SIBEC

Sampling and Data Standards

B.C. Ministry of Forests and Range
Research Branch
Version 5.3
Revised September 2009

Changes in SIBEC sampling and Data Standards Version 5.3 from previous Version 5.2

1. Two questions added to the FAQ section
2. Clarification on the goal/objective of the SIBEC project (page 2, paragraph 2)
3. URL for SIBEC website – www.for.gov.bc.ca/hre/sibec (page 2)
4. MFR HQ and Regional contacts for SIBEC (page 8)

SIBEC Data Needs

The SIBEC (Site Index/Biogeoclimatic Ecosystem Classification) EP1215 project is an initiative to develop an alternate method for estimating site index in stands where conventional methods are not suitable. Ecological and site index data from many studies were collated and screened. The resulting SIBEC database was used to develop the first approximation of the relationships between site index and site units of the Biogeoclimatic Ecosystem Classification (BEC) system (BC Ministry of Forests 1997).

The goal of the SIBEC project is to have the mean site index estimate for each given BEC site series/tree species combination to reflect the average growth potential of the site series and species. More data are needed to refine these relationships as the first approximation site index class estimates are replaced by second generation estimates, which consist of a mean site index and the standard error of the mean.

This document contains data collection and quality assurance standards for projects collecting SIBEC information. New data will be added to the provincial SIBEC data warehouse and used in updating the SIBEC relationships matrix. For more detailed information on the SIBEC project and current Approximation estimates, see http://www.for.gov.bc.ca/hre/sibec.

Plot Selection

The procedure for plot selection depends upon the available ecosystem (site series) mapping for the target Biogeoclimatic units and site series. If there is large scale ecosystem mapping available, use it to identify potential sampling areas and develop a sampling plan, e.g., stratify blocks by site series and then subjectively choose homogeneous and representative plots that contain suitable sample trees. Random sampling is also an option, but probably requires a larger sample size to meet the plot selection and tree selection criteria. If there is limited or no site series mapping available, this precludes forming a sampling frame. Use best available map resources to stratify sampling area and locate plots subjectively. Establish plots using the following criteria for a site that is ecologically uniform and comprised of the target BEC site series:

- stand is moderately dense (i.e. neither open-grown nor repressed)

- stand is not the result of partial cutting
- sample tree is between 10 (if a growth intercept model is available) or 20 and 120 years breast height age
- plot centre is not within 50 m of a major disturbance (road, harvested area, etc.)
- site trees are not affected by non-site factors that may influence site index (e.g., fertilization, repression, heavy pruning)
- contains a site (sample) tree of a target species

The BEC plot size should be a minimum of 314 m^2 (10.0 m radius) and the site index plot size should be 100 m^2 (5.64 m radius). Place the site index plot centre on the BEC plot centre.

Tree Selection

A site tree as defined by the criteria below must not be rejected if the criteria are met in a homogenous BEC site series:

- the largest diameter at breast height tree of the target species where breast height is measured on the high side of the tree (note: more than one target species may be sampled within a plot)
- dominant or co-dominant
- free of suppression (above breast height)
- not wolf, open-grown, or veteran
- straight-stemmed, free of disease, rot, insect damage, and other significant damage including forks, scars, and breakage (minor damage is allowed but should not occur over more than 5% of total tree height)
    - Temporary exemption: Lodgepole pine and ponderosa pine trees that are in the green- or red-phase of Mountain Pine Beetle (MPB) attack are suitable site trees. However, these trees must be in recently attacked stands (green- or red-phase) and still meet all the other requirements of a site tree. [Note: for these trees, in the FS882 form enter Damage Type=IBM and Damage Severity=S; for the GIF, place checkmark in the "Path" box and include Damage Type=IBM and Damage Severity=S under Notes]
- vigorous with a full crown

Appendix 1 is a checklist of the plot and tree selection criteria. This checklist can be used in the field to ensure that minimum requirements have been met.

Field Data Collection

The Terrestrial Ecosystem Mapping Ground Inspection Form (FS212-2 GIF) is the accepted minimum standard for collecting SIBEC data. The GIF has the required data fields (with the exception of PLOTAREA, PLOT_SHP, SI_ORIG, and CRWNCLAS) as well as those that will be used for quality assurance. All fields appearing in Appendix 2 must be filled in on the GIF. Original or copies of completed field forms are required at the completion of the SIBEC project. If more detailed ecological information is required, use the Ecosystem Field Form (FS882) for data collection. However, the minimum quality assessment will be based on the standards set for the GIF (Appendix 2).

Definitions and entry codes for data fields on the GIF and FS882 can be found in *Field Manual for Describing Terrestrial Ecosystems* (BC Environment and BC Ministry of Forests 1998).

Note: All distances are horizontal distances.

Data Entry

All fields from the GIF are required digitally. If the Ecosystem Field Form (FS882) is used, then all fields are required digitally. For a few mensuration attributes (Table 1) with no corresponding fields on the GIF, instructions are given in Table 1 on where to enter them.

GIF data can be entered and submitted using **VENUS 5.1** (MOE/MOF upgrade of VENUS 4.2 MOE) data entry program. VENUS 5.1 available for download from the MOE website: http://www.env.gov.bc.ca/ecology/dteif/venus.html. Contact Shirley Mah (Shirley.Mah@gov.bc.ca) or Gordon Nigh (Gordon.Nigh@gov.bc.ca) if you have any questions prior to beginning data entry.

Table 1. Placement of SIBEC data fields on GIF (FS212-2) form

SIBEC Database Field	Field Type	Field Length*	Corresponding field on GIF (FS212-2) form**
For each plot, enter:			
PLOTAREA	Number	3	[enter in NOTES section]
PLOT_SHP	Text	7	[enter in NOTES section]
For the sample tree within the plot, enter:			
TREE	Text	4	[If applicable, enter tree # in margin to left of SPP]
CRWNCLAS	Text	1	[enter in margin beside PATH field]

*Maximum field length for text entries.

** Codes are defined in *Field Manual for Describing Terrestrial Ecosystems* (BC Environment and BC Ministry of Forests 1998)

Quality Assurance

Appendix 2 shows quality assessment criteria that will be used by Ministry auditors or in some cases, contractors. In general the audit should be made on approximately 10% of the completed plots and cores. The audit process cannot anticipate all of the variables and thought processes needed to make the most appropriate ecological assessment of a site. The audit process is ultimately dependent on the careful assessment of the site and tree data by a competent ecologist as a QA person. The audit of the cores will require a review using a microscope or specialized ring counting equipment.

Pass/fail criteria:
A plot may fail if the QA person finds that data crucial to correct ecological interpretations were missing or incorrect. This cannot be stated explicitly in rules as different sites will have different elements that are critical to the interpretation of that particular site.

Guidelines for QA person:
Use the audit form (Appendix 2) and provide additional interpretation about the audit in the comments section. In the comments section, direct the contractor to areas of data collection that require mentoring and improvement. Explain which, if any, errors that are the most significant because of their effect on the interpretation of the site. In the situation where the plot fails even though the maximum number of points was not exceeded, a detailed explanation of the reasons for the plot failure must be provided.

The nature of the collection and evaluation of ecological data is subjective in nature, thus situations may arise where deducting points will require a judgment call by the QA person. In such cases, it is appropriate to provide the reasoning behind the point deduction in question.

Naming Conventions for Project and Plot Identification

To ensure consistency and minimize data ambiguity, the following naming conventions for projects and plots are recommended:

PROJECT

The project identification field should be filled in with a code conforming to the following convention:

[ADMIN_CODE] – [PROJECT_TYPE] – [PROJECT_YEAR] – [PROJECT_NUM]

where,

ADMIN_CODE: Alpha-numeric code used to distinguish administrative units such as TFLs and woodlots. Examples: TFL35, TSA14, WL123, ER77, UBC etc.

PROJECT_TYPE: An acronym or suitable alpha code for describing the project. This may describe the project's objectives, its geographical or biogeoclimatic focus, or perhaps its species focus. Examples: SIBEC, TEM, INV, GI_Fd, IDF_Fd etc.

PROJECT_YEAR: Four digit year. Examples: 1999, 2000, 2001 etc.

PROJECT_NUM: Optional. Use if multiple projects exist for the same ADMIN_CODE, PROJECT_TYPE, and PROJECT_YEAR. Always prefix with "PROJ" or some other prefix that cannot be confused with a plot number. Examples: PROJ001, PROJ002, PROJa, PROJb, etc.

Some examples of full Project IDs:
TFL35-SIBEC-1998
UBC-ESSFSe-KAYAHARA-1999
ER77-FdREGEN-1998
TSA14-TEM-1998-PROJ001
TSA14-TEM-1998-PROJ002

PLOT_ID

A unique plot number is required for the GIF (FS212-2). You may submit your own plot numbering scheme provided it is unique (e.g., TFL35-S001 which contains information that data are from TFL35 as well as a modifier (S) suggesting the type of project). The VENUS 5.0 entry program allows the complete PSP id for Resource Inventory Branch's Permanent Sample Plots to be entered.

Recommended References

British Columbia Ministry of Forests. 1997. Site index estimates by site series for coniferous tree species in British Columbia. Res. Br., Victoria, B.C.

Field Manual for Describing Terrestrial Ecosystems. 1998. BC Ministry of Environment, Lands, and Parks and BC Ministry of Forests. Land Management Handbook 25.

Describing Ecosystems in the Field. 1990. Second Edition. BC MOE Manual 11.

Regional Field Guides for Site Identification and Interpretation. BC Ministry of Forests.

Vegetation Inventory Sampling Procedures. March 31, 1995. Resources Inventory Committee.

On-line references

Current SIBEC Approximation site index estimates:

http://www.for.gov.bc.ca/hre/sibec/reports

SIBEC sampling and data standards:

http://www.for.gov.bc.ca/hre/sibec/documents/standards.pdf

GIF (FS212-2) and FS882 forms:
http://www.env.gov.bc.ca/ecology/dteif/forms.html

Field Manual for Describing Terrestrial Ecosystems:

http://www.env.gov.bc.ca/ecology/dteif/index.html

HQ and Regional contacts

- Research Branch – Shirley Mah, Gord Nigh (Victoria)
- Northern Interior Forest Region – Craig DeLong (Prince George), Allen Banner (Smithers)
- Southern Interior Forest Region – Ray Coupe (Williams Lake), Mike Ryan (Kamloops), Deb MacKillop (Nelson)
- Coast Forest Region – Andy Mackinnon, Sari Saunders (Nanaimo)

APPENDIX 1. Field Checklist

PLOT SELECTION	
even-aged	
ecologically uniform (i.e., one site series)	
moderately dense	
no partial cutting	
plot age between 10 (if GI model available) or 20 and 120	
plot centre at least 50 m from major disturbance	
not treated (fertilization, pruning, spacing)	
contains one sample tree per target species	

TREE SELECTION	
largest diameter tree of target species	
dominant or co-dominant	
free of suppression above breast height	
not wolf, open-grown, or veteran	
straight-stemmed, free of disease, and significant damage including forks, scars, or breakage (effect of damage does not exceed 5% of total tree height)	
vigorous with a full crown	

APPENDIX 2. FS212-2 Ground Inspection Form* (GIF) – Quality Assessment Criteria

Note: Point Total that exceeds Maximum Acceptable Deduction in any single block or the grand total of the Ecology Data block constitutes an unacceptable plot.

Ecological Data

DATA FIELD	DATA TYPE	COMMENTS AND DEDUCTIONS	Plot number: / Acceptable (Y/N)	
HEADER	Date	no errors allowed		
	Plot #	no errors allowed		
	Project ID.	no errors allowed		
	Surv.	no errors allowed		
LOCA-TION	Mapsheet	no errors allowed		
	Lat. / Long. or UTM	no errors allowed		
	Air photo no.	no errors allowed		
BEC CLASSIF.	BGC Unit	-10 if incorrect, -5 for incorrect or missing transitions		
	Site Series	-10 if incorrect, -5 for incorrect or missing transitions		
	Site Diagram	-2 for lack of adequate diagram		
	Notes	-2 for inadequate explanation of complex variation		
	Maximum Acceptable Deduction: 7		**TOTAL**	
SITE and SOIL	Elevation	-2 if >± 50m from actual		
	Slope	-2 if >± 10% from actual		
	Aspect	-2 if >± 15 degrees from actual		
	Meso Slope Pos.	-1 if out by 1 class, -3 if out by 2 or more		
	Moist. Regime (SMR)	-2 if out by 1 class, -5 if out by 2 or more		
	Nutr. Regime (SNR)	-1 if out by 1 class, -3 if out by 2 or more		
	Surface Org. Hor. Thk.	-3 if incorrect class		
	Min./Org. Soil Texture	-3 if out by 1 class, -5 if out by 2 or more		
	% Coarse Frags.	-3 if out by 1 class, -5 if out by 2 or more		
	Drainage – Min. Soils	-2 if out by 1 class, -5 if out by 2 or more		
	Root Restr. Type	-1 if incorrect type, -4 if missed		
	Root Restr. Depth	-2 if depth >± 5cm from actual		
	Terrain Classif.	-2 if incorrect surficial material, -2 if incorrect surface expression		
	Humus Form	-2 if incorrect Order		
	Notes	Must have comments if significant exposure, gleying etc.		
	Maximum Acceptable Deduction: 10		**TOTAL**	
VEGETA-TION	Species list	-2 for each species ≥ 1% cover missed or misidentified -2 for each site series indicator species < 1% cover missed or misidentified		
	All Species Covers	-1 if >± 10% when actual >10% or >± 2% if actual < 10%		
	Total % A	-1 if >± 10% when actual >10% or >± 2% if actual < 10%		
	Total % B	-1 if >± 10% when actual >10% or >± 2% if actual < 10%		
	Total % C	-1 if >± 10% when actual >10% or >± 2% if actual < 10%		
	Total % D	-1 if >± 10% when actual >10% or >± 2% if actual < 10%		
	Maximum Acceptable Deduction: 8		**TOTAL**	
Maximum Total Acceptable Deductions: 17			**GRAND TOTAL**	
Comments				

* Standard for each attribute as defined in *Field Manual for Describing Terrestrial Ecosystems* (BC Environment and BC Ministry of Forests 1998).

APPENDIX 2. FS212-2 GIF* Quality Assessment Criteria (Continued)

Mensuration Data

DATA FIELD	DATA TYPE	COMMENTS AND DEDUCTIONS	Plot number: / Acceptable (Y/N)
TREE MEASURE-MENTS	Tree selection	-5 if site tree does not meet sample tree selection criteria	
	Ht. to DBH (1.3 m)	-5 if > 5 cm from actual (taken on high side of root collar)	
	DBH	–5 if error > 0.1 cm or 1%, whichever is greater	
	Total Tree Height	-5 if error > 20 cm or 2%, whichever is greater (for height pole, -5 if > 10 cm or 1%, whichever is greater)	
	BH Age	Sample must include pith; no error allowed if bha ≤ 50; 1 year error allowed if bha = 50 to 100; 2 year error allowed if bha > 100	
	Notes	Must have comments where accepting a damaged sample tree	
	Maximum Acceptable Deduction: 4	**TOTAL**	

* Standard for each attribute as defined in *Field Manual for Describing Terrestrial Ecosystems* (BC Environment and BC Ministry of Forests 1998).

Appendix 3. SIBEC sampling - Frequently Asked Questions

1. What is the minimum number of samples for each site series (by species) that would assist in refining the SIBEC estimates?
   A. *Seven samples is considered the minimum number for reporting a second generation SIBEC estimate.*

2. Does the reliability rating (Low, Medium, High) in the SIBEC first approximation book (1997) relate to sample size?
   A. *The reliability rating does not always relate solely to sample size, but also includes consideration of the quality of data and level of expert knowledge for the site series/species combination*.
   Is it best to focus sampling on the site series/species combinations with Low reliability?
   A. *Not always. Some site series/species combinations can have a low reliability rating, but may represent a proportionally small area of the landscape*.

3. Are SIBEC plots always circular?
   A. *Yes. In the past, some plots were rectangular as well as circular.*

4. Does the site index plot have to be 0.01 ha?
   A. *Yes, this is according to the definition of site index (the height of a site tree at breast height age 50; and the site tree is the largest diameter tree of the target species in a 0.01 ha plot, provided the tree is suitable)*

5. Is the largest diameter tree of the target species always used to estimate site index?
   A. *Yes, this is according to the definition of site index*.

6. Does the BEC plot have to be 10 m radius?
   A. *No, it must be a minimum of 10 m radius, but it can be larger*.

7. Why are the site index plot and the BEC plot different sizes?
   A. *The BEC plot is larger than the site index plot so that there is at least a 4 m buffer around the site tree that is ecologically the same as the site index plot. Without this buffer, the roots of the site tree may be obtaining moisture and nutrients from a different site series, which may bias the site index - site series relationship*.

8. Do the site index and BEC plots have to be centred on each other?
   A. *Yes, otherwise the 4 m buffer may not exist*.

9. What do we do if the site tree is not suitable or the BEC plot is not homogeneous?
   A. *The plot is not useable as a SIBEC plot. The plot can be re-located nearby so that it meets the suitability criteria, or the sampling location can be abandoned.*

10. Can we sample more than one species in a plot?

A. *Yes, you can sample as many species as possible, as long as the sample trees meet the requirements for site trees. There is no requirement for the species to be leading, nor does the target species have to meet some minimum proportion*.

11. Can we use the partial list checkbox on the GIF for SIBEC plots?

A. *No, a full vegetation list is required and is the default. Under special circumstances, a full list may not be possible, and the partial list checkbox is used to flag the plots. It is best to attempt to completely describe the vegetation in the plot, as the ecological plot data is also of interest to other types of projects.*

12. Are there any rules to determine if there is suppression?

A. *Professional judgment and experience should be used to decide whether there is suppression.*

13.  Is there any guidance for setting sampling priorities within a BEC subzone/variant?

A*. Where possible, sampling should focus efforts where the BEC site units are common or widespread within the timber harvesting landbase. For uncommon or low productivity site series, seek modal examples as well to ensure site potential is representative. Regional and HQ ecologists are available to advise on sampling plans (see HQ and Regional Contacts, p.8).*

14.  Is the purpose of SIBEC sampling to find the most productive examples of a site series/tree species combination for sampling?

A. No, the intent of the SIBEC mean site index estimate for a BEC site series/species is to reflect the spectrum of age and growing conditions, i.e., the variation of growth potential in a site series and the variation introduced by stand history.