

A Method for Large-scale Biogeoclimatic Mapping in British Columbia

Prepared by

[Marvin Eng](#) and [Del Meidinger](#)

[Research Branch](#)
[Ministry of Forests](#)

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1.0 Introduction

This document provides a method for Biogeoclimatic (BGC) Subzone/Variant mapping in British Columbia. This method is designed to produce large-scale mapping (1:20 000). While the scale of existing BGC mapping varies from 1:100 000 to 1:500 000, it is the intent of the Ministry of Forests to produce new BGC mapping using digital elevation models and bases derived from the 1:20 000 TRIM or TRIM2 mapping. Therefore, the new mapping will have a scale of 1:20 000. This method outlines the process for the development of BGC mapping and the nature of the final map products.

Biogeoclimatic Subzone/Variant mapping is the stratification of a landscape into map units, according to a combination of ecological features, primarily climate and physiography. BGC mapping provides information that is used:

- to assist field workers in applying the Biogeoclimatic Ecosystem Classification (BEC) at the site level;
- as a basis for more detailed ecological mapping such as [Terrestrial Ecosystem Mapping](#) (TEM) and [Predictive Ecosystem Mapping](#) (PEM);
- for the application of old seral retention targets under the Forest Practices Code, [Landscape Unit Planning Guide](#); and,
- as a framework for a variety of provincial level reporting tasks such as representativeness of the [Protected Areas Strategy's](#) system of protected areas.

It should be noted that the Resources Inventory Committee Standard for Predictive Ecosystem Mapping requires that the method outlined here be used to create the BGC maps that are an input to the PEM process.

Where this method is applied and the appropriate documentation is created, the resulting BGC maps will be considered by [Custodian of the BGC mapping](#) for inclusion in the Provincial Digital BGC dataset.

2.0 Classification Concepts

The biogeoclimatic ecosystem classification (BEC) is a hierarchical classification scheme that includes separate zonal (climatic) and site classifications. [Meidinger and Pojar \(1991\)](#) describe the system in detail. Biogeoclimatic units represent geographic areas under the influence of the same regional climate. The biogeoclimatic subzone is the basic unit. Subzones are then grouped into zones reflecting similarities in regional climate and divided into variants and phases, reflecting differences in regional climate.

A biogeoclimatic subzone consists of unique sequences of geographically related ecosystems. Its climatic climax ecosystems are members of the same zonal plant association. Such sequences are influenced by one type of regional climate. About 100 subzones are currently recognized in British Columbia ([Meidinger and Pojar, 1991](#)).

Subzones with similar climatic characteristics and zonal ecosystems are grouped into biogeoclimatic zones. A zone is a large geographic area with a broadly homogeneous macroclimate. Fourteen biogeoclimatic zones are recognized in British Columbia ([Meidinger and Pojar, 1991](#)).

Subzones contain considerable variation and can be divided into biogeoclimatic variants, which reflect further differences in regional climate. Variants are generally recognized for areas that are slightly drier, wetter, snowier, warmer, or colder than other areas in the subzone. These climatic differences result in corresponding differences in vegetation, soil, and ecosystem productivity. The differences in vegetation are evident as a specific climax plant subassociation on zonal sites.

In the regional climate of subzones and variants, biogeoclimatic phase accommodates the variation resulting from local relief. Phases are useful in designating significant areas that are, for topographic or topo-edaphic reasons, atypical for the regional climate. Examples could be extensive areas of grassland occurring only on steep, south-facing slopes in an otherwise forested subzone, or valley-bottom, frost-pocket areas in mountainous terrain. To date, only a few phases are recognized in the province.

Conceptually, a regional climate is a large geographic area or elevational band with a predictable pattern of vegetation on zonal sites where the climatic differences between adjacent biogeoclimatic units are primarily related to temperature or precipitation effects explained, e.g., by latitude, elevation, or major climatic effects of mountain ranges. A local climate can be distinguished as a smaller area where local climatic effects, e.g., snow loading, cold air ponding, or warm aspect, are the main climatic factors influencing vegetation.

When mapping biogeoclimatic units, zonal sites are sampled in as many areas as possible. The classification of the climax or mature vegetation on the zonal sites determines the classification level and the range of distribution of the unit. The complete range of distribution is determined by developing a 'model' of elevation/slope/aspect rules within the range of the particular kind of zonal ecosystem.

When mapping at large scales, it can be challenging to distinguish between a regional climatic influence (a subzone or variant) and a climatic influence that is the result of a localized effect (a phase). As indicated above, phases comprise significant areas that are, due to topographic or topo-edaphic conditions, atypical for the regional climate. However, they are smaller in total area than the biogeoclimatic subzone or variant they are found within (see Table 1), and the zonal ecosystem (if present) within a phase is very different from the typical climatic climax. For example, a Bluebunch wheatgrass association on zonal sites in a grassland phase within the Interior Douglas-fir (IDF) zone where normally a Douglas fir – Pinegrass zonal ecosystem would occur, or a Mountain hemlock – Amabilis fir – Blueberry zonal ecosystem where the typical zonal ecosystem is Subalpine fir – Amabilis fir – Rhododendron. In some cases, zonal ecosystems

may not be present, but the area is still atypical in that a very different sequence or set of ecosystems is found compared to what is expected for the regional climate.

Table 1. Comparison of area of selected biogeoclimatic subzone/variants with related phase

Subzone/variant	Area (1000s ha)	Phase	Area (1000s ha)	% of area
ESSFmw	387	ESSFmwh	11	2.8
MHmm2	1200	MHmm2e	13	1.1
ICHwk1	565	ICHwk1c	0.6	0.11
IDFxb2	283	IDFxb2b	3	1.1
IDFxb1	241	IDFxb1a	55	23
IDFdk1	572	IDFdk1a	39	6.8

Even with these conceptual differences in mind, it can still be difficult to decide on the significance of a climatic influence. When in doubt, it is advisable to contact other ecologists knowledgeable with the area.

The minimum size area for a regional climatic effect could still be relatively small, if the combination of climatic factors is evident and is repeatable in the area. Small polygons of a regional climate would generally be the result of an elevational effect, i.e., the top of a hill or mountain, or possibly the bottom of a valley. If the small areas occur on slopes or sporadically, e.g., in one valley but not an adjacent one of the same elevation, it is likely that a local climatic effect is causing the difference. While no "rule" for a minimum polygon size can be specified, biogeoclimatic polygons should be on the order of 250 to 500 hectares in size. The size of the polygons should increase in plateau areas compared to mountainous areas.

3.0 Legacy Mapping

Digital BGC mapping exists for the entire province. At the time of the development of this method, most of this mapping was “legacy” in nature. That is, it was digitized from paper maps produced at scales appropriate for the original purpose of the mapping: to assist field workers in applying the Biogeoclimatic Ecosystem Classification at the site level. For that purpose it was not particularly important that the mapping was neither highly accurate nor that it was referenced to a variety of paper source base maps. The source scale of the mapping varied among regions as shown in Table 2.

Table 2. Source scale of legacy BGC mapping by Forest Region

Forest Region	Source Scale
Cariboo	1:250 000
Kamloops	1:100 000 and some 125 000
Nelson	1:250 000
Prince George	1:250 000
Prince Rupert	1:500 000 and some 1:250 000
Vancouver	1:250 000

It is now very important that we replace the “legacy” mapping with large scale (1:20 000) mapping that is well tied to the TRIM provincial digital base maps. Large scale BGC mapping is critical for natural resource management in the province because:

- BGC maps form the basis for site level, ecosystem mapping whether it is based on TEM standards or is some other form of mapping (often referred to as “Predictive Ecosystem Mapping” [PEM]).
- BGC maps are an integral part of the Landscape Unit Planning process. They are used in this process to determine the amount of old seral forest that must remain un-harvested in a Landscape Unit.

4.0 Mapping Procedures

4.1 Project Planning

There are several project planning steps required:

1. The boundaries of the study area need to be defined. The study area should be as large as possible, given the time, resources and objectives of the specific project. This will help ensure that “boundary effects” are not encountered during the classification process. For the same reason, where possible, the boundaries of the study area should be heights of land that extend into the Alpine Tundra BGC zone. The edge of a project area should not be a transition zone between two or more dominant climatic types (e.g. coastal and interior). These areas have complex biogeoclimatic relationships and it is easier to understand those relationships when the areas on either side of the transition zone are taken into consideration.
2. Once the boundaries of the study area have been determined:
 - Consult the [Custodian of the BGC mapping](#) regarding the state of legacy BGC mapping in the area and state of any current large-scale BGC mapping in or adjacent to the area.
 - Consult the Custodian of Terrestrial Ecosystem Mapping regarding any TEM mapping that may be relevant.
3. Input data should be compiled for the study area. At a minimum this will include:
 - [Legacy BGC mapping](#). This information is available in ARC/INFO, Pamap or DXF format;
 - a digital elevation model based on the Geographic Data BC 1:20 000 [TRIM mapping](#), [TRIM2 mapping](#) or the [Gridded DEM product](#); and,
 - a digital base, showing lakes and rivers at a minimum, at a scale appropriate for presentation of the entire study area (normally 1:250 000).

Depending on the location of the study area, the following information may be of value:

- forest cover mapping with a database that includes non-productive code, tree species and percentages 1 through 6, projected age, projected height, projected canopy closure class, site index and history information.
- BGC mapping from TEM projects in, and adjacent to, the study area.
- other information, e.g., satellite imagery, depending on the specific methodology to be employed.

Most importantly, a decision must be made about the level of reliability that is desired for the BGC map. Three levels of reliability of large scale BGC mapping are recognized:

1. *Localized Small-scale Linework*: The existing “legacy” mapping is “localized” to the scale of 1:20 000 with no additional fieldwork to check the accuracy of the mapping. This level of reliability is suitable for strategic level planning applications and for landscape unit planning, only when time and resources do not permit better mapping to be conducted.
2. *Reconnaissance Reliability*: A limited amount of field work is conducted to ensure that all the subzones and variants in an area are mapped and that the rules for the more difficult boundaries have been checked. This level of reliability is suitable for landscape unit planning, small scale (1:50 000 or smaller) Terrestrial Ecosystem Mapping, and any scale of Predictive Ecosystem Mapping.
3. *Systematic Sampling*: This level of reliability involves checking the rules for the boundaries between subzones and variants throughout the study area. This level of reliability is suitable for large scale (1:20 000 or larger) Terrestrial Ecosystem Mapping.

Planning a program of fieldwork associated with each level of reliability is discussed in Section 4.3.

4.2 Generation of Initial Linework

All of the input data (outlined in Section 4.1) should be combined into single map coverages for the entire study area. An initial rule set for delineation of the BGC Subzone/Variants based on elevation/aspect rules can be developed from the appropriate field guide for BGC site identification and interpretation (a [Land Management Handbook](#) specific to the area). Where possible, information in the field guide should be used to further refine the rule set based on the presence or absence of certain tree species. An example of an initial rule set is provided in Table 3.

Table 3. Example of an initial rule set developed from a field guide

Subzone/Variant	Upper Elevations		Tree Species
	South Aspect	North Aspect	Qualifiers
ICH dw	1200	1100	No spruce
ICH mw 2	1450	1400	
ESSFwc 1	1650	1600	
ESSFwc 4	1950	1950	No western redcedar or mountain hemlock
ESSFwcp4	2440	2440	
AT	N/A	N/A	

Note that the words south and north do not imply that only 2 aspects divided evenly on the east-west line are to be used. The elevation rule for neutral aspects will be half way between the north and south aspects and the actual aspect categories (in degrees) are as follows:

North: $>315^\circ$ and $\leq 360^\circ$ or $>0^\circ$ and $\leq 45^\circ$

South: $>135^\circ$ and $\leq 270^\circ$

Neutral: $>45^\circ$ and $\leq 135^\circ$ or $>270^\circ$ and $\leq 315^\circ$ or where the slope is less than 15°

The initial rule set can be further refined and modified by comparing the results of the rules to the legacy linework. In many cases "area specific" elevations need to be applied to approximate the legacy information. Additionally, the initial rule set can be refined in some cases by examining the elevations of various "breaks" in trees species compositions as depicted on forest cover maps. Local models and/or local expertise will have to be applied in many situations. Elevation and aspect rules may vary over relatively large areas in a way that is not easily predictable.

"Localized" effects on regional climates such as cold air drainage, areas of subdued topography in mountainous terrain and the presence of large lakes and river valleys have to be accounted for. Some of these effects can be modeled using automated methods but it may be more efficient to have local experts simply hand draw some of the linework. If possible the initial rule set should be discussed with the Ministry of Forests Regional Ecologist responsible for the study area.

Careful documentation of the steps included in developing the initial linework will assist in preparation of the project report as described in Section 5.2.1.

Having developed the initial rule set, the process of creating the initial linework proceeds as follows:

1. Develop a set of polygons for the study area where different elevation/aspect rules will be applied. These polygons often delineate mountain “blocks” where different elevational sequences of BGC subzones occur or where different rules are applied as a result of increasing latitude through the study area. Finally, these polygons may “cut off” the upper reaches of some valleys where the elevational rules lower in the valley are not appropriate. An example of the polygons used to create large scale BGC mapping for the Arrow Forest District are shown in Figure 1. The boundaries of these polygons are often based on heights of land. In those cases a contour map is a useful backdrop when digitizing the polygons. In other cases the boundaries may be large lakes or rivers or other topographic features. In those cases the planimetric base from the TRIM mapping may be a useful backdrop.
2. Use automated methods to create linework based on the elevation/aspect rules specific to the polygons described above. These automated methods should use a digital elevation model based on the [TRIM mapping](#) or the [Gridded DEM](#) product. Where appropriate, they should incorporate changes in elevation with changes in aspect, as outlined above.
3. Use manual methods to modify the elevation/aspect linework based on local knowledge (e.g., cold air drainage may influence the boundaries in the upper ends of some valleys). Forest cover mapping, particularly tree species presence and absence, may be a useful “back drop” during this process.
4. Use manual methods to include linework that can not be modeled with elevation/aspect rules. These lines are often a result of increasing latitude or increasing distance from a major mountain range or other landscape feature influencing the regional climate. The legacy mapping is usually a reasonable first approximation for this linework. The lines can often be refined using forest cover mapping as a “back drop” as described above.
5. Delete polygons that do not fit the regional climate concept in terms of size or elevational range. Polygons less than 250 hectares in size should be deleted.
6. If possible, provide the initial linework and the documentation of how the lines were created to the Regional Ecologist. Otherwise the most senior project ecologist should be provided with the initial linework. The map should include enough base information for location of major valleys, contour lines appropriate to the complexity of the terrain and the initial linework clearly identified as being either automatically generated based on aspect/elevation rules, hand drawn, or generated in some other fashion. The polygons should be labeled with the BGC zone, subzone, variant and phase (as appropriate). Separate maps showing the polygons delineated in step 1, above, should also be provided. Some method of relating the polygons with the elevational rules and any other required information should be provided (e.g., map labels, separate text documents, etc.).
7. Modify the initial linework based on the input from the Regional Ecologist or the most senior project ecologist by repeating steps 1 through 5.

If the project is to produce BGC mapping with “localized small scale linework” reliability (level 1) then a report and final digital product should be produced at this stage. Otherwise a field-sampling program should be developed and implemented.



Figure 1. Polygons used for geographic distinction in the elevation/aspect rules in the Arrow Forest District for distinguishing ICHdw from ICHmw2 (A), ICHmw2 from ESSFwc1 and ESSFwc4 (B) and ESSFwc4 from ESSFwcp4 and ESSFwcp4 from AT (C).

4.3 Developing and Implementing a Field Sampling Program

The most critical aspect of developing a field-sampling program is selection of appropriate personnel. A substantial amount of experience applying the BEC system in the field is required to identify subzones/variants. This level of experience must go well beyond an ability to apply the appropriate field guide to determine a site identification.

The field guides provide some information to assess the biogeoclimatic unit, however, considerable experience is required to map the biogeoclimatic units and differentiate local anomalies from local climates and from regional climates. When mapping BGC units, many zonal sites with mature to climax vegetation need to be visited to determine the elevation, latitude, or other climatic breaks. However, it is often impossible to find a mature, zonal site in the desired location. As a result, field personnel, identifying subzone/variants, must be able to understand and integrate the variety of topographic, edaphic and biotic factors that will influence the development of a particular site series on a particular kind of site. Field personnel should have a minimum of 5 full seasons of applying the BEC system in the field and some experience with the BEC zones that will be encountered in the study area. This could be in the form of conducting Silviculture Prescriptions or doing field work for Terrestrial Ecosystem Mapping.

As the names imply, a Reconnaissance Reliability level of mapping will involve a reconnaissance style field sampling program and a Systematic Sampling level of mapping will involve a systematic sampling program.

A reconnaissance sampling program requires that, at a minimum, each elevational/aspect rule, used to delineate the boundaries, should be verified at least once. That is, for each elevational sequence of subzone/variants, the boundaries between each subzone/variant should be checked on both north and south aspects (if appropriate). If more than one set of rules is applied to an elevational sequence then the sequence should be checked once where each set of rules occurs. The boundary for each of the lines that have a basis other than elevation/aspect rules (usually hand drawn lines) should be checked at least once. Spot checks for subzone/variants that may have been missed entirely should be made.

A systematic sampling level program requires that each elevational/aspect rule, used to delineate the boundaries, be checked systematically over the area where it is used. The nature of the “system” is at the discretion of the project designer, however, the boundaries should be checked in many locations for each rule following a sampling system. A systematic effort should also be applied to the lines that have a basis other than elevation/aspect rules.

Results of the field sampling program should be recorded using the Ground Inspection Form (FS212-2), the Ecosystem Field Form (FS882) or an equivalent form. It is critical that substantial notes and site diagrams be included when completing the forms because they are specifically designed for site identification, assuming the subzone/variant is known. The intent of recording the information on standardized forms is to ensure that enough information will be recorded so that an independent assessment of the determination of the subzone/variant can be made.

4.4 Generating Final Linework

Based on the results of the field sampling program, if one was conducted, the initial linework created using the process outlined in Section 4.2 should be modified. The modifications should be done using the process outlined in Section 4.2. Finally, ensure that insofar as possible the linework "edge matches" with the adjacent linework in the Provincial Digital BGC map.

Careful documentation of the steps included in developing the initial and final linework will assist preparation of the project report as described in Section 5.2.1.

5.0 Product Specifications

Digital large scale BGC mapping will rarely, if ever, be used alone. It will normally be used as part of a Terrestrial Ecosystem Mapping or Predictive Ecosystem Mapping project or to support a dataset used in landscape unit planning. It is the intent of the [Custodian of the BGC mapping](#) to include in the provincial digital BGC map large scale BGC maps, produced using this methodology, regardless of the purpose for which they are intended. These specifications are meant to facilitate that intent and desire.

We do recommend that where the mapping is to be used for another purpose where a digital data standard exists (notably [TEM](#), [PEM](#)) one should ensure that those digital standards could easily be met by the BGC mapping.

The phrases “as appropriate” and “at a minimum” are assumed but not stated throughout Section 5.0

5.1 Digital Data Specification

The mapping for each project is to be submitted in a digital form.

Acceptable file formats for the spatial data are:

- E00 – the ARC/INFO interchange format (single precision, uncompressed)
- IGDS – the Intergraph Interactive Graphic Design System format.

Acceptable file formats for attribute data required are:

- MDB – Microsoft Access (version 5 or greater)
- DBF – dBase, FoxPro, xBase, etc. (version 3 or greater)
- CSV – Comma separate value text format.

Projects are to be delivered as single complete coverages (maps) for the study area. They are NOT to be delivered as map sheets, nor are internal map sheet boundaries to be included as linework in the BGC coverage.

The mapping for each project must be divided into 4 “maps” or “coverages”:

1. The Biogeoclimatic polygons consisting of “lines” that delineate the polygons and a “label point” or “centroid” for each polygon. The biogeoclimatic polygons must conform to the standards found in the Ministry of Forests [Integrated Spatial Data Dictionary](#) (ISDD) for [Feature Class 435](#):
 - for IGDS format files, the lines and centroids must conform exactly and completely to the specifications for feature components 111165 (study area boundary), 300 (polygon centroids) and Biogeoclimatic line feature components suitable for the level of reliability of the mapping.
 - for E00 format files, the arc attribute table must contain a user defined integer field called Fcomp. This field is to contain the integer 111165 for study area boundary arcs and the number of the feature component in the ISDD that is suitable for the level of reliability of the mapping to delineate Biogeoclimatic polygons.

Each polygon “label point” in an E00 file or “centroid” in an IGDS must contain a unique polygon identifier (named polygon_id) of an integer type. A separate database is to contain an integer field named polygon_id and a field named “BECLabel” (left justified, character, 9 spaces wide). There must be a one to one relationship between polygon_id in the map and

polygon_id in the database. The field BECLabel is to be filled with an appropriate one of the values found in the first 9 columns of [BECLabel.txt](#). This string is formatted as follows:

ZZZZsssvp

Where: ZZZZ = the biogeoclimatic zone

sss = subzone

v = variant

p = phase

Spaces are to be introduced where a component of the value for BECLabel does not fill its specified width.

If necessary, in the description of the project's methodology, other user-defined attributes can be included in the biogeoclimatic polygon database.

2. *Processing polygons* consist of those polygons where different rules and processes were applied during the creation of the Biogeoclimatic polygons. These polygons should contain the information, or a link to the information, about the elevational rules used to automatically generate linework. They should also contain any other information, or links to that information, used in a systematic way to create the linework. Formats for these polygons and their associated databases are left up to the project manager but they must be specified in full detail as outlined in Section 5.2.1.
3. *Source linework*. Copies of the biogeoclimatic polygons that distinguish, at a minimum, two types of "lines": automatically generated biogeoclimatic polygon lines and hand digitized biogeoclimatic polygon lines. These lines are to be distinguished using fields in the arc attribute database (for E00 files) or line styles (for IGDS files). If necessary in the description of the methodology, other types or sub-types of "lines" can be distinguished. Formats for these lines are left up to the project manager but they must be specified in full detail as outlined in Section 5.2.1.
4. *Field sample locations* consisting of points or lines that represent the location of sample plots or transects, respectively used to collect data during the field sampling program. Each point or line will have a unique identifier that can be used to link it to a database containing the data for the plot or transect. At the discretion of the project manager, maps of field sample locations may be submitted in "hard copy" (paper) format consisting of plot sheets or field maps.

The mapping will conform to the following specifications with respect to its spatial coordinate system:

- Two projections are acceptable:
 - Albers Equal Area with parameters based on the Ministry of Environment Lands and Parks [standard projection](#)
 - Universal Transverse Mercator where the zone is externally specified and the following parameters are used:
 - Latitude of Projection Origin = 0:00:00 N
 - False Easting (metres) = 500 000
 - False Northing (metres) = 0
 - Scale Factor = 0.9996000
- The only acceptable geodetic datum is the North American Datum NAD83 Canada/Alaska
- Units of Measurement are to be metres

The mapping will conform to the following specifications with respect to its topology:

- All polygons must be explicitly closed areas and must close on themselves at exact coordinated junction points or nodes.
- Vertices must be spaced more than 10 metres apart.
- Except where required by software limitations, arcs should not contain pseudo-nodes (line endpoints with exactly two adjoining arcs with identical attributes).
- All polygons shall contain one and only one “label point” or “centroid.”

5.2 Reporting and Delivery Specifications

For each large scale BGC mapping project a variety of digital reports and maps will be required. The intent of these is to provide the custodian of the data with sufficient information to evaluate the reliability of the product and to allow efficient incorporation into the provincial digital BGC map.

5.2.1 Reports

A digital report containing the following information is required. The preferred format is Microsoft Word, although Wordperfect, HTML, rich text format, DOS text or UNIX text is acceptable.

Input Metadata

For each digital input data source specify the following information:

1. **Citation** – reference to a formal, published source of the data, if available.
2. **Responsible Agency** – agency/agencies or organization(s) responsible for collecting, compiling, and maintaining the data and an appropriate contact within the agency/agencies or organization(s).
3. **Date/Version** – the publication date of the source (the date it was made available) and the version number if applicable.

If a digital elevation model based on TRIM or TRIM2 is used, a full description of the method of converting the TRIM format files to a digital elevation model in the processing environment used is required.

Methodology

A complete report on the methodology used to generate the BGC map must be submitted. This report should outline methods used to achieve all the steps discussed in section 4.0. The report should explicitly describe any computerized methods used, particularly for generation of automated linework based on aspect and elevation. This should include documented versions of any macros, scripts or source code used for the process.

Output Metadata

1. **Citation** – reference to a formal, published source of the data, if available.
2. **Project Lead** – agency or corporation responsible for collecting, compiling, and maintaining the data and an appropriate contact within the agency or corporation.
3. **Date Range** – the date range between the beginning and end of the project.
4. **Level of Reliability** – as outlined in the section 4.1:

5. **Purpose** – the reason that the map was created. E.g., to support a TEM or PEM project, to facilitate landscape unit planning, etc.
6. **Computer Environment**
 - Names and versions of the software used to create the mapping and attribute files
 - Operating system under which the software was running
7. **Spatial Coordinate System (Projection)** – including the zone if applicable.
8. **File Formats** – specify the formats of the files used to submit the spatial (E00 or DGN) and attribute data (DBF, MDB or CSV).
9. **Data Specifications and Modeling** – Each file that is submitted needs complete specification. For the spatial files this should include a description of all the feature codes or levels and line indices. Attribute files need a description of the fields and a specification of the field formats. Any information required to understand the data model used must be included. In most cases a statement of the index, or key, fields in both the spatial and attribute data will suffice.

5.2.2 Maps and Databases

The maps and databases delivered will consist of the digital files described in section 5.1 that make up the:

- Biogeoclimatic polygons;
- processing polygons;
- source linework;
- field sampling locations (if applicable); and,
- all databases containing information relevant to the maps.

5.2.3 Delivery, Notification, and Comments

Reports and maps are to be delivered to the Ministry of Forests, Research Branch at the following ftp site (anonymous login):

<ftp://ftp.for.gov.bc.ca/Branches/Research/external/incoming/BGCMaps>

The [Custodian of the BGC mapping](#) must be notified upon delivery. Notification should include written approval of the project from the Regional Ecologist, if he or she was involved. This can take the form of a letter, fax or and email sent directly from the Regional Ecologist.

Research Branch has entered into a [stewardship agreement](#) with Ministry of Forests, Resources Inventory Branch. Once all the provisions of that agreement have been completed, BGC mapping will be delivered to the appropriate Regional Ecologist. Please consult this Method for Large-scale Biogeoclimatic Mapping in British Columbia prior to delivering projects to determine whether or changes have been made in the delivery specifications.

Please contact [Marvin Eng](#) if you have any questions, comments or concerns regarding these specifications.