on the hills and mountains south of south of Canim Lake

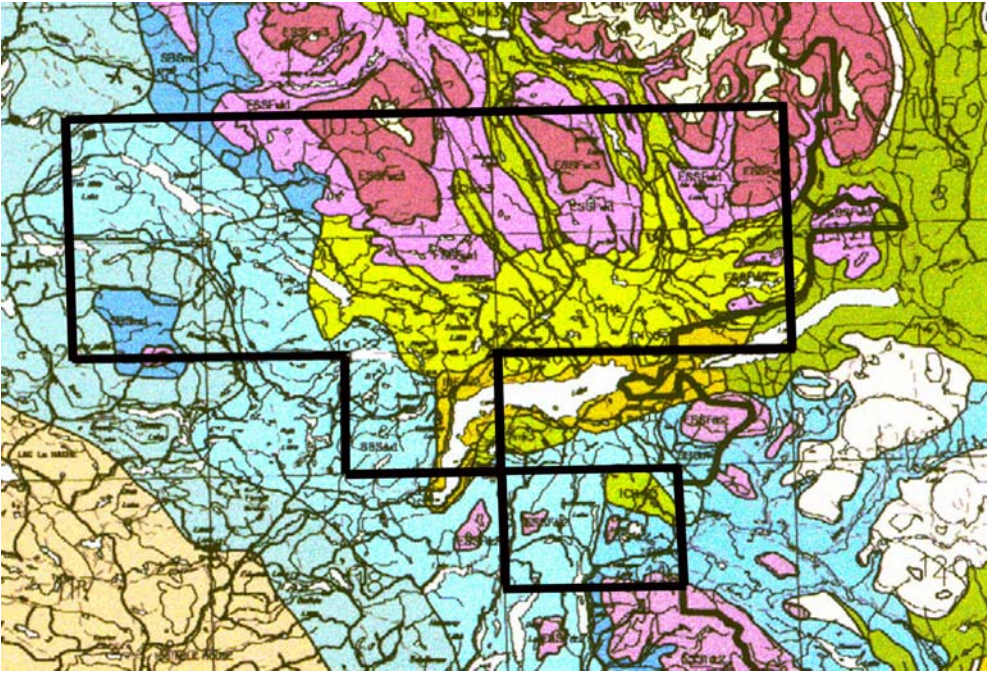


Figure 1. Canim PEM project area.

Quesnel PEM

The West Quesnel PEM project area includes most portions of the Quesnel TSA west of the Fraser River with the exception of areas at the westernmost edge, including the Ilgachuz Mountains and Dean River Valley (Figure 2). The project area includes all or portions of one hundred and twenty seven 1:20,000 scale map sheets.

The study area for purposes of this report includes that portion of the Quesnel TSA west of the Fraser River to the western slopes of the Itcha Mountains. In the north it is bounded by the Southern Interior Forest Region boundary. In the south it includes the northwestern portions of the Williams Lake TSA

Biogeoclimatic units shown on the regional legacy map for the study area (Fig 1a and 1b) are:

- MSxv at mid to upper elevations in western and southern portions of the study area;
- SBSmc2 at mid to upper elevations in northern and eastern portions of the study area;
- SBPSmk at mid elevations in northern and eastern portions of study area
- SBSdw2 at low to mid elevations in eastern portions of study area and in Nazko River valley north of about Marmot Lake;
- SBPSdc at low elevations in western two-thirds of study area

- SBSdw1 at low elevations in northeastern corner of study area
- SBSmh at lowest elevations near Fraser River
- SBPSmc at low elevations in the north western portions of the study area
- ESSFxv1 in the Itcha Mountains and scattered hill tops just south of the Itcha Mountains
- ESSmv1 at the highest elevations in the north central portions of the study area
- SBPSxc at low elevations in the southwestern portions of the study area, primarily in the Williams Lake TSA

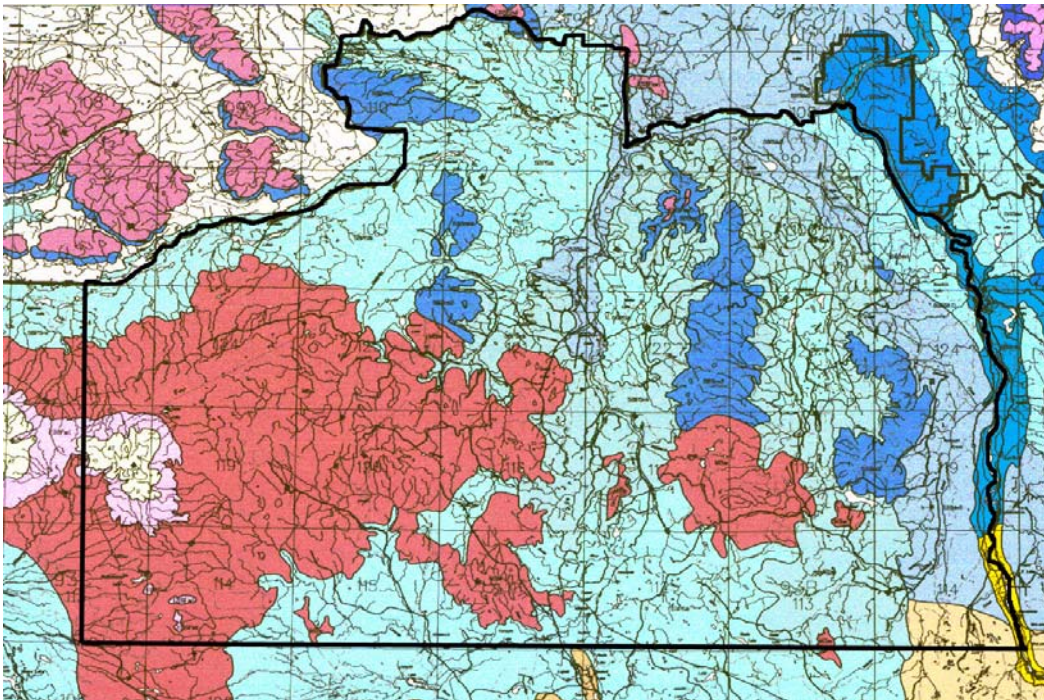


Figure 2. West Quesnel PEM project area.

Methods

Input Data

The principal source of input data for this project was the regional biogeoclimatic legacy map (Coupé and Steen 1998) for the two project areas (Figure 1 &2). This map, together with information in the guide to forested ecosystems of the Cariboo-Chilcotin region (Steen and Coupé 1997), provided the principal rule set regarding elevations and locations of biogeoclimatic unit boundaries. That is, they provided the rule set to be field tested and adjusted if necessary.

The biogeoclimatic legacy map was overlain on 20 m elevation contour maps produced from Terrestrial Resource Information Management (TRIM) data. The elevation contours provided a basis for field testing of biogeoclimatic elevation rules by allowing comparison of current biogeoclimatic mapping with the mapped elevation contours. They also provided a guide to developing adjusted elevation rules and for extrapolating biogeoclimatic boundaries from point data.

Forest inventory data, especially tree species information, were used to guide location of field plots and mapping of biogeoclimatic boundaries. For example, the distribution of Douglas-fir assisted mapping of the boundary between the SBSdw and SBPSmk subzones. The distribution of subalpine fir assisted the mapping the boundary between the MSxv and SBSmc subzones and the distribution of western hemlock assisted in mapping the ICHmw3 variant.

Level of Reliability

Eng and Meidinger (1999) recognize three levels of reliability for large scale biogeoclimatic mapping in British Columbia: a) localized small scale linework, b) reconnaissance, and c) systematic sampling. Level of reliability for this project is predominantly high reconnaissance to systematic sampling, except in a few areas with little or no road access. Road access, for the most part, determined the intensity of field sampling. Biogeoclimatic polygon boundaries that were crossed by roads at several points were correspondingly field tested at several points until a reasonable high level of confidence was developed in boundary elevation or other location “rules”. In areas where road access was very limited over a relatively large area, intensity of sampling declined and level of reliability dropped to reconnaissance. A two day helicopter-based reconnaissance provided sampling access to several areas with limited road access. The current BEC plot database and TEM project plots were utilized extensively to confirm or adjust BGC line placement and contributed site specific information for areas with poor ground access.

Principal areas of lower (reconnaissance level) reliability are;

Canim Pem area:

- ESSFwc3/ATp boundary primarily in the mountains east of Hendrix Lake
- south and east of Pendelton Lakes including boundaries between ICHmw3 and ESSFwk1
- eastern half of map sheet 92O077 including boundaries between ICHmk3, SBSmm and ESSFdc2

West Quesnel PEM area

- northeast of Itcha Mountain, in the upper Coglistiko to Kluskus Lakes area; including boundaries between the MSxv, SBPSdc, and SBPSmc;

- Itcha Mountains and area south to Satah Mountain including boundaries between ATp, ESSFvx1, and MSxv
- SBPSdc/SBPSmc boundary area south of Swede Creek and north of the Blackwater River in the northwest corner of the study area;
- A small but complex area of SBPSmk, SBPSdc, and SBPSmc southwest of Fishpot Lake;
- small area in vicinity of Clisbako River north and west of Brown Lake; including boundaries between currently mapped MSxv, SBPSmk, and SBPSdc
- east of Pelican Lake to the regional boundary; including the boundary between the SBPSdc and SBSdw2.

It should be noted that due to poor access and a limited budget no attempt was made to differentiate the woodland subzones occurring in the upper elevations of and currently mapped in the ESSFwk1 and ESSFvx1. Similarly the parkland subzones were not differentiated from the At zone. These will require substantial work in the future to delineate.

Initial Rule Set

The initial rule set for biogeoclimatic unit boundary elevations is implicit in the regional biogeoclimatic legacy map (Coupé and Steen 1998), prepared at a scale of 1:250,000. The legacy map was mapped on 1:250,000 NTS series maps. Placement of elevation contours frequently differ significantly from contours of the same elevation on more recent TRIM maps. Elevations and locations on the legacy map were considered to be implicit, localized rule sets. Elevations on the map were considered in the context of the more generalized, regional elevation rules provided in Steen and Coupé (1997), developed from regional experience.

The initial biogeoclimatic boundary rules implicit in the legacy map were used as hypotheses to be tested in the field. The rule set was not used to develop initial line work prior to field sampling. In essence, the legacy biogeoclimatic map was field tested and thus the implicit rule set was tested and altered as required.

Field Sampling

Personnel

Field surveys for this project were conducted by O. Steen, former Ministry of Forests regional ecologist, Cariboo Forest Region and Ray Coupé, regional ecologist, Southern Interior Forest Region with the assistance of two summer students.

Sampling System

Boundaries of all BGC units in the study area were evaluated by field surveys and sampling. Field sampling was done primarily from roads and trails, either by truck, trail bike or on foot. Limited helicopter access was used to evaluate boundaries not readily accessed by road

The road- and trail-based sampling system included surveys along a sufficient number of roads and trails crossing biogeoclimatic boundaries to gain a reasonably high confidence in boundary elevation or other location rules. This required a clear understanding of features that distinguish biogeoclimatic units in the study area, as provided in Steen and Coupé, (1997) and from previous biogeoclimatic mapping experience. The initial rules for locations of boundaries between two biogeoclimatic units (legacy maps) were checked, whenever possible, by traveling at least three roads crossing the boundary and separated by a sufficient distance to detect regional trends in the elevation or location rules. When elevations at different points were consistent or demonstrated a consistent and logical trend, no further surveys were done. If initial surveys resulted in elevations that were inconsistent and showed no logical trend, additional surveys were attempted until the boundary pattern became evident. In only a very few areas did boundary “rules” not become evident. These are identified in the section on description and rationale for proposed changes to the legacy map.

Emphasis was given to sampling zonal and near-zonal sites (sites with relatively gentle slopes and mesic moisture regime). In some cases, however, only wetter or drier sites were available for sampling. Biogeoclimatic mapping based on these sites relied on descriptions and previous experience in non-zonal site series. A GPS location was recorded at each sample site.

Most field sampling in the study area was done to determine or confirm elevation rules for BGC boundaries. However, biogeoclimatic unit boundaries in some areas are not consistent with elevations but rather their locations are a response to other topographic features that influence the climate, such as local rain shadows and large scale cold air ponding. The accuracy and reliability of these boundaries is generally less than for boundaries that clearly follow an elevation.

Data Forms

For the purposes of this project, sample plot data were recorded primarily on Ground Inspection Forms (GIF) (FS212-2) and Ecosystem Field Forms (FS882). A full species list was recorded at each sample site where these forms were used. In addition, reconnaissance observations, usually with a list of key indicator species, were recorded in field notes. These notes included rationale for revising the BGC locations or elevation rules. Reconnaissance observations recorded on field notes formed a key component of the information used to redraw BGC boundaries and evaluate BGC classifications.

Field inspection data, including a GPS location, were recorded at about 400 sites within the two study areas. In addition, many field notes were recorded using geographic locations but no GPS location.

Final Linework

Final proposed BGC boundaries were drawn by hand on 1:100,000 scale TRIM maps with 20 m contour intervals. These boundaries were determined from results of the field sampling program, legacy map, forest inventory maps, previous BEC sample plots, TEM project plots and TRIM data. In addition, the lower ATp boundary was also determined through air photo interpretation. Boundaries that followed a contour interval were distinguished on the map from those that did not (by solid or dashed line). Wherever a

boundary was drawn to follow a contour interval, the elevation of the contour was written adjacent to the line.

Description and Rationale for Proposed Revisions to the Legacy Map

Canim PEM area

The principal changes to the BGC legacy map for the Canim study area are:

- SBPSmk in Little Timothy Mountain area.

The BGC legacy map (Coupé and Steen 1998) shows the SBPSmk below the SBSmc1 on all sides of Little Timothy Mountain (Fig. 1). However, field sampling on all sides of the mountain suggests that the SBPSmk on the north, east, and south sides of the mountain should be reclassified as SBSdw. The area shown as SBPSmk on the east-facing slopes should be reclassified as SBSdw1 while the SBPSmk on the north- and south-facing slopes should be reclassified as SBSdw2. In addition, the SBPSmk on the southern half of the west-facing slopes should be reclassified as SBSdw2. The SBPSmk is confirmed to occur below the SBSmc1 only on the northern half of the west-facing slopes.

Principal reasons for reclassifying these portions of the SBPSmk as SBSdw are:

- abundant Douglas fir on zonal sites as well as other sites
- occasional presence of subalpine fir and paper birch, especially on the east slopes;
- very frequent presence of *Rubus parviflorus* in the shrub layer on zonal sites;
- very frequent presence of *Aralia nudicaulis* in the herb layer on zonal sites;
- abundant shrubs including *Rubus parviflorus*, *Viburnum edule*, and often *Cornus stolonifera* on subhygric sites;

New boundaries separating the SBSdw from the SBPSmk were drawn in locations where forests with Douglas-fir, *Rubus parviflorus*, and *Aralia nudicaulis* first become common on zonal sites. These new boundaries do not, for the most part, follow elevational contours.

The area mapped as SBPSmk on the north and south sides of Little Timothy Mountain should be mapped as SBSdw2 rather than SBSdw1 since:

- Lodgepole pine dominated stands with abundant *Calamagrostis rubescens* but little or no Douglas-fir, *Rubus parviflorus*, *Aralia nudicaulis*, or other SBSdw indicators occur on some mesic and submesic sites;
- Many ecosystems on the south side of Little Timothy Mountain have attributes suggesting similarity of this area to the IDFdk including multi-layered stand structures dominated by Douglas-fir, abundant *Calamagrostis rubescens*, common *Arctostaphylos uva-ursi*, and only widely scattered SBSdw indicators such as *Cornus canadensis*, *Rubus parviflorus*, and spruce;
- *Calamagrostis rubescens* is generally abundant on most zonal sites;
- The shrub layer on zonal sites is not as rich in numbers of species nor as well developed in terms of total cover as is typical for the SBSdw1.

Boundaries between the SBSdw2 and the SBSdw1 were drawn based on topographic information to separate the east from the north and south sides of Little Timothy

Mountain. Although field data indicate that the east side is best mapped as SBSdw1 and the north and south sides as SBSdw2, the field data could not be used to define the precise location of the boundaries. This is due in part to the lack of a strong vegetation distinction between the SBSdw1 and SBSdw2 variants.

Field sampling verified the occurrence of SBPSmk below the SBSmc1 on the northern half of the east side of Little Timothy Mountain. Forests on zonal sites in this area are predominantly lodgepole pine with abundant *Calamagrostis rubescens* and other vegetation typical of the SBPSmk. However, unlike SBPSmk forests on zonal sites in most other areas, *Paxistima myrsinites* is common, although not abundant. Although this species is often considered an indicator of the SBSdw1 and wetter climates (Steen and Coupé 1997), other vegetation attributes in this area are clearly more consistent with the SBPSmk than the SBSdw.

SBPSmk/SBSdw Boundary North of Two Mile Lake

Field surveys in the Two Mile Lake to McIntosh Lakes area demonstrated that the SBSdw extends northward from its current boundary with the SBPSmk in two areas. The first area includes the hills northwest of Two Mile Lake. It extends from just northwest of Two Mile Lake to the north side of McIntosh Lakes. The second area is an extension northeast of Two Mile Lake into the SBPSmk as far north as the northern tip of Upper McIntosh Lake. The area between these two extensions is confirmed as SBPSmk although the northern boundary of the SBSdw should be moved southward to just north of Two Mile Lake.

These extensions generally do not follow a consistent elevation contour. However the lower elevation boundary of the western SBSdw extension is 1100 m on the west side of the hills northwest of Two Mile Lake and mostly 1060 m on the east side of the hills. Northward to McIntosh Lakes, the lower boundary is mostly 1040 to 1060 m. No general elevation rule for the eastern extension is evident. The northern and eastern boundary of this extension is generally on the crest of the low ridge south of the Moffat Lakes road.

These two extensions of the SBSdw are apparently a response to increased local relief in an area climatically transitional between the SBPSmk and the SBSdw1. Increased local relief results in increased nocturnal air flow and thus less frequent and less severe nocturnal frosts. The boundaries of the two extensions are largely consistent with increased local relief. The area of SBPSmk between the two extensions that is extended southward to nearly Two Mile Lake is an area of very low relief.

The rationale for these two extensions of the SBSdw is consistent with the rationale outlined above for the reclassification in the Little Timothy Mountain area. Forests in these two extensions of the SBSdw have:

- Very common Douglas-fir in the canopy on zonal sites;
- Very common *Rubus parviflorus* and *Aralia nudicaulis* on zonal sites;
- Occasional subalpine fir and paper birch ;
- Well developed shrub layer, including *Rubus parviflorus* and *Cornus stolonifera*, on subhygric sites.

The boundary of the two extensions was drawn to separate the areas where Douglas-fir, *Rubus parviflorus*, and *Aralia nudicaulis* are common on zonal sites from areas where characteristic SBPSmk vegetation is predominant on zonal sites.

The two northward extensions of the SBSdw in this area should be classified as SBSdw2 rather than SBSdw1. That is, they are two islands of SBSdw2 with SBPSmk on north, east, and west sides and SBSdw1 on south sides. Rationale for classifying them as SBSdw2 is the same as outlined above under reclassifications in the Little Timothy Mountain area. That is:

- Lodgepole pine dominated stands with abundant *Calamagrostis rubescens* but little or no Douglas-fir, *Rubus parviflorus*, *Aralia nudicaulis*, or other SBSdw indicators occur on some mesic and submesic sites;
- *Calamagrostis rubescens* is generally abundant on most zonal sites;
- The shrub layer on zonal sites is not as rich in numbers of species nor as well developed in terms of total cover as is typical for the SBSdw1.

SBSmc1/ESSFwk1 Boundary on Little Timothy Mountain

The biogeoclimatic legacy map includes a small area of ESSFwk1 on the summit of Timothy Mountain on the southern boundary of the study area. As mapped, the lower boundary of this small area of ESSF is not at a consistent elevation. Field surveys by road and by helicopter indicated that the lower elevational limit of the ESSFwk1 on this summit is generally 1480 m on south-facing slopes and 1420 m on north-facing slopes. As a result, the western half of the area mapped as ESSF, below 1420-1480 m, is proposed for reclassification as SBSmc1 and the ESSF polygon is extended considerably further to the east.

Three heights-of-land north of the summit of Little Timothy Mountain and mapped as SBSmc1 on the legacy map, rise to elevations above 1420 m. Field surveys demonstrated the presence of ESSF on two of these heights at elevations above 1440 m. No ESSF occurs on the third height at the very northwest corner of the area currently mapped as SBSmc1.

The principal rationale used to determine the lower boundary of the ESSFwk1 is the common presence of *Rhododendron albiflorum* on zonal sites. Ecosystems at the highest elevations of the third height-of-land have no *Rhododendron* and have abundant *Calamagrostis rubescens*.

SBSdw1/ICHdk Boundary north of Lang Lake

The biogeoclimatic legacy map locates the SBSdw1/ICHdk boundary as a nearly north-south trending line that extends across Lang Lake, placing the eastern two-thirds of Lang Lake in the ICHmk3 and western third in the SBSdw1 (Figure 1). However, field surveys indicated that the generally southwest facing slopes along the entire north side of Lang Lake are within the SBSdw1 rather than the ICHdk. The generally northeast facing slopes on the south side of Lang Lake are correctly placed within the ICHdk. That is, the SBSdw1 extends further eastward on the north side than on the south side of Lang Lake.

The revised boundary extends the SBSdw1 onto the southwest facing slopes above Lang Lake as far as about 3.5 km east of Lang Lake. From the valley bottom east of Lang Lake, the eastern boundary of the SBSdw1 trends northwestward with increasing elevation to an upper elevation of approximately 1200 m. At 1200 m the SBSdw1 borders the SBSmc1.

The proposed new boundary of the SBSdw1/ICHdk, like the current boundary, generally does not follow an elevation contour or other topographic feature. Rather it represents the location on the gradient of increasing precipitation from west to east where the climate is sufficiently wet for the area to be classified as ICHdk. It is reasonable that this location would be slightly further east on warm, relatively dry south-facing slopes than on cooler, wetter north-facing slopes.

The rationale for including the generally southwest facing slopes above Lang Lake in the SBSdw1 rather than the ICHdk is:

- western redcedar is not present in the canopy or regeneration layers of forests on zonal sites;
- *Calamagrostis rubescens* is abundant on zonal sites;
- other ICHdk indicators including *Tiarella* spp., *Rubus pedatus*, and *Streptopus roseus* are absent from zonal sites.

Western redcedar and other ICHdk indicators are present on the generally northeast facing slopes south of the east end of Lang Lake (P16).

It should be noted that western redcedar and *Tiarella* are present on some subhygric sites in the area of the expanded SBSdw1. No site series in the SBSdw1 is currently described as including western redcedar. However, western redcedar has also been noted on subhygric sites in other areas currently mapped as SBSdw1 but near the ICHdk border. The presence of ICH-like vegetation should be expected on wetter than mesic sites near the ICH border.

The revised SBSdw1/ICHdk boundary was drawn to separate area where western redcedar, *Tiarella*, and/or *Rubus pedatus* are common on zonal sites (ICHdk) from areas where they are generally absent. Presence or absence of western redcedar was a principal indicator used in reconnaissance surveys to locate the boundary.

SBSmc1 north of Lang Lake

The biogeoclimatic legacy map locates the eastern boundary of the SBSmc1 north of Lang Lake on a line that is an extension of the SBSdw1/ICHdk boundary (Figure 1). However, field surveys demonstrated that the SBSmc1 extends further eastward for approximately 8 km to meet the descending lower boundary of the ESSFwk1. That is, the lower boundary of the SBSmc1 north of Lang Lake remains at 1200 m as it is north of Murphy Lake further to the west. The upper limits of the SBSmc1 (SBSmc1/ESSFwk1 boundary) north of Lang Lake is essentially correct as drawn, rising from 1240 m at the eastern end of the SBSmc1 to 1340 m north of the west end of Lang Lake.

The rationale for extending the SBSmc1 eastward above the 1200 m contour are:

- *Rubus pedatus* is very common and usually abundant on zonal and wetter sites;
- Western redcedar is absent on all sites;

- *Rhododendron albiflorum* and other ESSFwk indicators are absent on zonal sites;
- The extension maintains a consistent elevation rule for the lower boundary of the SBSmc1 from west to east within the study area.

The SBSmc1/ESSFwk1 boundary at the eastern limits of the SBSmc1 is proposed to be on the 1220 m contour. However, the boundary in this area was difficult to determine due to the extensive logging that has occurred recently. A reconnaissance inspection of a small residual stand on a slightly wetter than mesic site at about 1230 m noted *Valeriana sitchensis* (on a raised microsite) and *Senecio triangularis* (wetter microsite), suggesting that ecosystems at this elevation should be classified as ESSFwk1.

ICHmk3/ESSFwk1 Boundary in Boss Creek Valley

The biogeoclimatic legacy map (Figure 1) shows the ICHmk3 on lower valley slopes nearly as far north as where Boss Creek descends from the west. This would imply that the upper elevation limits of the ICHmk3 rise from about 1240 m in the lower part of the valley to 1300 to 1400 m in upper parts of the valley. However, field surveys indicated a more consistent upper elevation boundary at 1240 m, with higher elevations being within the ESSF. As a result, the northern third of the area classified as ICHmk3 in the Boss Creek Valley (elevations above 1240 m) is reclassified as ESSFwk1.

The rationale for this reclassification includes:

- *Rhododendron albiflorum* and *Valeriana sitchensis* are common on zonal sites above 1240 m in upper and lower parts of valley;
- logical application and consistency of elevation rule; boundaries of biogeoclimatic units generally descend or remain constant in valleys rising into mountain passes.

ESSFwk1/ESSFwc3 Boundary in the Boss Creek Valley

The biogeoclimatic legacy map shows the lower boundary of the ESSFwc3 at a constant 1500 m below the summit of Big Timothy Mountain. However the legacy map shows no ESSFwc3 at elevations above 1500 m on the east side of the valley.

Field surveys by road and helicopter in the Boss Creek valley indicate that the lower limits of the ESSFwc3 descend from 1500 m on the west side of the valley where Boss Creek flows in from the west to about 1450 m near the upper reaches of Ryan Creek. Then they rise again on the east side of the valley to 1500 m. That is, the ESSFwk1 is cut off below the pass near the headwaters of Ryan Creek. The ESSFwc3 is expanded to include the pass at the headwaters of Ryan Creek and elevations above 1500 m on the ridge on the east side of the valley.

The rationale for expanding the ESSFwc3 is that ecosystems on zonal sites in the expanded area generally have:

- A very dense cover of *Rhododendron albiflorum*;
- Relatively open forest canopies, dominated primarily by subalpine fir;
- Poor representation of feathermosses (*Pleurozium schreberi*, *Ptilium crista-castrensis*, and *Hylocomium splendens*).

ICHdk / ICHmw3 in the Pendelton Lakes area

The biogeoclimatic legacy map shows area around Pendelton Lakes as ICHdk with areas south and north of the lakes as ICHmw3.

Field surveys by road and helicopter and review of forest cover maps indicate that the areas immediately surrounding the Pendelton Lakes below 1300 - 1400 m are more appropriately mapped as ICHmw3. The revised boundary for the ICHmw3 extends west to near Tommy Archie Lake in an approximate north-south line from the 900 m contour east of Deception Creek to just south of Spanish Creek and then east to the height of land north of the Pendelton Lakes

The principal rationale for including this area as an expansion of the ICHmw3 rather than as ICHdk or ICHmk3 is:

- Late seral and climax stands with abundant hemlock and red cedar are present;
- A well developed, near-continuous cover of feathermosses;
- Lack of well developed shrub layer dominated by *Amelanchier alnifolia* and *Rubus parviflorus*.

ICHdk/ICHmw3 along eastern portion of Spanish Creek

The biogeoclimatic legacy map locates the eastern boundary of the ICHdk as a northeast trending diagonal line from the eastern end of the height of land north of Pendelton Lakes to the ESSFwk1 north of Spanish Creek. East of this line is mapped as ICHmw3.

Field surveys by road and helicopter and review of forest cover information indicate that western red cedar is common in the both the overstory and understory of many stands in this area. Western hemlock was only infrequently encountered and only as scattered subcanopy trees near the eastern edge of the study area. This area best fits the concepts of the ICHmk3.

This proposed new ICHdk/ICHmk3 boundary, like similar boundaries in the project area, generally does not follow an elevation contour or other topographic feature. Rather it represents the location on the gradient of increasing precipitation from west to east.

The rationale for this reclassification includes:

- The absence of western hemlock;
- The presence of relatively abundant western red cedar in the canopy of many stands;
- The lack of a vigorous shrub layer dominated by *Amelanchier alnifolia*, *Rubus parviflorus* and other drier climate shrubs;
- A well developed, near-continuous cover of feathermosses.

AT (ATp) east of Redfern Creek

The biogeoclimatic legacy map locates the lower boundary of the AT zone, that also includes alpine parkland forests (ESSFwcp3), at inconsistent elevations ranging from approximately 1800 m to over 1940 m. Steen and Coupé (1977) describe the lower boundary as occurring at about 1800 m for this area.

These areas lack road access and were not visited. Photo interpretation and review of the East Cariboo Mountains TEM project BGC boundaries for this area indicate that the lower limit for this zone is at approximately 1900 m.

The rationale for raising the lower boundary of the AT zone is:

- General lack of continuous forests above 1900 m on all aspects;
- more consistent with East Cariboo TEM lines.

ESSFwk1 east of McNeil Lake

The biogeoclimatic legacy map includes an area of ESSFwk1 above about 1220 m on the summit of a long ridge east of McNeil Lake. As mapped, the lower boundary of the ESSFwk1 on this ridge is consistent with the lower boundary as described in Steen and Coupé (1997). However field surveys by helicopter and a review of forest cover information indicated that the lower elevational boundary of the ESSFwk1 is significantly higher. It was observed to occur above 1400 m on warm aspects and above 1320 m on cool aspects.

The rationale for raising the lower boundary of the ESSFwk1 in this area is:

- The presence of abundant *Rhododendron albiflorum* above these elevations;
- The lack of Douglas-fir and western red cedar above these elevations;
- The dominance of Engelmann spruce and subalpine fir above these elevations.

ESSFdc2 on isolated hilltops south of Canim Lake

The legacy map for map 92O077 includes areas of ESSFdc2 on two hilltops between McNeil Lake and Donnely Lake above about 1400 m. This is consistent with elevation of the ESSFdc2 east of Bowers Lake.

Field observations and review of forest cover information, however, indicate that these areas have characteristics that are more consistent with the SBSmm. The lower boundary of the SBSmm in these areas is 1260 m on cool aspects and 1380 m on warm aspects.

The rationale for this reclassification include;

- The lack of ESSF indicators including *Rhododendron albiflorum*, *Valeriana sitchensis* and *Veratrum viride* from all sites;
- The frequent occurrence of Douglas-fir, especially on warm aspects;
- The presence of subalpine fir and *Rubus pedatus*.

Elevation Rules for Biogeoclimatic Units in the Canim Lake Study Area

As indicated previously, many of the biogeoclimatic unit boundaries within the study area do not follow elevation contours but rather reflect the influence of topographic features within a gradient of increasing precipitation from west to east. However, some biogeoclimatic units do follow elevation “rules”. These elevations are listed in the following table.

Table 1. Elevation “rules” for biogeoclimatic units within the Canim PEM study area

BGC Unit	Lower Elevation (m)		Upper Elevation (m)		Comments
	North	South	North	South	
ESSFwc3	1500	1500	1900	1900	Lower elevation descends to 1440 m at headwaters of Ryan Ck and near headwaters in some valleys east of Hendrix Lake
ESSFwk1 – Little Timothy Mt	1420	1480	n.a.	n.a.	
ESSFwk1 - west of Lang Lk. On Big Timothy Mt	n.a.	1340	1500	1500	
ESSFwk1 - east of Lang Lk on Big Timothy Mt	n.a.	1240	1500	1500	Upper elevation drops to 1440 m at headwaters of Ryan Ck
ESSFwk1 – Hendrix valley	1260 (east)	1300 (west)	1500	1500	
ESSwk1 – Redfern and upper Deception creek valleys	1300	1300	1500	1500	
ESSFwk1 – Spanish Ck valley	1240	1240	1500	1500	Lower elevation rises to 1260 – 1300 m east of Pendleton Lakes
SBSmc1 – Little Timothy Mt	1320	1320-1360	1480	1420	Lower boundary drops to 1280 on east-facing slopes
SBSmc1 – North of Murphy Lake	n.a.	1200	n.a.	1340	Upper boundary drops to 1240 at eastern limits
ICHmk3 – Boss Crk Valley	n.a.	n.a.	1240	1240	
ICHmk3 – Spanish Creek Valley	n.a.	n.a.	1240	1240	
ICHmw3 – Spanish Creek Valley – Pendleton Lakes	n.a.	n.a.	1400	1400	Upper boundary raises to 1420 on N aspect and 1460 on S aspects on large hill S of Pendleton Lakes
SBSmm – east of Donnely Lake	n.a.	1200 (west)	1400	n.a.	

Other Proposed Changes

Several other revisions to the biogeoclimatic legacy map have been made but are primarily minor biogeoclimatic boundary revisions with relatively little effect on the

map. Most of these revisions were the result of more logical application and consistency of elevation rules.

Quesnel PEM area

Several principal changes to the biogeoclimatic legacy map for the study area are proposed. These are primarily biogeoclimatic classification changes that affect significant areas and do not include the many small mapping changes that reflect minor adjustments to boundary elevations. The rationale for each of these principal proposed changes is presented here.

SBSmc2 and SBPSdc South of Batnuni Lake.

The biogeoclimatic legacy map identifies an SBSmc2 polygon on the hills immediately south of Batnuni Lake in the northwestern-most corner of the study area (Fig. 1a). This polygon is shown as bordered on the north and east by the SBPSdc and on the west, in the Northern Interior Forest Region, by the SBSmc3.

Field surveys identified a sequence of three biogeoclimatic units from the valley bottom near Batnuni Lake to the upper elevations of the hills south of Batnuni Lake. Near the east end of Batnuni Lake the SBSdw2 occurs from the valley bottom to an elevation of 1040 m. The upper limit corresponds generally to top of the moderately steep valley slope, where it breaks onto the more gently sloping upper elevations of the hills. In addition, a significant area of this SBSdw2 polygon extends southeastward along a ridge between the Blackwater and Euchiniko rivers at elevations above about 960 m. This ridge is included in the SBPSdc on the current legacy map.

The principal rationale for including these slopes and the ridge in the SBSdw2 rather than the SBPSdc as presently mapped are:

- Common Douglas-fir in the canopy and regeneration layers of zonal sites and abundant Douglas-fir on some south-facing slope submesic ecosystems ;
- Common *Aralia nudicaulis* and usually abundant *Calamagrostis rubescens* in the herbaceous layer on zonal sites;
- Abundance of shrubs including *Rubus parviflorus*, *Lonicera involucrata*, and *Cornus stolonifera* on subhygric sites.

The SBSmc2 occurs as a band above the SBSdw2 from about 1040 m to 1120-1140 m on the north- and east-facing slopes above Batnuni Lake. The vegetation of zonal sites here is generally consistent with the SBSmc2 as presently mapped and is characterized by a moss dominated undergrowth but with only very small amounts of *Rubus pedatus*. In contrast to typical SBSmc2, black spruce is common on subhygric and wetter sites. Since this band is small and transitional to the SBSmc3, it could for practical reasons be combined with the SBSmc3 that occurs at higher elevations.

Most of the mid and upper elevations of the area currently mapped as SBSmc2 should be reclassified as SBSmc3. The SBSmc3 occurs above the narrow band of SBSmc2 at an elevation of approximately 1120 m to the highest point surveyed on the hills at approximately 1360 m. At these upper elevations the stands include considerable

subalpine fir and appear to be transitional to ESSF. However, no definitive ESSF indicators were noted.

The principal rationale for reclassifying most of the area as SBSmc3 rather than as SBSmc2 are:

- Black spruce is common in stands on mesic sites and is often dominant on wetter sites;
- *Petasites palmatus* is very common on zonal sites;
- *Festuca occidentalis* is common and *Rubus pedatus* is very uncommon on zonal sites.

It should be noted that, at the western end of the area currently proposed to be reclassified as SBSmc3, zonal sites that were surveyed have common *Rubus pedatus* and less black spruce (*G17*). *Petasites* is still present. This suggests that the western portion of the proposed SBSmc3 polygon is transitional to the SBSmc2.

No band of SBSmc2 is proposed below the south side of the SBSmc3. Access to this area is very limited. A helicopter reconnaissance confirmed the presence of SBPSdc on the south facing slopes below the proposed SBSmc3.

Eastward Extension of SBSdk from Northern Interior Forest Region

The current biogeoclimatic mapping of the Northern Interior Forest Region includes an area of SBSdk in the valley bottom around Klunchatistli Lake. Much of this area has been historically repeatedly burned and is currently forested mostly with aspen. Based on field surveys and information provided by the Prince Rupert Region field guide, a very small area in the valley bottom in this portion of the study area appears to best fit the SBPSdk.

The rationale for extending the SBSdk east into the study is:

- The presence of *Lathyrus nevadensis* on mesic and near-mesic sites
- The abundance of aspen forests on near-mesic sites

It should be noted that during field surveys no late seral/climax coniferous forests were observed on zonal sites and subzone determination is based on disclimax vegetation and discussions with Northern Interior Forest Region ecologist. This is likely the most easterly distribution of the SBPSdk and is likely to be transitional in nature.

Eastward Extension of the SBPSmc

The current biogeoclimatic legacy map cuts off the eastern extent of the SBPSmc at Kluskus Lakes. However, the SBPSmc was found during field surveys to extend further eastward as a band below the north-facing slopes of the MSxv from Kluskus Lakes to the upper Bazaeko River drainage, southwest of Fishpot Lake. This band generally occurs above 1140 m in the west and 1060 to 1100 m in the east. Locally elevations sometimes vary according to local topographic features. The upper elevations of the band are generally about 1220 m, where the proposed SBPSmc borders the MSxv. The SBPSmc

generally does not occur below the SBSmc2, except near the boundary with the MSxv. Below the SBSmc2, the SBPSmc is largely replaced by the SBPSmk.

This proposed SBPSmc band below the MSxv is currently mapped as SBPSdc on the legacy map. The principal reasons for including this band in the SBPSmc rather than the SBPSdc are:

- The abundance of lichens, primarily *Cladina* spp., and presence of *Arctostaphylos uva-ursi*, as well as the common occurrence of lodgepole pine regeneration confirms that the area is within the SBPS zone;
- *Calamagrostis rubescens* is absent or incidental in the undergrowth;
- The undergrowth is strongly dominated by a carpet of feathermosses and the number of vascular species with >1% ground cover is small, even in mature stands;
- Black spruce is very common on sites of all moisture regimes.

The SBPSmc was distinguished from the SBPSdc primarily by the absence, or only incidental occurrence of *Calamagrostis rubescens*, relatively species-poor shrub and herb layers, and a well developed moss layer.

East of the Kluskus Lakes in the Coglistiko drainage area, the SBPSdc as presently mapped occupies elevations below the SBPSmc.

Near its eastern extent in the Bazaeko River drainage, the SBPSmc includes relatively large areas on coarse, gravelly soils. These sites have abundant lichens and *Arctostaphylos uva-ursi*. Coarse, rocky soils on warm south-facing slopes have abundant *Arctostaphylos uva-ursi* and lichens and some *Calamagrostis rubescens*.

SBPS in the lower Clisbako River Drainage

The biogeoclimatic legacy map in the lower Clisbako River drainage area (Figure 2) and 1b, map sheet 93B-116 and 117) shows an SBPSdc polygon bordered primarily by the MSxv. On its eastern boundary in the Clisbako River valley, this SBPSdc polygon is shown as bordered by a large area of SBPSmk. Field surveys by road and helicopter have resulted in several proposed changes in this area.

First the MSxv lower boundary in the Clisbako River valley is reduced to about 1220 m. This is consistent with the generally 1240 m lower boundary north and south of the valley. Most of the small polygon classified as SBPSdc on the legacy map is, as a result, reclassified as MSxv.

Rationale for this mapping change is that surveyed zonal sites at elevations above 1220 m have MSxv indicators, especially abundant *Empetrum nigrum*. *Vaccinium scoparium* is apparently not common in this area.

Field surveys in the lower Clisbako River drainage at elevations below 1220 m suggest that a large portion of the SBPS in this area is SBPSxc, rather than SBPSdc or SBPSmk. This includes the area within the small polygon mapped as SBPSdc as well as a relatively large area of SBPSmk, which occurs on the relatively low elevation, low relief terrain crossed by the lower Clisbako River before it turns north. This low relief area is largely bounded by higher terrain of the SBPSmk to the north, east, and south. This area appears to be a cold basin that is very dry due probably to an intense rainshadow of the high terrain to the west.

Furthermore, it is proposed that the newly classified SBPSxc be extended south from the Clisbako River drainage into the upper Aneko River area that is currently classified as SBPSdc. This southward extension links the SBPSxc along the Clisbako River to the currently mapped SBPSxc north of Nazko and Tanilkul lakes. The reclassification of the SBPSdc in the upper Aneko River area to SBPSxc includes only the portion of the SBPSdc that is immediately east of the MSxv and generally below 1140 m. Field surveys in this upper Aneko River area indicate that this area is better classified as SBPSxc than as SBPSdc.

The rationale for reclassifying these areas as SBPSxc rather than SBPSdc or SBPSmk is:

- The moss-lichen layer on zonal sites is strongly dominated by lichens with relatively little cover of feathermosses;
- *Arctostaphylos uva ursi* and *Juniperus communis* are abundant on zonal sites ;
- *Calamagrostis rubescens* cover is much less continuous and vigorous than in the SBPSdc and especially the SBPSmk ;
- Lodgepole pine stands on zonal sites are relatively open with abundant pine regeneration but little or no spruce.

SBSdw2 in the Nazko and Blackwater Valleys South of the Euchiniko River

The biogeoclimatic legacy map shows a long thin peninsula of the SBSdw2 extending southward from the Northern Interior Forest Region boundary and the Euchiniko River to

just south of Marmot Lake near the village of Nazko (Figure 2). The classification of this area as SBSdw2 is based largely on the presence of Douglas-fir dominated stands on valley side slopes.

Based on field surveys, it is proposed that the extent of the SBSdw2 in this area be reduced and partially reclassified as SBPSdc. The peninsula of SBSdw2 extending south from the Northern Interior Forest Region should be terminated about 6 km north of the confluence of the Nazko and Blackwater rivers. From there, the valley bottom and lower valley slopes should be reclassified as SBPSdc to about Rainbow Lake. From Rainbow Lake to about Marmot Lake, a long, thin island of SBSdw2 occurs on the west side of the Nazko River valley from the valley floor to an elevation of about 920 m. A second, larger island of SBSdw2 occurs on the higher terrain northeast of Redwater Lake at elevations above about 1020 m. Both of these islands are within the area currently mapped as SBSdw2.

Decisions regarding the most appropriate biogeoclimatic classification of this area are challenging due to the transitional climate and complexity of the terrain. Climatically, the entire SBSdw2 peninsula on the legacy map seems to be just on the edge between SBPSdc and SBSdw2 climates. As a result, local steep slopes with good air drainage and few frosts, support Douglas-fir dominated stands. Micosites on these slopes with some subsurface seepage also support shrub and herb layers with SBSdw2 characteristics such as common *Rubus parviflorus*. Steep slopes that are mesic or drier often support Douglas-fir dominated stands with some IDF-like characteristics. In contrast, mesic sites on gentle slopes often have little or no Douglas-fir and have shrub and herb layers characteristic of the SBPSdc. The classification challenge is enhanced by the dominance of sandy soils in the valley bottom. Level sites here are dry due to the sandy soils and are likely also cold due to nocturnal cold air ponding. As a result, their SBPSdc-like vegetation has been interpreted in the past as cold, submesic sites within the SBSdw2.

The proposed reclassification of large portions of the currently mapped SBSdw2 as SBPSdc is based on examination of sites with loamy soils on gentle slopes leading into the valley. For example, such sites are relatively extensive on the gently sloping terrain on the west side of the valley, south of where the Blackwater River enters from the west. The rationale for including these sites, considered to be zonal, in the SBPSdc are:

- Douglas-fir is absent or at most incidental (may be present on other, steeper sites);
- SBSdw indicators such as *Rubus parviflorus*, *Aralia nudicaulis*, and *Paxistima myrsinites* are absent;
- *Arctostaphylos uva-ursi* is common;

Recommendations to retain two islands of SBSdw2 as described above are based on similarities of ecosystems to the SBSdw2 and the fact that zonal or most forest sites in these areas could reasonably be managed for Douglas-fir. The recommended SBSdw2 island on the higher terrain northeast of Redwater Lake is based on the frequent presence of *Rubus parviflorus*, *Aralia nudicaulis*, and *Paxistima myrsinites* on zonal sites and the presence of scattered Douglas fir in the forest canopy. This area is clearly transitional between the SBSdw2 and the SBPSmk and does not fit either concept well. Based on some SBSdw2 indicators and the likely management of many sites for Douglas-fir, it was felt best to leave it as SBSdw2. It could be considered an eastern outlier of the proposed extension of the SBSdw2 from the Batnuni Lake area as described above.

The second island, a long, thin band of SBSdw2 south of Rainbow Lake on lower valley slopes includes very few zonal ecosystems but many Douglas-fir stands, often with SBSdw indicators such as *Aralia nudicaulis*. Since there are few zonal sites, biogeoclimatic classification is problematic. However, silviculture and other management practices would likely be consistent with guidelines attached to the SBSdw2 classification. As a result, it was considered best to map it as SBSdw2.

If a large portion of the SBSdw2 is reclassified as SBPSdc as proposed here, then the SBPSdc will include forested ecosystems with a Douglas-fir dominated canopy. The existing guide to forested ecosystems (Steen and Coupé 1997) does not identify a Douglas-fir dominated site unit. As a result, it is proposed that a new site unit be added to the SBPSdc. It occurs primarily on mesic and submesic sites on moderate to steep (>20%) east-, south-, and west-facing slopes, in climates transitional to the SBSdw2. Douglas-fir dominates, or is at least well represented in the forest canopy and is usually present in the regeneration layers. The undergrowth is characterized by species characteristic of mesic to submesic sites in the SBPSdc.

SBPSmk and SBPSdc South and West of Snaking River.

The biogeoclimatic legacy map shows a relatively large island of SBPSdc in the basin of the Snaking River east of the Nazko River valley (Figure 2). The SBPSmk is shown at elevations above the SBPSdc on the north, east, and south sides of the basin.

Field surveys in this area demonstrated that the boundary between the SBPSdc and SBPSmk is higher than indicated on the legacy map. As a result, relatively large areas that are currently mapped as SBPSmk are proposed for reclassification as SBPSdc. These changes are most significant on the west side of the Nazko River valley and south of the Snaking River basin near the headwaters of the Snaking River. West of the Nazko River valley, the proposed lower boundary of the SBPSmk is raised to 1120 m. This change, together with the reduction in the area of the SBSdw2 in the Nazko River valley results in continuity between the SBPSdc in the Snaking River basin and the SBPSdc west of the Nazko River valley.

On the south side of the Snaking River basin, the lower boundary of the SBPSmk is raised to 1080 m. As a result, the Nazko River valley and the lower Clisbako River valley in the area currently mapped as SBPSmk is reclassified as SBPSdc. The SBPSdc extends southward through the Nazko River valley to the large area of SBPSdc to the south, including the Brown Lake area.

The principal rationale for raising the lower boundary of the SBPSmk are based on characteristics used to distinguish the SBPSmk from the SBPSdc in the Nazko area. That is, zonal ecosystems with characteristics of the SBPSdc dominate the landscape at higher elevations than indicated on the legacy map for this area. Characteristics used to distinguish the SBPSdc and SBPSmk are shown in Table 1. These characteristics do not necessarily apply to areas east of the Snaking River basin.

Table 1. Characteristics used to distinguish SBPSdc and SBPSmk zonal ecosystems in the Nazko River area.

Attribute	SBPSdc	SBPSmk
Moss – Lichen Layer	Discontinuous cover of mosses, moss mat thin (generally < 2 cm) <i>Ptilium crista-castrensis</i> cover < 3%; <i>Cladina</i> and <i>Cladonia</i> lichens common (generally 0.5-2% cover))	Continous cover of mosses; moss mat thicker; <i>Ptilium crista castrensis</i> cover usually > 3%; <i>Cladina</i> and <i>Cladonia</i> lichens not common (cover generally < 0.5%)
Shrub layer	<i>Vaccinium membranaceum</i> and <i>Rubus parviflorus</i> absent; <i>Viburnum edule</i> absent or incidental).	<i>Vaccinium membranaceum</i> usually present (G26, G28, G60, N8-22-3) but generally abundant only at elevations well above boundary; <i>Rubus parviflorus</i> occasionally present but never abundant; <i>Viburnum edule</i> often present .
Herb layer	<i>Goodyera oblongifolia</i> and <i>Rubus pubescens</i> usually absent; <i>Arctostaphylos uva-ursi</i> cover usually > 1%.	<i>Goodyera oblongifolia</i> or <i>Rubus pubescens</i> commonly present (G26, G28); <i>Arctostaphylos uva-ursi</i> cover usually < 1%.
Tree layers	Forest canopy most often relatively open; many subcanopy stems (A3 and B1 layers) usually present	Forest canopy less open and often closed; few subcanopy stems typically present; A2 layer more clearly dominant.

SBPSdc Surrounding and North of Batnuni Lake

The biogeoclimatic legacy map indicates that the area surrounding and north of Batnuni Lake to the regional boundary are SBPSdc. North of this area in the Northern Interior Forest Region the area is mapped as SBSmc3.

Field surveys identified that above approximately 900 m the area is more appropriately mapped as SBPSmk. Zonal site vegetation of this area is more consistent with the SBPSmk.

The principal rationale for replacing the SBPSdc with the SBPSmk in this area are based on characteristics used to distinguish the SBPSmk from the SBPSdc in other parts of the study area. Characteristics used to distinguish the SBPSdc and SBPSmk are shown in Table 1 above.

It should be noted that the SBPSmk in this area is transitional to the SBPSdc and SBSmc3 with black spruce often occurring on mesic and near-mesic sites. Future revisions to the site series classifications should investigate whether a separate variant of the SBPSmk is warranted for this area. Of significance as well are the several treed wetlands in this area containing tamarack of low vigour.

SBPSmk Southwest of Milburn Mountain

The biogeoclimatic legacy map shows the SBPSmk bordering the west side of the small SBSmc2 polygon on the summit of Milburn Mountain (Fig. 1b). On the southeast and northwest sides of Milburn Mountain, the SBSmc2 is bordered by the SBSdw2.

Field surveys indicated that the SBSdw2 extends around onto the west side of Milburn Mountain, between the currently mapped SBSmc2 polygon and the SBPSmk to the west. The upper boundary of the SBSdw2 on the west side of the mountain is approximately 1220 m but the boundary with the SBPSmk to the west does not follow a consistent elevation contour. Rather it appears that the SBSdw2 occurs on relatively high relief terrain in this area of climatic transition between the SBSdw and SBPSmk. The relatively high relief terrain may improve cold air drainage and reduce the frequency and intensity of nocturnal frosts and thereby result in a climate more characteristic of the SBSdw2 than the SBPSmk. The proposed SBSdw2 extends about 2.5 to 6 km west of the currently mapped SBSmc2. The boundary was drawn following several survey transects.

The reclassification of the SBPSmk on the west side of Milburn Mountain as SBSdw2 results in linking the SBSdw2 polygons northwest and southeast of Milburn Mountain.

The rationale for placing this previously mapped portion of the SBPSmk into the SBSdw2 is:

- Douglas-fir is common and very often dominates stands on zonal sites;
- White birch is often present in stands;
- *Rubus parviflorus* is very common in the shrub layer on zonal sites;
- *Aralia nudicaulis* is very common in the herb layer on zonal sites;
- *Calamagrostis rubescens* is generally less abundant and less vigorous than in the SBPSmk;
- *Rubus parviflorus* and *Cornus stolonifera* are often abundant on subhygric sites.

SBSmc2 on Milburn Mountain

The biogeoclimatic legacy map shows elevations above roughly 1200 m to be within the SBSmc2. However, field surveys at an elevation of about 1300 m on the gentle south-facing slopes just below the summit of Milburn Mountain detected no conclusive SBSmc2 indicators. Vegetation on zonal sites was dominated by lodgepole pine over an undergrowth with *Alnus*, *Calamagrostis rubescens*, *Vaccinium membranaceum*, and *Paxistima myrsinites* (G99). No *Rubus pedatus* was seen in the area. A transect about 150 m long through the forest revealed only a small number (<10) subalpine fir, all in the subcanopy and mostly less than 2 m tall. This vegetation, which is more characteristic of the SBPSmk than the SBSmc2, was predominant down to the upper boundary of the SBSdw2 at approximately 1220 m. Just above the boundary, *Calamagrostis rubescens* was more abundant than at higher elevations.

Based on these surveys of Milburn Mountain from the south, it is proposed that the southern half of the small polygon on the summit of the mountain that is currently mapped as SBSmc2 should be reclassified as SBPSmk. However, the presence of subalpine fir, relatively low cover of *Calamagrostis rubescens*, and domination of the undergrowth by mosses, indicate that, if the area is mapped as SBPSmk, it is also transitional to the SBSmc2. Subalpine fir in both the overstory and understory are

common on the north side of Milburn Mountain and stands here are more characteristic of the SBSmc2. The revised boundary of the SBSmc2 in this area was based on field observations and the distribution of subalpine fir on forest cover maps.

SBPSdc/SBPSmk Boundaries East of Puntchesakut Lake

Field surveys demonstrated that the upper boundary of the SBPSdc, where it meets the SBPSmk east of Puntchesakut Lake, is higher than indicated on the biogeoclimatic legacy map. The boundary drops from about 980 m north of the lake and 1000 m south of the lake to 880 to 900 m east of the lake. The result is that the SBPSdc extends eastward from Puntchesakut Lake to the boundary with the SBSdw2. This extension breaks the continuity of the SBPSmk northwest and southeast of Puntchesakut Lake.

The SBPSdc) in this area was distinguished from the SBPSmk using the same vegetation characteristics that are listed in Table 1 except for moss layer thickness and continuity. In this more easterly area, the moss layer is often thicker (>2 cm) and more nearly continuous than it is in the Nazko area. In addition, the forest canopy is generally less open and pine is less abundant in the A3 and B1 layers than it is in the Nazko area. However, the canopy in SBPSdc stands still tends to be less closed and subcanopy stems more abundant than in the SBPSmk. *Vaccinium membranaceum* seems to be a better distinguishing attribute here than in the Nazko area.

Extension of SBPSmk into Upper Deserters Creek Area

The biogeoclimatic legacy map shows the SBPSmk occurring below the west and north sides of the SBSmc2 polygon southeast of Puntchesakut Lake. However, the east side of this polygon is bordered only by the SBSdw2.

Field surveys in the upper Deserters Creek area, on the east side of the SBSmc2 polygon, indicated that a small area of the SBSdw2 in this area should be reclassified as SBPSmk. This reclassification and mapping should bring the SBPSmk from the north side of the SBSmc2 polygon down the east side of the polygon to the southern extent of the Deserters Creek drainage area. The upper boundary of the SBPSmk in this area, where it borders the SBSmc2 is 1040 m while the lower boundary, where it meets the SBSdw2, is 960 to 1000 m. Although the elevation range is small, it includes a small basin drained by a southern tributary of Deserters Creek. The climate of this small basin appears to be significantly affected by cold air ponding, resulting in a colder climate and SBPSmk ecosystems. Outside of this basin and north of Deserters Creek, ecosystems are transitional between the SBPSmk and the SBSdw2.

The rationale for extending the SBPSmk from the north side of the SBSmc2 polygon into the upper Deserters Creek area is that vegetation more characteristic of the SBPSmk than the SBSdw predominates on zonal sites, especially in the small basin. However, *Calamagrostis rubescens* cover is generally low for the SBPSmk. Characteristics that distinguish this vegetation from that of the SBSdw2 are:

- Douglas-fir infrequent on zonal sites;
- Characteristic SBPSmk species present;
- *Rubus parviflorus* and *Aralia nudicaulis* absent or incidental

SBSmh Boundary South of Quesnel

The upper elevation of the SBSmh, where it borders the SBSdw, is generally about 750 m (Steen and Coupé 1997). The biogeoclimatic legacy map indicates that the upper boundary on the west side of the Fraser River near Quesnel is about 600 m, rising to about 650 m south of Quesnel.

Field surveys on the west side of the Fraser River south of Quesnel indicate that the upper boundary of the SBSmh rises from about 600 m near Quesnel to about 740 m near the canyon of the lower Narcosli River. The effects of this change are greatest south of the Narcosli River canyon, where a moderate area of SBSdw2 on the legacy map is proposed for reclassification as SBSmh.

Criteria used to distinguish the SBSmh from the SBSdw in this area are:

- Lodgepole pine very uncommon on zonal sites;
- White birch common on zonal sites ;
- *Calamagrostis rubescens* generally sparse or absent on zonal sites;
- *Corylus cornuta* usually present on zonal sites;
- Rich and well developed shrub layer present on zonal sites, with *Shepherdia canadensis*, *Viburnum edule*, *Spiraea betulifolia*, *Amelanchier alnifolia*, *Rosa acicularis*, and *Mahonia aquifolia* .

A large portion of the SBSmh in this area is private land and much of the forest has been cleared for agriculture purposes.

MSxv polygon south of Tzenzaicut Lake

The legacy map shows the top of the hill (above 1240 m on N aspect and above 1300 m on S aspect) south of Tzenzaicut Lake to be MSxv. Field surveys however indicated this area to be more similar to the SBSmc2. No MSxv indicators (*Vaccinium scoparium* and *Empetrum nigrum*) were observed. Subalpine fir was present and especially abundant on N aspects.

Rationale for reclassifying this polygon as SBSmc2 is;

- Neither *Vaccinium scoparium* or *Empetrum nigrum* were present,
- Subalpine fir, *Vaccinium membranaceum* are common;
- *Rubus pedatus* scattered over most of polygon.

SBPSmk South of Tzenzaicut Lake

The biogeoclimatic legacy map shows that much of the area south of Tzenzaicut is mapped as SPSmk. Field surveys, however indicate that a second polygon of SBSmc2 occurs above 1240 m on the north side of the ridge. The boundary on the south side of the ridge does not follow a particular elevation contour but substantially follows the height of land. Reclassification of this area is based on the presence of subalpine fir and *Rubus pedatus*, low cover of *Calamagrostis rubescens* and a near-continuous cover of feathermosses.

SBSmc2 boundary north of Tzenzaicut Lake

The biogeoclimatic legacy map indicates that the upper boundary SBPSmk north of Tzenaicut Lake is about 1200 m. Field observations indicate that the boundary rises from 1200 m on the east slopes of this height of land to 1280 m on the south end of this height of land. Below this elevation the vegetation is typical of the SBPSmk with little or no subalpine fir and *Rubus pedatus* and with abundant *Calamagrostis rubescens*.

SBSdw2/SBPSmk2 boundary south of Tzenaicut Lake

Field surveys of the area south of Tzenaicut Lake that the SBSdw2/SBPSmk boundary on the biogeoclimatic legacy map should be moved two to six kilometers west of its present location. The northern section of this revised boundary largely follows the 1240 m contour. South of Ramsey Creek the boundary follows no particular elevation. The rationale for moving the boundary to the west of its present location is that vegetation is more characteristic of the SBSdw2 than the SBPSmk.

Criteria used to distinguish the SBSdw2 from the SBPSmk in this area are:

- Douglas-fir is common in both overstory and understory layers;
- *Rubus parviflorus* and *Aralia nudicaulis* scattered throughout the area.

Other Proposed Revisions

Many other smaller revisions that have only minor effects on the overall biogeoclimatic legacy map are proposed for the study area. These revisions are primarily the result of minor changes to elevation boundaries of biogeoclimatic units and rationalization of the boundaries with the greater topographic detail of the TRIM maps.

Elevations of Biogeoclimatic Unit Boundaries in the West Quesnel Study Area

Some of the biogeoclimatic unit boundaries within the study area do not conform to elevation boundaries but rather reflect the climatic gradients from west to east and south to north within the study area as well as the local influence of topographic features on these climatic gradients. However, most biogeoclimatic unit boundaries in the study area generally conform to elevation contours. However, the elevations of these boundaries typically change from west to east and from south to north. In general, they decline from west to east and from south to north. In addition, the elevation of boundaries often respond to local influences such as the head of a valley, a local rainshadow, or level, cold air accumulation terrain. As a result, simple elevation rules that apply to all or most of the study area are only generalizations and are frequently not consistent with local conditions. In the following table, typical elevations are provided for each biogeoclimatic unit, subdivided when necessary according to geographic sections of the study area. Localized elevations are shown on the revised biogeoclimatic map.

For purposes of these elevation descriptions, the study area is subdivided into several geographic areas or subunits. The **Blackwater North subunit** lies between the Euchiniko and Blackwater rivers and includes the hills south of Batnuni Lake. The

Euchiniko River North subunit includes all portions of the study area north of the Euchiniko River to the Northern Interior Forest Region boundary. The **Pantage Lake subunit** includes all portions of the study area north of the height of land between the Nazko and Blackwater roads to the Northern Interior Forest Region boundary. The **Bazaeko-Coglistiko subunit** includes all portions of the study area west of the Nazko River valley, south of the Blackwater River and north of the Clisbako and Aneko river drainages. The **Clisbako subunit** includes the Clisbako and Aneko river drainages. The **Snaking River subunit** includes all portions of the study area east of the Nazko River valley to the height of land east of the Snaking River. It includes the Udy Creek and Snaking River headwaters. The **Tibble Creek subunit** includes all portions of the study area east of the Snaking River subunit to the floor of the Baker Creek basin, including Puntataenkut Lake. The **Mount Creek subunit** includes all portions of the study area from the bottom of the Baker Creek basin to the height of land east of Puntataenkut Lake, including the headwaters of Mount Creek and the west side of Milburn Mountain. The **Narcosli subunit** includes all portions of the study area east of the Mount Creek subunit to the Fraser River. The **Tzenzaicut Lake subunit** includes all portions of the study area south and east Tzenzaicut Lake to Twan Lake. The **Ramsey Creek subunit** includes all portions of the study area from the height of land north of the Ramsey Creek to the southern boundary of the study area and east of the upper Nasko River Valley. The **Chilcotin River subunit** includes all portions of the study area west of the Clisbako and Aneko rivers to the study area's western boundary and south of the Bazaeko-Coglistigo subunit to the study area's southern boundary. Additionally, each subunit is divided into north and south sections in order to describe elevation differences related to latitude.

Table 2. Elevations of biogeoclimatic unit boundaries within the study area.

Biogeoclimatic Unit / Geographic Area	Lower Boundary Elevation (m)	Upper Boundary Elevation (m)
Atp Itcha Mts	1760-1800	
ESSFvx1 Itcha Mts Chilcotin River	1600-1640 1640	1800 1780-1820
MSxv Bazaeko-Coglistiko Tibble Creek south Snaking River south Clisbako Ramsey Creek Chilcotin River	1180-1220 1220 1220-1240 1240 1220-1280 1260-1340	n.a. n.a. n.a. n.a. 1640
SBSmc2 Euchiniko River North Blackwater North Narcosli North Tibble Creek North Narcosli South Snaking River South Tibble Creek South Mount Creek North Mount Creek South Snaking River North Bazaeko-Coglistiko Tzenzaicut Lake	1020-1040 1040 1040-1100 1100-1120 1100-1140 1120-1180 1160-1200 1160-1200 1180-1220 1180-1200 1180-1200 1240-1300	1360 1140 n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a.
SBSmc3 Blackwater North	1140	n.a.
SBPSmk Euchiniko River North Narcosli North Tibbles Crk North Tibbles Crk South Mount Crk North Mount Crk South Snaking R North Snaking R South Bazaeko-Coglistiko South Bazaeko-Coglistiko North Pantage Lake Tzenzaicut Lake North Tzenzaicut Lake South	920-960 960-1000 960-1000 1000-1040 1000-1040 1040 1020-1060 1040-1080 1060-1100 1080-1120 940 n.a. 1200-1260	1020-1040 1040-1060 1100-1140 1140-1220 1160-1200 1180-1220 1180-1200 1140-1200 1240-1280 1180-1240 1140-1200 1260 n.a.
SBPSdc Tibbles Crk North Tibbles Crk South Mount Crk North Mount Crk South Snaking R. North Snaking R. South Bazaeko-Coglistiko South Bazaeko-Coglistiko North (except S of Euchiniko Lks) Bazaeko-Coglistiko North (South of Euchiniko Lks)	n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a. n.a.	960-1000 1000-1040 (900)1000-1040 1040 1020-1060 1040-1080 1060-1100 1080-1200 1140-1200

Euchiniko River North	n.a.	920-960
Ramsey Creek	n.a.	1240
Tzenzaicut Lake South	n.a.	1200-1260
SBPSmc		
Bazaeko-Coglistiko North (except S of Euchiniko Lks)	1060-1100	1220-1240
Bazaeko-Coglistiko North (South of Euchiniko Lks)	1140-1160	1180-1220
ESSFmv1		
Pantage Lake	1400	n.a.
Euchiniko River North	1360	n.a.
SBSdw2		
Narcosli North	720-800	960-1000
Narcosli South	740-760	1100-1160
Blackwater North	940-960	1040
Bazaeko-Coglistiko Nazko-Blackwater Valley	n.a.	900-940
Redwater Lake hills	1020	n.a.
Pantage Lake	800	940
Tzenzaicut Lake South	n.a.	1200-1240
SBSdw1		
PantageLake	n.a.	800
Narcosli North	660	800
SBSmh		
Narcosli North	n.a.	600-640
Narcosli South	n.a.	720-760

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