FLNR Provincial Site Productivity Layer

PEM/TEM-SIBEC and Biophysical Analysis

Version 5.0 April 6, 2016

CLOVERPOINT

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Project Results

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TEM/PEM for Site Productivity

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Document History

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Revision History

Revision Number	Revision Date	Summary of Changes	Author
1	March 31, 2012	Created Document	Jeff Kruys
2	April 4, 2012	Revised distribution list Revised section 1.1 Added section 1.2 Revised section 3.0	Jeff Kruys
3	May 8, 2012	Minor text corrections Explanatory footnotes added to Appendix B maps	Jeff Kruys
3.1	July 11, 2012	Revised section 1.1 (updated description of intended uses)	Gordon Nigh
3.2	July 27, 2012	Added “Accuracy Assessment” column to Appendix A table; updated maps of BAPIDs 4024 and 5511 in Appendix B	Jeff Kruys
3.3	July 30, 2012	Created Table 3 in section 1.5 for data revision history; Renumbered subsequent tables; Added “BGC Units Requiring Crosswalking (by)” column and removed “Non-SIBEC BGC Units” column in Table 9 (formerly Table 8) in Appendix A	Jeff Kruys
4.0	March 31, 2013	Removed section 1.2 Review and Feedback; updated Table 1 in section 1.3; restructured the entire document from section 2.0 onwards.	Jeff Kruys
4.1	June 30, 2013	Updated the PEM/TEM dataset list in Appendix B and PEM/TEM maps in Appendix C; moved table of Site Prod Working attribute fields from section 6.2 to section 3.1, as these fields are now all defined at stage 1 of the workflow; updated section 6.2 with description of Script 10 which now also produces FGDB datasets for FTP distribution	Jeff Kruys
4.2	October 28, 2013	Site Prod v3.1 dataset released; updated references to current data version number	Jeff Kruys

Revision Number	Revision Date	Summary of Changes	Author
4.3	March 31, 2014	Added descriptions of Scripts 11 and 12 to section 6.2; added quality assurance methods for Scripts 11 and 12 to section 7.1; updated workflow diagram in Appendix A	Jeff Kruys
4.4	March 31, 2015	Inserted a new sections 4.2 to 4.4 and renumbered subsequent 4.x sections; revised section 6.2; updated workflow diagram in Appendix A; updated table of PEM/TEM datasets in Appendix B; updated map figures in Appendix C; removed references to BCGW and iMap throughout document	Jeff Kruys, Erin Philip
5.0	March 31, 2016	Updated sections 4.4 and 4.5 with description and use of the newly restructured SIBEC crosswalk table	Jeff Kruys

Reference Documents

Please see the following documents for more information:

Document Name	Version	Author
A Biophysical Model for Estimating Site Index for the Major Commercial Species in British Columbia	1	Gordon Nigh

Distribution List

This document has been distributed to:

Name	Position	Company
Corey Erwin	Project Lead	ENV
Ron Planden	Project Lead	FLNR
Graham Hawkins	Site Productivity Sub-Project Lead	MoFLNRO
Erin Philip	Project Manager, Technical Lead	CP
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1.0 Site Productivity dataset

The Site Productivity Dataset provides site index estimates province-wide for commercial tree species. The estimates are based on available ecosystem data (spatial delineations and descriptions) from existing PEM (Predictive Ecosystem Mapping) and TEM (Terrestrial Ecosystem Mapping) datasets, coupled with SIBEC data (the Site Index Estimates by BEC Site Series: 2013 Approximation table, along with various 2014 and 2015 addenda). In areas where no PEM or TEM data are available, site index estimates are based on biophysical data and species ranges.

1.1 Description and intended uses

These data and accompanying documentation are the result of the first two years Site Productivity Project, and can be considered the final release of the current version of the data. Updated versions will be released annually on June 30 in coordination with the release of a new SIBEC Approximation.

The data is being distributed in ESRI File Geodatabase (FGDB) format, which can be viewed using the ESRI ArcGIS Desktop software suite (version 9.3.1 or newer) or other GIS or GID viewing software. The data structure is described in further detail in sections 1.3 and 1.4 of this document.

The province-wide vector (point) dataset comprises 6.0 GB of data (1.0 GB when archived in zip files). To facilitate data transfer via FTP, it has been divided by Timber Supply Area (TSA) management unit into 36 separate feature classes, each in its own FGDB. The raster version of the data comprises 22 province-wide rasters, one for each tree species included in the Site Productivity project. This data is distributed via FTP in a single FGDB which occupies 388 MB, or 311 MB when archived in a zip file.

The site index layer contains estimates of site index that are derived from a SIBEC/PEM/TEM or a biophysical site index model. The site indexes are more appropriately used for strategic, as opposed to operational, purposes. It would be appropriate, for example, to group points from the site productivity layer into classes (e.g., analysis units), average the site indexes for those points, and then assign that average site index to the class. If used for operational purposes (e.g., site specific applications), the site index estimates should be verified through a ground-based survey. The site index estimates can have significant errors in some situations, and it is not possible to assess the accuracy of the estimates without doing a ground-based survey.

Starting at version 2 and continuing through to the current version 4, the Site Productivity Dataset is being produced in two editions: one named “Site Prod with All PEM/TEM” which incorporates all of the PEM and TEM data available regardless of accuracy assessment (AA) and/or ecosystem intensity survey level (ESIL), and another named “Site Prod with Approved PEM/TEM” that uses only the PEM and TEM projects that have undergone and passed a third party accuracy assessment, or that utilized a suitable number of field sample sites during the

mapping process, typically ESIL levels 1-5. See Appendices B and C for details and maps of the PEM and TEM datasets that were used in each of these two editions of the Site Productivity Dataset. Both editions contain biophysical site index data over all areas of the province.

1.2 Spatial data structure

The goal of the Site Productivity project is to produce a spatial dataset covering the entire province which provides a site index estimate in each hectare for every tree species (from a set of 22 species; see Table 2 below) that could potentially be growing on that hectare.

The spatial structure of the Site Productivity Dataset is derived from standards developed for the Hectares BC (HaBC) project, which defines a standard 100m raster grid covering the province. The Site Productivity Dataset will consist of points that lie at the center of each raster cell in a standard Hectares BC raster grid. Points that lie offshore, outside of BC's land borders, or in permanently non-forested areas will not be stored in the Site Productivity Dataset.

1.3 Non-spatial data structure

The non-spatial attributes of the Site Productivity Dataset are listed in the following table.

Table 1 - Non-spatial attributes of the Site Productivity Dataset

Field Name	Field Type, Length	Description
ID_TAG	Text, 20	Unique identifier for the point
AT_SI	Float	Site index estimate for At (trembling aspen)
BA_SI	Float	Site index estimate for Ba (amabilis fir)
BG_SI	Float	Site index estimate for Bg (grand fir)
BL_SI	Float	Site index estimate for Bl (subalpine fir)
CW_SI	Float	Site index estimate for Cw (western redcedar)
DR_SI	Float	Site index estimate for Dr (red alder)
EP_SI	Float	Site index estimate for Ep (paper birch)
FD_SI	Float	Site index estimate for Fd (Douglas-fir)
HM_SI	Float	Site index estimate for Hm (mountain hemlock)
HW_SI	Float	Site index estimate for Hw (western hemlock)
LT_SI	Float	Site index estimate for Lt (tamarack)
LW_SI	Float	Site index estimate for Lw (western larch)
PA_SI	Float	Site index estimate for Pa (whitebark pine)
PL_SI	Float	Site index estimate for Pl (lodgepole pine)
PW_SI	Float	Site index estimate for Pw (western white pine)
PY_SI	Float	Site index estimate for Py (ponderosa pine)
SB_SI	Float	Site index estimate for Sb (black spruce)
SE_SI	Float	Site index estimate for Se (Engelmann spruce)

Field Name	Field Type, Length	Description
SS_SI	Float	Site index estimate for Ss (Sitka spruce)
SW_SI	Float	Site index estimate for Sw (white spruce)
SX_SI	Float	Site index estimate for Sx (interior spruce)
YC_SI	Float	Site index estimate for Yc (yellow-cedar)
BAPID	Long Integer	Business Area Project ID of the PEM or TEM source dataset used for estimating site index value for the species listed in the PEM_SPP field. Value will be <Null> if all site indexes for the point were calculated using the Biophysical Model.
PEM_SPP	Text, 30	Comma-delimited list of two-letter codes of tree species for which site index estimates are derived from the PEM/TEM-SIBEC model (as opposed to the Biophysical model)
BGC_LABEL	Text, 9	Biogeoclimatic unit (zone, subzone, variant and phase). The BEC unit codes written here belong to the BEC version 8 classification, unless the point lies within a PEM/TEM polygon, in which case the BEC unit code belongs to the BEC classification version used in that particular PEM/TEM project.
TSA_NUMBER	Text, 30	Numeric code (as defined in the BCGW feature class WHSE_ADMIN_BOUNDARIES.FADM_TSA) of the Timber Supply Area in which the point lies

1.4 Data revision history

Table 2 - Data Revision History

Revision Number	Revision Date	Summary of Changes	Author
1.0	March 31, 2012	Created data, using SIBEC: 2011 Approximation and 85 PEM/TEM datasets	Jeff Kruys
1.1	July 27, 2012	Removed PEM/TEM-SIBEC Site Index estimates derived from BAPIDs 4024 and 5512 from the Merritt TSA and Okanagan TSA Site Prod datasets, and replaced with original Biophysical Model Site Index estimates	Jeff Kruys
2.0	March 31, 2013	Incorporated 102 more PEM/TEM datasets (and removed 5 that were used in version 1), for a total of 182 PEM/TEM datasets; performed further QA and error correction on all PEM/TEM data; developed crosswalk table of all PEM/TEM ecosystem unit codes to SIBEC classification standard; calculated site indexes using SIBEC: 2011 Approximation and the updated Biophysical Model; created two editions of Site Prod data for FTP distribution: “Site Prod with All PEM/TEM” and “Site Prod with Approved PEM/TEM”.	Jeff Kruys

Revision Number	Revision Date	Summary of Changes	Author
3.0	June 30, 2013	Recalculated using SIBEC 2013 table; added PEM/TEM datasets with BAPIDs 6065, 6066 and 6067; removed PEM/TEM datasets with BAPIDs 210 and 4485	Jeff Kruys
3.1	October 28, 2013	Recalculated after fixing bug in scripted process which caused significant portion of SIBEC table to be ignored when calculating site index estimates for the PEM/TEM-SIBEC model	Jeff Kruys
4.0	March 31, 2015	Recalculated using SIBEC 2015 "supertable"; added PEM/TEM datasets with BAPIDs 5677, 6309, 6420, 6421; removed PEM/TEM datasets with BAPIDs 4023, 4024	Jeff Kruys
5.0	March 31, 2016	Recalculated using an updated crosswalk table for relating PEM/TEM ecosystem unit codes to equivalent SIBEC ecosystem unit codes	Jeff Kruys

1.5 Update cycle for data and documentation

As mentioned in section 1.1, a new Site Productivity dataset will be released on June 30 of each year, to coincide with the release of a new SIBEC Approximation, and with the incorporation of new PEM and TEM datasets that have been received since the most recent Site Productivity dataset version was created. The following is a minimal list of the documents and sections therein that require reviewing and updating with each new Site Productivity data release:

- FLNR Provincial Site Productivity Layer (this document)
    - Document Revision History
    - 1.4 Data Revision History
    - Appendix B – List of PEM/TEM Datasets
    - Appendix C – Maps of PEM/TEM Datasets
    - Other sections as needed
- FAIB Site Productivity Strategic Work Plan
    - Description of work plan for the coming year
- Site Productivity website front page http://www.for.gov.bc.ca/hts/siteprod

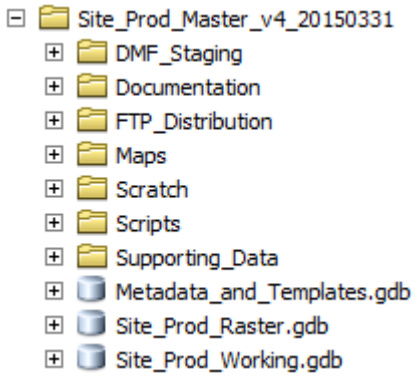
- Text in main body of web page

- Provincial Site Productivity Layer website http://www.for.gov.bc.ca/hts/siteprod/provlayer.html
  - Text in main body of web page, and PEM/TEM coverage map figures

2.0 Site_Prod_Master data storage and processing environment

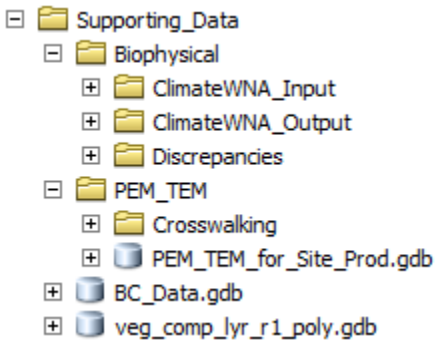
Version 4.0 of the Site Prod feature class is built through a series of Python geoprocessing scripts running under an ArcGIS 10.2 license, using supporting datasets available through the BCGW and other sources. The entire workflow is illustrated in Appendix A.

Data has been organized into a folder structure to be stored on Ministry of Environment servers in parallel with similar data structures such as the TEIS Environment (Terrain and Ecosystem Inventory), as the Site Productivity data is derived in part from the PEM and TEM data stored there. The folder structure is shown below:



- The **DMF_Staging** folder contains the final Site Productivity point data in file geodatabase (FGDB) format to be delivered to a staging folder, from which it will be loaded to the Data Mashup Framework (DMF).
- The **Documentation** folder contains this document and other files containing descriptions of various aspects of the Site Productivity project.
- The **FTP_Distribution** folder contains the final Site Productivity data in file geodatabase (FGDB) format, which is ready for public distribution via FTP. These datasets are among the final outputs of the workflow described in this document, and specifically they are created by Script 10 (see section 6.2).
- The **Maps** folder contains ArcMap MXD files for generating map figures for documentation purposes.
- The **Scratch** folder contains a Scratch file geodatabase for holding temporary datasets produced by the geoprocessing scripts.

- The **Scripts** folder contains all Python geoprocessing scripts and supporting files.
- The **Supporting_Data** folder contains local copies of datasets needed by the geoprocessing scripts. It contains the following subfolders:



  - The **Biophysical** folder contains four subfolders, each of which contains CSV files.
    - The files in the **ClimateWNA_Input** subfolder are created by the Python script **02_CreateClimateWNAInputFiles.py**.
    - The files in the **ClimateWNA_Output** subfolder are created by the ClimateWNA application.
    - The files in the **Discrepancies** subfolder are created by the Python script **09_CreateDiscrepancyRasters.py**.
  - The **PEM_TEM** folder contains a local copy of the PEM and TEM polygon feature classes.
    - The **Crosswalking** subfolder contains a CSV file for crosswalking PEM/TEM ecosystem codes from their various classification versions to the classification version used in the SIBEC table. The format of the CSV file is described in Section 4.2.
    - The **All_PEM_TEM_for_Site_Prod** and **Approved_PEM_TEM_for_Site_Prod** file geodatabases contains feature classes derived from the TEIS data by the Python script **04_ExtractCrosswalkAndWriteSIsToPEMTEM.py**.
  - The **BC_Data** file geodatabase contains local copies of various tables and feature classes needed by the Python geoprocessing scripts.
    - **prov_aspect100**, **prov_dem100** and **prov_slope100** are 100m DEM rasters obtained from the Ministry of Forests, Lands and Natural Resource Operations. It was found that these rasters were aligned in such a way that every Site Prod point laid directly on the meeting point of four DEM raster pixels, resulting in unexpected values being assigned to the points. As a workaround, all three rasters were shifted (arbitrarily) north 50m and

west 50m to create the new rasters **prov_aspect100_Shift**, **prov_dem100_Shift** and **prov_slope100_Shift**. These are used in the Python script **02_CreateClimateWNAInputFiles.py**.

- **SIBEC2016** is the updated SIBEC "Supertable" consisting of Site Index Estimates by BEC Site Series: 2013 Approximation, and the 2014 addendum, obtained from http://www.for.gov.bc.ca/hre/sibec. In addition, it has site index approximations for ecosystem units in the new Arrow, Cranbrook, Kootenay Lake and Merritt PEMs. The 2016 SIBEC Supertable is unchanged from the 2015 version.

- **Site_Prod_TSA** contains seamless, non-overlapping boundaries for the 36 Timber Supply Areas in the province. This feature class was developed specifically for the Site Productivity project in 2012 (see section 3.1.1). It is used for constructing ID_TAG values for Site Prod points in the Python script **01_CreateSiteProdPointsFromHaBCRaster.py**.

- The **UBC_species_ranges_combined** feature class tree species range polygons obtained from http://www.ualberta.ca/~ahamann/data/rangemaps.html. The source data consists of one polygon feature class for each of the 22 tree species being considered in the Site Productivity project. This single feature class combines them all into one. (The script that created the combined feature class has been lost, but there are no updates anticipated for this data.)

- Feature classes copied directly from the BCGW geodatabase, which were used in the manual construction of the **Site_Prod_TSA** feature class (see section 3.1.1):
    - WHSE_ADMIN_BOUNDARIES_FADM_DISTRICT
    - WHSE_ADMIN_BOUNDARIES_FADM_REGION_COMPARTMENT
    - WHSE_ADMIN_BOUNDARIES_FADM_TSA
- Feature classes copied directly from the BCGW geodatabase, and used for creating the initial Site Prod point feature classes in the Python script **01_CreateSiteProdPointsFromHaBCRaster.py**:
    - WHSE_BASEMAPPING_NTS_250K_GRID
    - WHSE_BASEMAPPING_NTS_BC_COASTLINE_POLYS_125M
    - WHSE_BASEMAPPING_TRIM_EBM_AIRFIELDS
    - WHSE_BASEMAPPING_TRIM_EBM_BUILDINGS
    - WHSE_BASEMAPPING_TRIM_EBM_BUILTUPAREAS
    - WHSE_BASEMAPPING_TRIM_EBM_DESIGNATEDAREAS
    - WHSE_BASEMAPPING_TRIM_EBM_EXTRACTIONSITES
    - WHSE_BASEMAPPING_TRIM_EBM_HYDRONAVBARRIERS
    - WHSE_BASEMAPPING_TRIM_EBM_HYDRORELATEDFEATURES

        - WHSE_BASEMAPPING_TRIM_EBM_ICEMASSES
        - WHSE_BASEMAPPING_TRIM_EBM_LANDCOVER
        - WHSE_BASEMAPPING_TRIM_EBM_LANDFORMS
        - WHSE_BASEMAPPING_TRIM_EBM_OCEAN
        - WHSE_BASEMAPPING_TRIM_EBM_WATERBODIES
        - WHSE_BASEMAPPING_TRIM_EBM_WATERCOURSES
        - WHSE_BASEMAPPING_TRIM_EBM_WETLANDS
      - Feature classes copied directly from the BCGW geodatabase, and used for biogeoclimatic zone attributes to each Site Prod point in the Python script **02_CreateClimateWNAInputFiles.py**:
        - WHSE_FOREST_VEGETATION_BEC_BIOGEOCLIMATIC_POLY
  - The **veg_comp_lyr_r1_poly** file geodatabase contains a copy of the VRI feature class WHSE_FOREST_VEGETATION.VEG_COMP_LYR_R1_POLY from the BCGW geodatabase. It is used in the Python script **08_WriteBiophysicalSIsToSiteProdPoints.py**.

- The **Metadata_and_Templates** file geodatabase contains the following items:
  - **Site_Prod_BAPID_Overlaps**: This table lists all potential and existing pairs of BAPIDs (PEM or TEM project numbers) that partially overlap each other spatially. The attribute fields are BAPID1, BAPID2 and WINNER, which indicates which of the two overlapping BAPIDs takes precedence. The Python script **06_UpdateOverlappingBAPIDTable.py** will automatically detect these overlaps in the PEM/TEM feature class and add new rows to this table; the user must then manually enter the BAPID number of "winner" in each newly added row.
  - **Site_Prod_BAPIDs_All** and **Site_Prod_BAPIDs_Approved**: These tables are simple listings of BAPID numbers and various details about each PEM/TEM project. Only the BAPID field is required in each of these tables. These tables must be manually maintained to reflect the current list of all BAPIDs of PEM/TEM datasets being used for the Site Productivity project. The tables are read by the Python script **04_ExtractCrosswalkAndWriteSIsToPEMTEM.py** which copies the appropriate PEM/TEM data from the main TEIS geodatabase (whose location must be specified by the user when running the script).
  - **Site_Prod_Metadata_Items**: This table lists details of the fields that should belong to the template feature class attribute tables. A script will be created in the future which creates a new template based on the contents of this table.
  - **Template_Site_Prod**: This point feature class is an empty template that is created by running the script **00_CreateSiteProdTemplates.py**. This is the template for the final Site Prod feature classes that are distributed to the public.

- **Template_Site_Prod_Working**: This point feature class is an empty template that is created by running the script **00_CreateSiteProdTemplates.py**. It contains all of the intermediate fields that are required during the running of all Site Prod data processing scripts.
- **Template_PEM_TEM_SiteProd**: This polygon feature class is an empty template that contains only the fields from the TEIS_Master_Long_Tbl feature class that are required for site index estimation. It is created by running the script **00_CreateSiteProdTemplates.py**.

- The **Site_Prod_Raster** file geodatabase contains the set of provincewide rasters to be loaded to HectaresBC. This is created by running the script **10b_CreateFinalSiteProdRasters.py**.
- The **Site_Prod_Working** file geodatabase is where the Site Prod point feature classes are kept during development. There are 89 feature classes, one for each 1:250K mapsheet tile in BC, and they are all processed serially by each of the Python scripts that modifies them.

The entire data development workflow is illustrated in the diagram in Appendix A. It begins with two parallel processing streams, one that creates the point feature class and applies the Biophysical Model site index estimates to each point (in scripts 1 to 3), and another that processes the PEM/TEM polygon data and calculates weighted site index estimates for each polygon using the SIBEC table (in scripts 4 to 6). The points are then overlaid with the PEM/TEM polygons, resulting in points with site index estimates from both models. When a given point has been assigned site index estimates for a given species from both models, the PEM/TEM-SIBEC Model estimate takes precedence over the Biophysical Model estimate. The final Site Prod point feature classes (for loading to the DMF and the FTP site) and a set of rasters (for loading to Hectares BC) are derived from this (in scripts 7 to 10).

The following sections outline the functions of the Python scripts that build the Site Prod feature class. For a more detailed technical look at the processes, view the scripts themselves, which contain descriptive comments.

3.0 Creation of the Site Prod point feature class

The following sections outline the data processing steps that create the working Site Prod point feature classes and the addition of attributes which will later be used to calculate Biophysical Model site index estimates.

3.1 Initial derivation of point features and ID_TAG values

Script 1: Create Site Prod points from HaBC raster

As the point grid is based on the Hectares BC specification, the first step is to create a generic Hectares BC raster and convert it to a point feature class. We will be assigning an ID_TAG value to each point based on which TSA and which BCGS 1:250K mapsheet the point lies in.

The specifications of the standard Hectares BC raster grid are as follows:

- East-West (x) minimum: 159,587.5 BC Albers
- East-West (x) maximum: 1,881,187.5 BC Albers
- North-South (y) minimum: 173,787.5 BC Albers
- North-South (y) maximum: 1,748,187.5 BC Albers
- Cell Width: 100 metres
- Cell Height: 100 metres
- Cell Area: 1 hectare
- Grid Width (number of columns): 17,216 cells
- Grid Height (number of rows): 15,744 cells
- Total Grid Size: 271,048,704 cells

After creating the temporary generic raster, the script performs a geometric intersection of the TSA and 1:250K mapsheet polygons, and loops through the polygons in the resulting dataset, each of which is attributed with a unique combination of TSA number and 1:250K mapsheet name. For each of these polygons, the HaBC raster cells within the polygon are converted to points, and each point is assigned an ID_TAG value based on the TSA and mapsheet of the polygon in which the point lies, along with the X and Y coordinates of the point. For example, within the polygon for TSA 01 and mapsheet 082E, the ID_TAGs of the points will all begin with “01_082E”. Each point has a unique pair of coordinates, such as 1580337.5, 475237.5. In the HaBC specification, all coordinate values end with 37.5, so those digits are dropped, and the ID_TAG for this example becomes “01_082E_15803_04752”. All ID_TAG values are exactly 19 characters long.

During the rest of the data development process, the Site Prod points will be kept in 89 separate feature classes in the **Site_Prod_Working** file geodatabase, one for each 1:250K mapsheet. The number of points in each feature class is then 1.6 million at most, which is more manageable than a single feature class containing a point for every hectare in BC. The final step will be to combine these 89 feature classes into a single feature class with approximately 85 million points for the entire province, which can then be transferred to the BCGW.

Upon its creation at this stage, each of the 89 feature classes in the **Site_Prod_Working** file geodatabase has the following attribute fields:

Table 2 - Attribute fields stored in the working Site Prod feature classes after running Script 1

Attribute Group	Attribute	Attribute Description
ID_TAGs and TSAs (populated by Script 1)	ID_TAG	Unique ID for each point (see section 3.1)
	TSA_NUMBER	Numeric code of the TSA in which the point lies
Attributes required for ClimateWNA	BGC_LABEL	Biogeoclimatic unit in which the point lies, according to the latest BEC linework (currently version 8)

Attribute Group	Attribute	Attribute Description
input (populated by Script 2)	ZONE	Biogeoclimatic zone in which the point lies, according to the latest BEC linework (currently version 8)
	ELEVATION	Elevation in meters according to TRIM 100m DEM
	SLOPE	Slope in degrees according to TRIM 100m DEM
	ASPECT	Aspect in degrees azimuth according to TRIM 100m DEM
	LAT	Latitude in decimal degrees
	LONG	Longitude in decimal degrees
PEM/TEM attributes and site indexes (populated by Script 7)	TEIS_ID	Unique ID of PEM/TEM polygon in which the point lies
	BAPID	Project ID for PEM/TEM polygon in which the point lies
	SDEC_# (3 fields)	Decile value of ecosystem component of PEM/TEM polygon in which the point lies
	SITE_S# (3 fields)	Site series code of ecosystem component of PEM/TEM polygon in which the point lies
	SITEMC_S# (3 fields)	Site series mapcode of ecosystem component of PEM/TEM polygon in which the point lies
	BGC_LBL	Biogeoclimatic unit of PEM/TEM polygon in which the point lies
	SIBEC_BGC# (3 fields)	Biogeoclimatic unit of PEM/TEM polygon after crosswalking
	SIBEC_SS# (3 fields)	Site series code of PEM/TEM polygon after crosswalking
	USE	"Use" code (see section 4.5)
	PEM_SI_xx (22 fields)	Weighted PEM/TEM-SIBEC site index estimate for species xx
	PEM_SPP	List of codes of species for which the site index estimate was derived from PEM/TEM-SIBEC
Species ranges, biophysical site indexes, and ClimateWNA results (populated by Script 8)	UBC_SPP	List of codes of species whose ranges the point lies within according to UBC species ranges
	VRI_SPP	List of codes of species whose ranges the point lies within according to observed species in VRI data
	BPSI_OBL_xx (15 fields)	Biophysical site index estimate for species xx according to original (version 8) biogeoclimatic linework
	BPSI_PBL_xx (15 fields)	Biophysical site index estimate for species xx according to localized PEM/TEM biogeoclimatic linework
	MWMT	Mean warmest month temperature (°C)
	MCMT	Mean coldest month temperature (°C)
	TD	Temperature difference between MWMT and MCMT, or Continentality (°C)
	MAP	Mean annual precipitation (mm)
	MSP	Mean summer (May to Sept.) precipitation (mm)
	AHM	Annual heat:moisture index (MAT+10)/(MAP/1000))
	SHM	Summer heat:moisture index ((MWMT)/(MSP/1000))
	DDLT0	Degree-days below 0°C, chilling degree-days
	DDGT5	Degree-days above 5°C, growing degree-days
	DDGT18	Degree-days above 18°C, cooling degree-days
	NFFD	Number of frost-free days
	PAS	Precipitation as snow (mm)
	EMT	Extreme minimum temperature over 30 years
	EREF	Hargreaves reference evaporation
	CMD	Hargreaves climatic moisture deficit
Discrepancy values (populated by Script 9)	DISCREP_xx (15 fields)	Numeric difference between biophysical site index and PEM/TEM-SIBEC site index for species xx

3.1.1 Creation of the Timber Supply Area boundaries feature class

The BC Geographic Warehouse (BCGW) geodatabase contains a vector dataset depicting TSA boundaries (**WHSE_ADMIN_BOUNDARIES.FADM_TSA**), but it is not topologically clean, in that it contains overlapping polygons and gaps between adjacent polygons. We needed to subdivide the entire HaBC raster, created in the previous step, into "tiles" conforming to the TSA polygons. So it was necessary to create a topologically clean TSA boundaries feature class.

Note that many TSAs occupy entire forest districts. However, in some cases, a group of multiple adjacent forest districts forms a single TSA. So the forest district feature class (named **WHSE_ADMIN_BOUNDARIES.FADM_DISTRICT** in the BCGW geodatabase) was used as a basis for constructing the TSA polygon feature class.

In some instances, a forest district is split into multiple TSAs. It can be seen that in each such case, the line or lines upon which the forest district is split follow the boundaries of forest region compartment polygons, found in the BCGW feature class **WHSE_ADMIN_BOUNDARIES.FADM_REGION_COMPARTMENT**. See the figure below; note that the blue line that splits the forest district (with orange boundaries) into two TSAs is made up of regional compartment boundaries (in black).

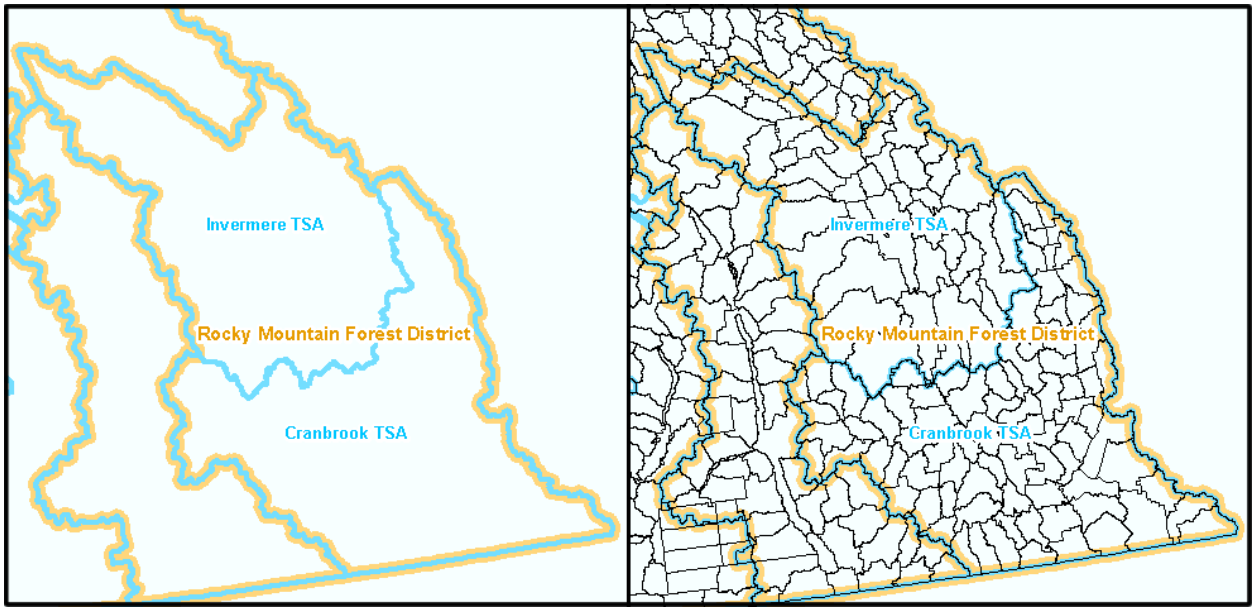


Figure 1 - Derivation of Timber Supply Area boundaries using Forest Region Compartment boundaries

The resulting TSA polygon feature class was included in the 2011-12 fiscal year deliverables for this project.

3.2 Creation of input files for ClimateWNA application

Script 2: Add elevation, slope, aspect and BGC attributes to Site Prod points, and create ClimateWNA input files

Historical climate information is required by the Biophysical Model, and the ClimateWNA standalone application is required to assign this information to each Site Prod point. ClimateWNA is available as a free download from http://www.genetics.forestry.ubc.ca/cfcg/ClimateWNA/ClimateWNA.html. For the Site Productivity project, the use of version 4.62 (no later) of ClimateWNA is required.

ClimateWNA requires CSV input files in a certain format. This Python script builds these input files, containing the ID_TAG, slope, aspect, biogeoclimatic zone, latitude, longitude and elevation of each point. (Not all of these parameters are required for ClimateWNA, but they are required for the Biophysical Model site index calculations later.) The user must then start up the ClimateWNA application and specify as input one of the four CSV files that the Python script has created. These four files are named:

- \Supporting_Data\Biophysical\ClimateWNA_Input\CWNA_Input_082E_092L.csv
- \Supporting_Data\Biophysical\ClimateWNA_Input\CWNA_Input_092M_093N.csv
- \Supporting_Data\Biophysical\ClimateWNA_Input\CWNA_Input_093O_102P.csv
- \Supporting_Data\Biophysical\ClimateWNA_Input\CWNA_Input_103A_114P.csv

When running ClimateWNA, the user should specify the output files to be named as follows:

- \Supporting_Data\Biophysical\ClimateWNA_Output\CWNA_Output_082E_092K_Normal_1961_1990Y.csv
- \Supporting_Data\Biophysical\ClimateWNA_Output\CWNA_Output_092L_093K_Normal_1961_1990Y.csv
- \Supporting_Data\Biophysical\ClimateWNA_Output\CWNA_Output_093L_094L_Normal_1961_1990Y.csv
- \Supporting_Data\Biophysical\ClimateWNA_Output\CWNA_Output_094M_114P_Normal_1961_1990Y.csv

Each CSV file will contain approximately 24 million lines and will take approximately 24 to 30 hours for ClimateWNA to process, depending on the computer's processing speed. Multiple instances of ClimateWNA can be run in parallel on a machine with multiple CPU cores with little or no speed penalty.

3.3 Removal of Site Prod points in non-forested areas

Script 3: Remove Site Prod points in non-forested areas

Points that lie in non-forested areas are not stored in the final Site Prod feature class. This script will remove from the working Site Prod feature classes any points that lie within any of the polygon features in the BCGW feature classes listed below in Table 4.

Table 3 - BCGW feature classes depicting permanently non-forested areas

Feature Class Name	Description
WHSE_BASEMAPPING.TRIM_EBM_AIRFIELDS	Airfields
WHSE_BASEMAPPING.TRIM_EBM_BUILDINGS	Buildings
WHSE_BASEMAPPING.TRIM_EBM_BUILTUPAREAS	Built up areas
WHSE_BASEMAPPING.TRIM_EBM_DESIGNATEDAREAS	Designated areas

Feature Class Name	Description
WHSE_BASEMAPPING.TRIM_EBM_EXTRACTIONSITES	Developed areas, eg. sports fields, military establishments, campgrounds, landfills, quarries
WHSE_BASEMAPPING.TRIM_EBM_HYDRONAVBARRIERS	Hydrological navigation barriers, eg. gravel bars, dams
WHSE_BASEMAPPING.TRIM_EBM_HYDRORELATEDFEATURES	Hydrological related features, eg. wharves, docks, beacons
WHSE_BASEMAPPING.TRIM_EBM_ICEMASSES	Ice masses
WHSE_BASEMAPPING.TRIM_EBM_LANDCOVER	Agricultural features, eg. vineyards, orchards
WHSE_BASEMAPPING.TRIM_EBM_LANDFORMS	Non-forested landforms, eg. slides, moraine, lava beds
WHSE_BASEMAPPING.TRIM_EBM_OCEAN	Ocean
WHSE_BASEMAPPING.TRIM_EBM_WATERBODIES	Water bodies
WHSE_BASEMAPPING.TRIM_EBM_WATERCOURSES	Water courses
WHSE_BASEMAPPING.TRIM_EBM_WETLANDS	Wetlands

4.0 PEM/TEM-SIBEC Model

The PEM/TEM-SIBEC model, incorporates Predictive Ecosystem Mapping (PEM) and Terrestrial Ecosystem Mapping (TEM) data that has been gathered in many areas of the province over recent decades. These datasets delineate distinct ecosystem units down to the level of biogeoclimatic unit and site series. This information is then used in combination with the Ministry of Forests' SIBEC table, which lists site index estimates, developed through field sampling, for each BGC unit, site series, and observed tree species.

4.1 Cleaning of PEM/TEM data from TEIS geodatabase

Much manual work has gone into standardizing the ecosystem attribute data of the PEM and TEM datasets chosen for use in the Site Productivity project, and edge matching between pairs of spatially adjacent PEM/TEM projects. This was a prerequisite to the work of crosswalking all biogeoclimatic, decile value and site series codes to the SIBEC classification standard (see section 4.2). The "cleaned" data will be loaded into the Data Mashup Framework (DMF) in 2015, and will be made available for download via a web-based mapping interface.

The following automated processes require "cleaned" PEM/TEM data to function correctly.

4.2 Compilation of SIBEC sources to SIBEC "Supertable" for 2016

The most recent official release of a full SIBEC table was in 2013. There was an addendum released in 2014. These are published on the SIBEC website, http://www2.gov.bc.ca/gov/topic.page?id=6221CAFD41244A8987DA4D7C7F414FB0.

In March 2015, additional site index approximations were provided for use in the Site Prod project, which corresponded to the ecosystem unit codes used in the newly released PEM datasets for Kootenay Lake, Cranbrook, Arrow and Merritt Timber Supply Areas (BAPIDs 5677, 6309, 6420 and 6421 respectively). Included were rules for handling "lumped" or aggregate ecosystem units. All of these sources for site index approximations were compiled together into a SIBEC "Supertable" which we refer to as the SIBEC 2015 release, although it will not be published in the same form as previous SIBEC tables. An Excel document containing the "supertable" and all of its sources in separate worksheets is included in this release of Site Prod version 4.0, in a file named SIBEC_Supertable_20150331.xls. The full table is also stored in the file geodatabase table **\Supporting_Data\BC_Data.gdb\SIBEC2016** (which is unchanged from the 2015 version), and it is read from that location by various Site Prod data processing scripts.

4.3 Correcting PEM/TEM attribute errors

Script 4a: Create table for use in cleaning PEM/TEM ecosystem unit attribute data

This script will read in the entire PEM/TEM "long table" polygon feature class and produce an Excel table containing a list of all of the unique ecosystem units by BAPID. This table is then looked at by specialists, currently Ted Lea and/or Barb von Sacken. They will make a note of any errors they find, and then send back the table with corrections noted.

Script 4b: Implement ecosystem unit attribute corrections

This script will implement the corrections to the PEM/TEM attributes from the table received from Ted Lea and/or Barb von Sacken.

After running the 4b script which corrects the PEM/TEM attributes, you may wish to run script 4a again, and send the output table to Ted and/or Barb to look for any errors that might have been overlooked the first time. Continue this cycle until all errors have been corrected.

4.4 Creating the PEM/TEM-SIBEC crosswalk table

Ecosystem classification standards have evolved through several versions, and the PEM and TEM data stored in the TEIS Environment, which has been gathered over many years, may adhere to any of these versions. Not all productive forested ecosystem units in the PEM and TEM data have an exact matching ecosystem unit in the SIBEC table.

In consultation with ecosystem classification specialists (most notably Ted Lea and Del Meidenger), a “crosswalk table” has been developed which gives the equivalent SIBEC-standard ecosystem classification for every ecosystem code found in the PEM and TEM project datasets used for Site Productivity. The crosswalk table takes the form of

an Excel spreadsheet, which is saved in CSV format and stored in the folder **\Supporting_Data\PEM_TEM\Crosswalking**. Updating and improving this crosswalk table is an ongoing concern, and will need special attention anytime new PEM or TEM data is to be incorporated, and potentially anytime a new version of the SIBEC table is released.

The table contains the following fields:

- BAPID
- BGC_UNIT
- SITE_S
- SITEMC_S
- Seral
- IN_SIBEC_2011, IN_SIBEC_2013, and IN_SIBEC_2015
- HAB_SUBTYPE
- HAB2_SUBTYPE
- Blank_Column
- BGC_UNIT_X
- SITE_S_X

Script 4c: Create a new crosswalk table

This script will read the current PEM/TEM data and the crosswalk table from the previous version of Site Prod. The information from the previous crosswalk table will be repeated in a new crosswalk table output, and new rows are added for ecosystem units that are in the current PEM/TEM data but weren't listed in the previous crosswalk table. This output table must be sent to Ted Lea and/or Barb von Sacken. They will add information for ecosystem units that do not have direct matches in the current SIBEC table. If such an ecosystem unit has an equivalent ecosystem unit that is listed in the SIBEC table, then Ted and/or Barb enter that equivalent ecosystem unit in the BGC_UNIT_X and SITE_S_X columns; this is "crosswalking" from the PEM/TEM data to the SIBEC table.

In 2016, this crosswalk table was restructured. Each PEM/TEM ecosystem code is now crosswalked to a unique combination of SIBEC BGC unit, site series code, region, and source, where “source” refers to the names of the sections of the amalgamated SIBEC Supertable. Previously, the crosswalk table only specified an equivalent SIBEC BGC unit and site series for each PEM/TEM ecosystem unit.

4.5 Extraction of PEM/TEM data and site index calculation

Script 4d: Extract, crosswalk, and write site index values to PEM/TEM data

This script will read the table **\Metadata_and_Templates.gdb\Site_Prod_BAPIDs** to determine the BAPID numbers of the PEM and TEM project datasets that should be copied over to the Site Prod folder structure for calculating weighted site indexes under the PEM/TEM-SIBEC model. It then exports a subset of the TEIS Master Long Table feature class (the location of which must be specified as the first argument to this script) and stores it

as **\Supporting_Data\PEM_TEM\PEM_TEM_for_Site_Prod.gdb\TEI_Long_Tbl_SiteProd**. This working copy of the PEM and TEM data will contain only the few required attribute fields out of the approximately 275 fields that the original PEM and TEM feature classes contain.

This Python script adds these new attribute fields to the working PEM/TEM feature class:

- BGC_LBL (full BGC unit designation)
- SIBEC_BGC1 (full BGC unit of the crosswalked SIBEC-recognized ecosystem for component 1)
- SIBEC_SS1 (site series code of the crosswalked SIBEC-recognized ecosystem for component 1)
- SIBEC_REG1 (region code of the crosswalked SIBEC-recognized ecosystem for component 1)
- SIBEC_SRC1 (source code of the crosswalked SIBEC-recognized ecosystem for component 1)
- SIBEC_BGC2
- SIBEC_SS2
- SIBEC_REG2
- SIBEC_SRC2
- SIBEC_BGC3
- SIBEC_SS3
- SIBEC_REG3
- SIBEC_SRC3
- USE

The USE field contains a string value that indicates whether the polygon can be used for site index calculation. The possible values written to this field are:

- **NCBF**: “Not crosswalkable, but forested”. If any of the three components fall into this classification, then the entire polygon will not be used for site index calculation. Approximately 3.7% of all PEM/TEM area falls under this classification.
- **NM**: “Not mapped”. No BGC unit or ecosystem codes were specified, and this polygon cannot be used for site index calculation. Approximately 1.4% of all PEM/TEM area falls under this classification.
- **NP**: “Non-productive”. The polygon contains only non-forested ecosystems, and cannot be used for site index calculation. Approximately 19.1% of all PEM/TEM area falls under this classification.
- **UNK**: “Unknown”. If any of the three ecosystem component codes were unrecognized by the ecosystem classification specialists, then the entire polygon will not be used for site index calculation. Approximately 0.01% of all PEM/TEM area falls under this classification.
- **Use**: At least one of the ecosystem components (after crosswalking) is found in the SIBEC table, and there are no ecosystem codes classified as **NCBF** or **UNK**. This polygon can be used for site index calculation. Approximately 75.8% of all PEM/TEM area falls under this classification.

The script will export the PEM/TEM polygons where the USE field contains the value “Use” to a new feature class named **TEI_Long_Tbl_SiteProd_USE**, and export the PEM/TEM polygons where the USE field contains a value other than “Use” to a new feature class named **TEI_Long_Tbl_SiteProd_DO_NOT_USE**.

The final step in this script is to calculate and write site index estimates to the **TEI_Long_Tbl_SiteProd_USE** feature class. It steps through each polygon in the feature class and, referring to the SIBEC table’s site index values, calculates site index estimates for each polygon and stores them in the attribute fields named **PEM_SI_xx** (22 fields, one for each species, where **xx** is the two-letter species code). Additionally, a field named **PEM_SPP** is

populated with a comma-delimited list of tree species for which site indexes were calculated in this model for each polygon.

For each polygon in the PEM/TEM dataset, one weighted site index value is calculated **for each tree species** that is ecologically suitable for the site series Each weighted site index for a species incorporates all of the SIBEC site index estimates for that species in the (up to) three PEM/TEM site series components, excluding any site series for which the SIBEC table gives no site index estimate. This equation is:

$$si_T = \sum_S c_{S,P} si_{T,S}$$

where:

Table 4 - Elements of the Site Index equation

Element	Description	Determination
si_T	The weighted **Site Index** for a given **Tree Species**	Computed
S	The set of **Site Series** components within the **PEM/TEM Polygon** (determined by the **BGC Unit** and **Region**) for which the SIBEC table gives a **Site Index Estimate** for the **Tree Species**	Observed
$c_{S,P}$	The **Site Series** component fraction (decile) within a **PEM/TEM Polygon**	Observed
$si_{T,S}$	The **Site Index Estimate** in the SIBEC table for the **Tree Species** for a given **Site Series** within a **BGC Unit** and **Region**	Estimated

Site index calculation example

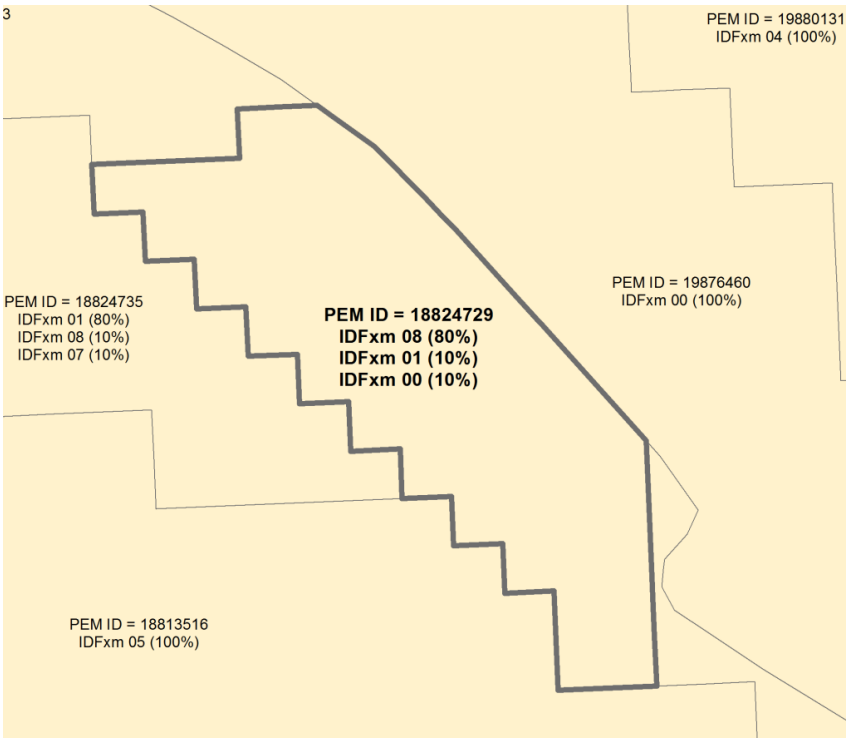


Figure 2 – Example of a PEM polygon

For the example polygon above, the relevant SIBEC table entries are as follows:

Table 5 - Excerpt from the SIBEC table

BGC Unit	Site Series	Tree Spp	Region	Site Association	Mean Plot Site Index
IDFxm	01	Fd	Cariboo	Fd - Pinegrass - Feathermoss	16.40222221
IDFxm	08	Fd	Cariboo	Sxw - Snowberry - Prickly rose	18
IDFxm	08	Sx	Cariboo	Sxw - Snowberry - Prickly rose	18

We determine from the SIBEC table that Fd is an ecologically suitable species in IDFxm 01 and IDFxm 08, two site series which collectively occupy 9/10ths of the polygon. For the remaining 1/10th of the polygon (IDFxm 00 site series), there is no SIBEC site series estimate for Fd, so this 1/10th of the polygon should not be included in the weighted averaging of the available site index estimates. It can be stated that 90% of the polygon supports any growth of Fd.

Similarly, Sx is potentially present in IDFxm 08 which occupies 8/10ths of the polygon.

So we calculate:

$si_{Fd} = (18 \times (8 \div 9)) + (16.40222221 \times (1 \div 9))$

$= \mathbf{17.8224691344}$

$si_{Sx} = (18 \times (8 \div 8))$

$= \mathbf{18}$

The attributes stored for this PEM/TEM polygon are shown in the following table:

Table 6 - Attribute values stored as a result of the sample calculation

Attribute	Attribute Description	Value
PEM_SI_FD	Calculated site index for the Fd species	17.8
PEM_SI_SX	Calculated site index for the Sx species	18

4.6 Dissolving PEM/TEM feature class for depiction on map figures

Script 5: Create dissolved PEM/TEM dataset for map figures

This is not a necessary step for data development. It creates a simplified feature class for depiction on map figures (such as in Appendix C of this document). It is recommended to run this script under ArcGIS 10.1 or later with 64-bit geoprocessing installed. The output feature classes are named **TEI_Long_Tbl_SiteProd_USE_Dissolved** and **TEI_Long_Tbl_SiteProd_DO_NOT_USE_Dissolved**. The ArcMap MXD files are found in the **Maps** folder.

4.7 Updating the Overlapping BAPIDs table

Script 6: Update table of overlapping BAPIDs

There will always be overlapping areas between PEM and TEM projects, so for every pair of overlapping projects, it must be decided which one of the pair takes precedence. These decisions result from a manual process of comparing the details of the two PEM/TEM projects in question for vintage of data (ie. the most recent data is usually better quality), the known quality of the data (the relative experience of the PEM/TEM mappers for example), the survey intensity level (projects that included a high level of field sampling are considered better quality), and known accuracy of data (eg. results of a third party accuracy assessment).

The **Site_Prod_BAPID_Overlaps** table (found in the **Metadata_and_Templates** file geodatabase) contains one row for each pair of BAPID numbers of PEM/TEM projects that spatially overlap. This script searches the current PEM/TEM feature class for pairs of overlapping BAPIDs that aren't already listed in the table, and adds them to the table. The script does not automatically select which of the pair has the better quality data; the user must manually edit the table and fill in the **WINNER** field with the BAPID number that takes precedence in each newly added record in the table.

4.8 Writing PEM/TEM-SIBEC site index values to the Site Prod points

Script 7: Write PEM/TEM-SIBEC site index values to Site Prod points

This script overlays the working Site Prod point feature classes with the PEM/TEM feature class and copies the PEM/TEM attributes and site index values to the working Site Prod point feature classes. It refers to the **Site_Prod_BAPID_Overlaps** table (see section 4.4) for any point that lies within multiple overlapping PEM/TEM polygons to decide which polygon's attributes to assign to the point.

5.0 Biophysical Model

The following section describes the Biophysical Model for calculating site index estimates for all Site Prod points, regardless of whether the point lies within a PEM/TEM polygon.

5.1 Addition of species ranges and biophysical model site indexes to Site Prod points

Script 8: Write species ranges and biophysical site index values to Site Prod points

This script first overlays the working Site Prod points with the UBC Species Range polygon feature classes and the VRI feature class (in the **Supporting_Data** folder; see section 2.0) to determine the lists of species whose ranges each point lies in. The attribute fields **UBC_SPP** and **VRI_SPP** are updated in each of the 89 feature classes in the **Site_Prod_Working** file geodatabase. Each of these fields is populated with a comma-delimited list of species codes, for example "At,Pl,Sb,Sw,Sx". These values are referred to in subsequent scripts.

The script then reads the ClimateWNA output files (produced by running the ClimateWNA application using the input files produced by Script 2; see section 3.2), and uses this information along with the point's other attributes (elevation, slope, aspect, and biogeoclimatic zone) to calculate biophysical site index values for each Site Prod point. The biogeoclimatic zone largely determines which species are estimated for each point. If the point lies within a PEM/TEM polygon, then the biogeoclimatic zone of that polygon is used; otherwise, the biogeoclimatic zone of the point according to the BCGW biogeoclimatic unit feature class is used.

The biophysical model was initially created as a statistical model in SAS by Gord Nigh, and its logic has since been translated to Python and embedded directly into this script. Biophysical model site index estimates are written into the fields named **BPSI_OBL_xx** and **BPSI_PBL_xx** (one pair for each of the 15 tree species for which this model can predict a site index value, where **xx** is the species code) in each of the 89 feature classes in the **Site_Prod_Working** file geodatabase. Note that it writes all of the site index values that it calculates, regardless of the species ranges that the point lies in according to the values that were written in the fields **UBC_SPP** and **VRI_SPP**; these range restrictions are applied at the final stage (Script 10) of the data development process.

6.0 Final Products

6.1 Creation of discrepancy tables and rasters

Script 9: Create discrepancy tables and rasters

This script updates the working Site Prod feature classes' attributes named DISCREP_xx (where xx is the two-letter species code) with the numeric difference between the biophysical site index value and the PEM/TEM site index value for the species, when site index estimates from both models have been calculated. It then creates one CSV file (in the \Supporting_Data\Biophysical\Discrepancies folder) and one raster (in the \Supporting_Data\Biophysical\Discrepancies\discrepancy_rasters.gdb file geodatabase) for each of the 15 tree species, listing the discrepancies for all points for which there are two differing site index estimates for the species. These CSV files and rasters can be viewed and analyzed in order to identify problem areas where change or improvement is needed in some aspect of the calculations.

6.2 Creation of final datasets for loading to DMF, HectaresBC and FTP

Script 10a: Create final Site Prod feature classes

This final Python script will read the working Site Prod feature classes and calculate the final set of 22 site index values for each point, and then write the points to a single feature class which can be loaded to the Data Mashup Framework (DMF). For each point, the final site index values are calculated using the following logic:

- for each species:
    - if there is a PEM/TEM-SIBEC site index value for the species, then write this value to the final Site Prod site index field for that species;
    - if there is no PEM/TEM-SIBEC site index value for the species, and the point lies within a PEM/TEM polygon, and there is a Biophysical Model site index (calculated using the PEM/TEM

polygon's BGC zone attribute) for the species, and if the point lies in the UBC and/or VRI species distribution range for the species, then write this value to the final Site Prod site index field for that species;

- if there is no PEM/TEM-SIBEC site index value for the species, and the point does not lie within a PEM/TEM polygon, and there is a Biophysical Model site index (calculated using the BGC zone attribute of the BEC v8 polygon in which the point lies) for the species, and if the point lies in the UBC and/or VRI species distribution range for the species, then write this value to the final Site Prod site index field for that species;
- else, write a null value to the final Site Prod site index field for that species.

The final Site Prod feature class attribute table conforms to the BCGW-modeled non-spatial data structure as outlined in Table 1 (see section 1.3), whereas the Working Site Prod feature classes with all of their intermediate attributes can be preserved in the Site_Prod_Master data processing environment for the purposes of investigating the calculations that led to the final results.

The script also produces file-based copies of the dataset in FGDB format for FTP distribution. One FGDB is produced for each of the 36 TSAs. Two sets of 36 FGDBs are written, one set for the "Site Prod with Approved PEM/TEM" edition of the data, which is identical to the Site Prod data to be loaded into the DMF, and another set for "Site Prod with All PEM/TEM" edition.

Script 10b: Create final Site Prod rasters

This script creates two FGDBs (one for each of the two Site Prod editions) each containing 22 rasters, one per tree species, depicting the site index values province-wide. Starting at Site Prod version 3.1, the rasters for Site Productivity with Approved PEM/TEM will be loaded to Hectares BC. As well, the rasters for both Site Productivity editions (with Approved PEM/TEM and with All PEM/TEM) will be made available in file geodatabase format via FTP.

Script 11: Create final Site Prod feature classes and layer files for PDF maps

At version 3.1 of Site Prod, a new scripted process was developed which converts the rasters for Site Productivity with Approved PEM/TEM, created by Script 10, into polygon feature classes which are then formatted for use in the production of PDF map products.

When the script has completed, a file geodatabase named Site_Prod_Polygons_for_PDFs.gdb will have been created in the Maps folder of the Site Prod data processing environment. The feature classes in this FGDB will be used by Script 12 and its associated MXD file.

Script 12: Create PDF maps

This script reads the MXD file Site_Prod_PDF_maps_3m_intervals_letter_size.mxd, found in the Maps folder of the Site Prod data processing environment, and uses its Data Drive Pages capability to create a series of PDF maps. With 36 TSAs in the province, and 22 species, this script could potentially produce 792 PDF files, each displaying the site index values for one species in one TSA. The script filters out non-existent combinations of TSA and species; for example, since there are no values for Cw found in the Fort Nelson TSA, there will be no PDF map produced for that combination. With the Site Prod 3.1 data, this script resulted in 436 of the possible 792 PDF maps being output.

These PDFs are distributed via the Site Prod website and the DMF. The files should be transferred to Forest Analysis and Inventory Branch (FAIB) who will ensure that they are copied to the appropriate servers and properly linked from the website.

7.0 Quality Assurance

Data quality is expressed in two ways: data correctness and data accuracy. The former involves checking the data development process to ensure that the expected numbers are produced. The latter requires checking the results against other similar datasets and/or against data observed in the field.

7.1 Data correctness

After each step of the data development process, the results were reviewed manually. Since there are 85 million points available to be checked, a random sample had to suffice. The sample was selected to span all timber supply areas, PEM/TEM project areas, and biogeoclimatic zones or units.

The following is a list of quality assurance methods followed after each stage of data development. Any issues discovered generally indicated that the script in question was not performing correctly, so the script was debugged until the expected results were achieved.

Table 7 – Quality assurance methods to ensure data correctness

Data Development Stage	Attribute to Check	Description of Quality Assurance Methods
Script 1: Create points and write ID_TAG values	**Working Site Prod point attributes:** ID_TAG	Check that the first part ID_TAG value (prior to the first underscore character) corresponds to the number of the TSA in which the point lies, that the second part of the ID_TAG value corresponds to the 1:250K mapsheet (letter block) in which the point lies, and that the final two parts of the ID_TAG value correspond to the XY coordinates of the point.

Data Development Stage	Attribute to Check	Description of Quality Assurance Methods
Script 2: Add elevation, slope, aspect, and BGC zone attributes, and create ClimateWNA input files	BGC_LABEL	Check that the value corresponds to the biogeoclimatic unit label attribute of the BEC (version 8) polygon in which the point lies
	ZONE	Check that the value corresponds to the biogeoclimatic zone attribute of the BEC (version 8) polygon in which the point lies
	ELEVATION	Check that the value corresponds to the DEM raster cell in which the point lies
	SLOPE	Check that the value corresponds to the slope raster cell in which the point lies
	ASPECT	Check that the value corresponds to the aspect raster cell in which the point lies
	LAT	Check that the value corresponds to the latitude coordinate of the point
	LONG	Check that the value corresponds to the longitude coordinate of the point
	ClimateWNA Input CSV Files	Check that on each line of the CSV file, the ID_TAG value, biogeoclimatic zone, slope, aspect, latitude, longitude and elevation match in the same way they do in the working Site Prod point attribute table
Script 3: Remove Site Prod points in non-forested areas	n/a	Verify that Site Prod points no longer exist in areas occupied by non-forested area polygons
Scripts 4a to 4d: Extract, crosswalk and write Site Index values to PEM/TEM	**PEM/TEM polygon attributes:** BGC_LBL	Verify that BGC_LBL is a concatenation of BGC_ZONE, BGC_SUBZON, BGC_VRT and BGC_PHASE
	SIBEC_BGC# (3 fields)	Look up the combination of BGC_LBL and SITEMC_S# in the crosswalk table, and verify that this attribute has the correct cross-walked BGC unit
	SIBEC_SS# (3 fields)	Look up the combination of BGC_LBL and SITEMC_S# in the crosswalk table, and verify that this attribute has the correct cross-walked site series code
	USE	Verify that the correct "Use" code has been written (see section 4.2 for a description of codes)
	PEM/TEM "Use" polygon attributes: PEM_SI_xx (22 fields)	Check that the site index values are calculated correctly (see section 4.2 for a description of the calculation)
	PEM_SPP	Check that the codes for all species for which a site index was calculated are listed in the string written here
Script 6: Update Overlapping BAPIDs table	**Overlapping BAPIDs table attributes:** BAPID_1, BAPID_2	Check that all expected pairs of overlapping BAPIDs are listed in the table
	WINNER	Check that existing values are correct, and update any blank values

Data Development Stage	Attribute to Check	Description of Quality Assurance Methods
Script 7: Write PEM/TEM-SIBEC site index value to Site Prod points	**Working Site Prod point attributes:** BAPID_1	Check that all values correspond to the PEM/TEM polygon in which the Site Prod point lies
	SDEC_# (3 fields)	
	SITE_S# (3 fields)	
	SITEMC_S# (3 fields)	
	BGC_LBL	
	SIBEC_BGC# (3 fields)	
	SIBEC_SS# (3 fields)	
	USE	
	PEM_SI_xx (22 fields)	
	PEM_SPP_1	
Script 8: Write species ranges, biophysical site indexes, and ClimateWNA results to Site Prod points	**Working Site Prod point attributes:** UBC_SPP	Check that the list of codes of tree species corresponds to the UBC species range polygons in which the point lies
	VRI_SPP	Check that the list of codes of tree species corresponds to the species observed in the VRI polygon in which the point lies
	BPSI_OBL_xx (15 fields)	Verify that the biophysical site indexes (for the original version 8 biogeoclimatic linework) have been calculated correctly (refer to the Biophysical Model reference document and/or the Python script code)
	BPSI_PBL_xx (15 fields)	Verify that the biophysical site indexes (for the localized PEM/TEM biogeoclimatic linework) have been calculated correctly (refer to the Biophysical Model reference document and/or the Python script code)
	MWMT	Check that the climate attributes written here correspond to the values written in the ClimateWNA output files for each ID_TAG value
	MCMT	
	TD	
	MAP	
	MSP	
	AHM	
	SHM	
	DDLT0	
	DDGT5	
	DDGT18	
	NFFD	
	PAS	
	EMT	
	EREF	
	CMD	
Script 9: Calculate discrepancies	**Working Site Prod point attributes:** DISCREP_xx (15 fields)	Verify that the value is equal to the numeric difference between biophysical site index and PEM/TEM-SIBEC site index for species xx
Scripts 10a and 10b: Create Final Site Prod feature class and	n/a	Verify that the number of records in the final feature class is equal to the sum of the number of records in each Working Site Prod feature class

Data Development Stage	Attribute to Check	Description of Quality Assurance Methods
rasters	**Final Site Prod point attributes:** xx_SI (22 fields)	Check that all fields have been calculated according to the logic described in section 6.2. Check that the values in the raster datasets correspond to the values found in the point feature class.
	BAPID	
	PEM_SPP	
	BGC_LABEL	
	TSA_NUMBER	
Script 11: Create Site Prod feature classes for PDF maps	**New FGDB in Maps folder:** Site_Prod_Polygons_for_PDFs.gdb	Check that values in polygons in FGDB feature classes match the values in the corresponding source rasters (created by Script 10b and found in the FTP_Distribution folder).
Script 12: Create PDF maps	**PDF maps in \Maps\PDF_Maps folder**	Visually check that the PDF maps match the rasters in \Maps\Site_Prod_Polygons_for_PDFs.gdb

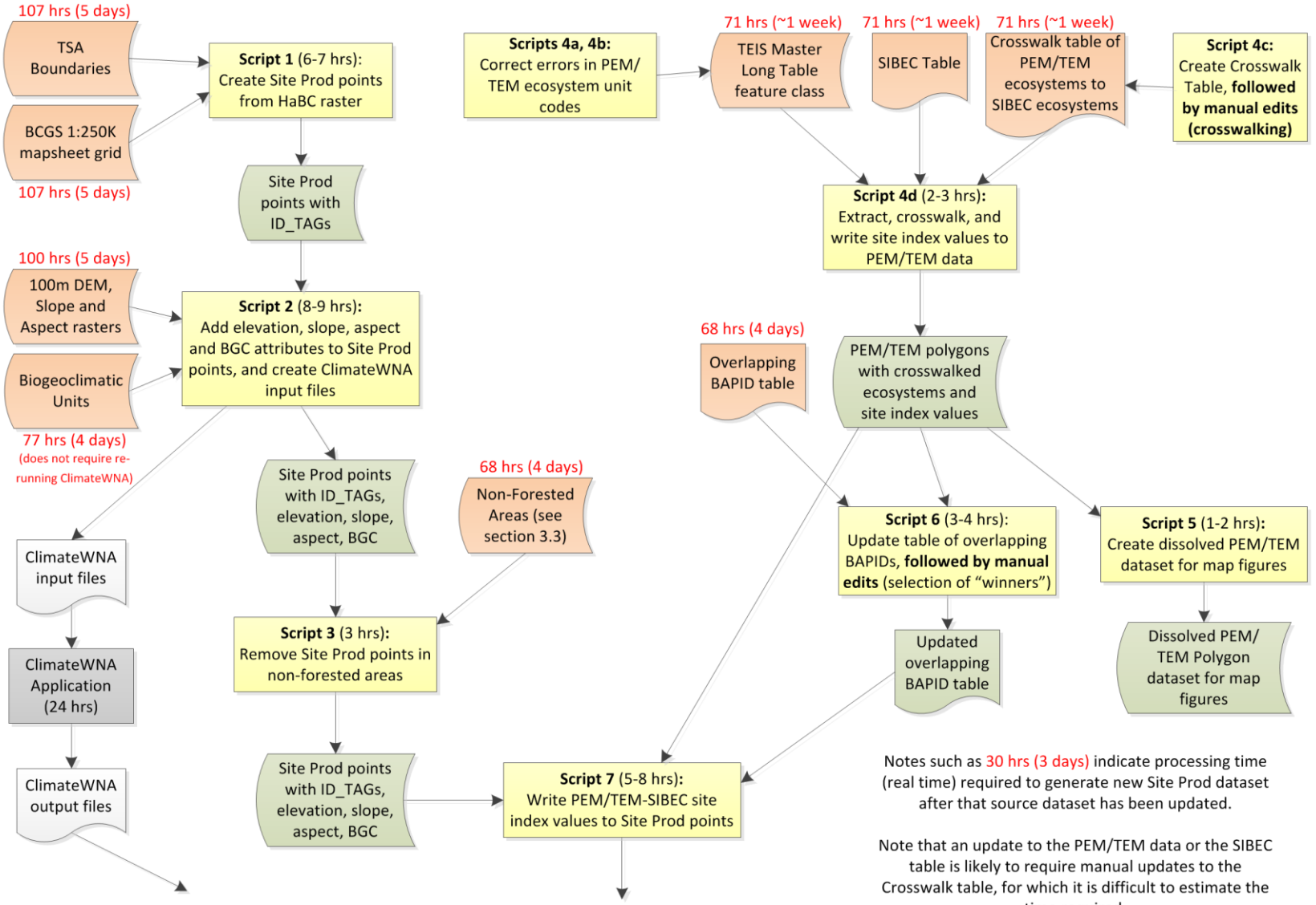
7.2 Data accuracy

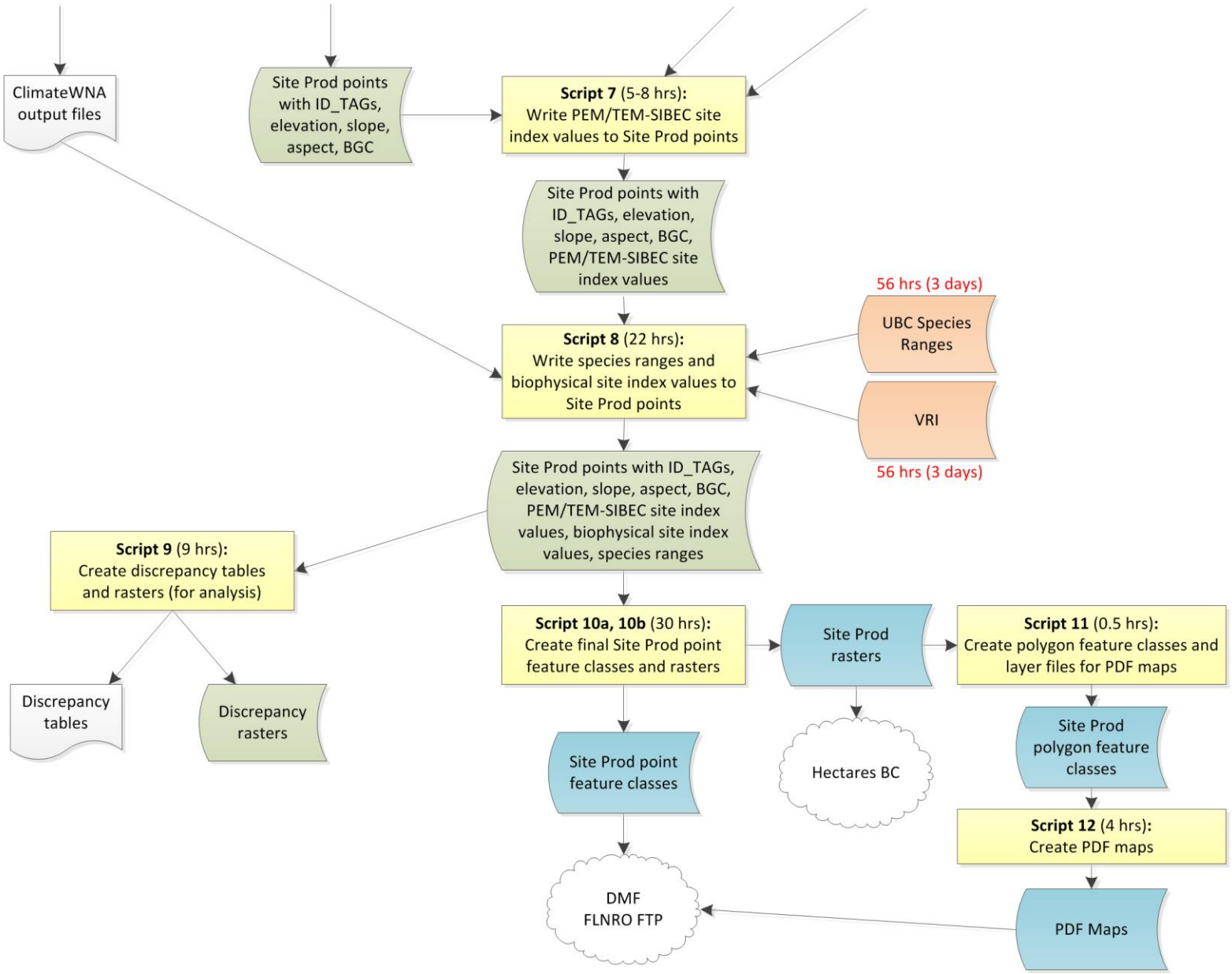
The discrepancy values (see section 6.1) may provide an indication of areas where Site Prod data is less accurate or less reliable. Individual points where the biophysical model site index and the PEM/TEM-SIBEC model site index differ widely lead one to question which model is more accurate. Investigating the origins of each of the two differing values may lead to recognition that one model or the other needs refinement in a certain region.

The accuracy of some source data can come into question. PEM and TEM datasets sometimes go through accuracy assessments which estimate their reliability, and the Site Prod accuracy suffers when PEM/TEM accuracy is low. In other cases, a deficiency of field sampling can lead to equations used in the biophysical model that may not give accurate results in all parts of a biogeoclimatic zone and improvements cannot be made to the model until further sampling is carried out.

In the future, a comparison will be made of Site Prod data and the RESULTS data to assess Site Prod accuracy. Findings resulting from this process will appear in this section in future versions of this document.

Appendix A – Workflow Diagram





Appendix B – List of PEM/TEM Datasets

Table 7 is a list of PEM/TEM datasets used in the Site Productivity project in the 2011-12 and 2012-13 fiscal years.

More information and metadata regarding these PEM/TEM datasets can be found in the feature class WHSE_TERRESTRIAL_ECOLOGY.STE_TEI_PROJECT_BOUNDARIES_SP, found in the BCGW geodatabase.

The **Earliest Site Prod Version** column indicates the version number of the Site Productivity dataset in which this PEM/TEM dataset was first used.

The **Accuracy Assessment** (AA) and Ecosystem Survey Intensity Level (**ESIL**) columns give an indication of the reliability of the PEM/TEM dataset. Note that accuracy assessments were not generally performed on PEM/TEM data until recent years; for earlier projects, the Ecosystem Survey Intensity Level (ESIL) value is a reliability indicator. ESIL is defined as the sampling intensity characterized according to percentage of polygons that have been field inspected or density of inspections by area. Coding must follow Table 6-3 in the Standard for Terrestrial Ecosystem Mapping in British Columbia (see http://archive.ilmb.gov.bc.ca/risc/pubs/teecolo/tem/tem6/tem63.htm).

The **Site Prod Editions** column indicates which editions of the Site Productivity dataset the PEM/TEM dataset has been incorporated into. The Site Productivity dataset editions are named “Site Prod with All PEM/TEM” and “Site Prod with Approved PEM/TEM”. Every PEM/TEM dataset is included in the “All” edition, but for a PEM/TEM dataset to be included in the “Approved” edition, completion and approval of a third party accuracy assessment and/or an ESIL value of 1-5 are necessary.

The **Superseded Overlapping Projects** column lists BAPID numbers of PEM/TEM datasets that are superseded by the PEM/TEM dataset in question. Overlapping areas are still present in the PEM/TEM data, but in these areas, the polygons belonging to the superseded PEM/TEM project are disregarded (see section 4.8).

Table 7: Summary of PEM/TEM datasets used in the PEM/TEM-SIBEC Model

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
29	TFL 41 - Dala Creek TEM	1.0	Not completed	4	**All** and **Approved**	
31	Mamin Blackwater TEM	2.0	Not completed	4	**All** and **Approved**	
36	TFL39 - Walbran Caycuse TEM	2.0	Not completed		**All**	
46	TFL 45 - Knight Inlet TEM	1.0	Not completed	3	**All** and **Approved**	6067

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
50	Adam and Eve TEM	2.0	Not completed		**All**	
52	Dinan McClinton TEM	2.0	Not completed	4	**All** and **Approved**	
53	Henderson Lake TEM	2.0	Completed; approved	3	**All** and **Approved**	3058
54	Chemainus River TEM	2.0	Not completed		**All**	
57	Klanawa River TEM	2.0	Completed; approved		**All** and **Approved**	
58	Salmon River TEM	2.0	Completed; approved	4	**All** and **Approved**	
64	Catface LU TEM	2.0	Not completed		**All**	
65	Sydney River TEM	2.0	Not completed		**All**	
68	Hesquiat LU TEM	2.0	Not completed	4	**All** and **Approved**	
69	Muriel Ridge TEM	2.0	Not completed	4	**All** and **Approved**	
70	Fortune LU TEM	2.0	Not completed		**All**	
71	Marble LU TEM	2.0	Not completed	4	**All** and **Approved**	
73	Tranquil Creek TEM	2.0	Not completed		**All**	
74	Bedwell TEM	2.0	Not completed		**All**	
75	Ursus TEM	2.0	Not completed	4	**All** and **Approved**	
77	Atleo TEM	2.0	Not completed	4	**All** and **Approved**	
78	Pretty Girl TEM	2.0	Not completed	4	**All** and **Approved**	
81	Iron River TEM	2.0	Not completed		**All**	
91	Adams Lake TEM	2.0	Not completed	R	**All**	3006
92	TFL19 Gold River TEM	2.0	Not completed	4	**All** and **Approved**	
108	BC Gas Pipeline TEM	1.0	Not completed	R	**All**	239
121	Cathedral Park TEM	1.0	Not completed	4	**All** and **Approved**	4778
131	Forbidden Plateau TEM	2.0	Not completed	4	**All** and **Approved**	
133	TFL 35 TEM	1.0	Not completed	4	**All** and **Approved**	
142	Indian Arm - Mt Seymour Park TEM	2.0	Not completed	5	**All** and **Approved**	
149	Sutherland River Babine TEM	2.0	Not completed		**All**	
153	Chilliwack Lake TEM	2.0	Not completed	5	**All** and **Approved**	1073
157	Nahatlach Lake TEM	2.0	Not completed		**All**	
166	Phillips River TEM	1.0	Completed; approved	1	**All** and **Approved**	
167	QCI Upper Yakoun TEM	2.0	Not completed	4	**All** and **Approved**	52
168	QCI Louise Island TEM	2.0	Not completed		**All**	
169	Haans TEM	2.0	Not completed	4	**All** and **Approved**	
170	Schoen Strathcona Park TEM	2.0	Not completed		**All**	
171	Upper Kennedy TEM	2.0	Not completed	R	**All**	206

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
172	Bulson River TEM	2.0	Not completed		**All**	70
174	Lower Nahmint TEM	2.0	Not completed		**All**	
175	Taylor River Maber Creek TEM	2.0	Not completed		**All**	75
176	Namu Koeye TEM	1.0	Not completed	4	**All** and **Approved**	5681, 6067
177	Tsitika River TEM	2.0	Not completed		**All**	
178	Upper Nahmint TEM	2.0	Completed; approved		**All** and **Approved**	
179	TFL 47 TEM	1.0	Completed; approved		**All** and **Approved**	
180	TFL 46 - S. Vancouver Island TEM	2.0	Not completed	4	**All** and **Approved**	5627
182	Akie Pesika TEM	2.0	Not completed	4	**All** and **Approved**	
184	Valemount Kinbasket Lake TEM	2.0	Not completed	4	**All** and **Approved**	
185	Ingenika TEM	2.0	Completed; not approved	4	**All**	
198	Fort Sheppard TEM	1.0	Not completed	4	**All** and **Approved**	
203	Tsulquate TEM	2.0	Not completed	4	**All** and **Approved**	
204	Great Central Lk TEM	2.0	Completed; approved		**All** and **Approved**	
205	TFL 41 - Kitimat TEM	1.0	Not completed		**All**	
206	Clayoquot Sound REVISIT	2.0	Not completed	4	**All** and **Approved**	71
207	QCI TFL39 Peel Security TEM	2.0	Not completed	4	**All** and **Approved**	
208	TFL18 - Slocan Vavenby TEM	2.0	Not completed	4	**All** and **Approved**	
214	Dunkley TFL53 TEM	1.0	Not completed	4	**All** and **Approved**	
222	Cummins River TEM	2.0	Not completed	4	**All** and **Approved**	
225	Bonanza TEM	2.0	Not completed	4	**All** and **Approved**	177
226	Wood River TEM	2.0	Not completed	4	**All** and **Approved**	
228	Shushartie TEM	2.0	Not completed	4	**All** and **Approved**	
230	Mahatta TEM	2.0	Not completed	4	**All** and **Approved**	
231	Sukunka TEM	1.0	Not completed	4	**All** and **Approved**	
234	Sooke Hills TEM	2.0	Not completed	4	**All** and **Approved**	
235	TFL 8 - Pope and Talbot TEM	1.0	Completed; approved		**All** and **Approved**	1055
236	TFL 44 - Sproat Lake TEM	2.0	Completed; approved		**All** and **Approved**	
238	TFL 14 - Spillimacheen TEM	1.0	Completed; approved	4	**All** and **Approved**	
239	TFL 15 OK Falls TEM	1.0	Not completed	4	**All** and **Approved**	
240	Gosnell Creek TEM	1.0	Not completed	5	**All** and **Approved**	
242	Mt Cornation TEM	2.0	Not completed		**All**	
243	Upper Qualicum TEM	2.0	Not completed		**All**	
1029	Ellerslie Lk TEM	1.0	Not completed		**All**	

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
1039	Princess Royal Island TEM	2.0	Not completed	4	**All** and **Approved**	
1055	Granby Kettle TEM	1.0	Not completed			
1056	Tulsequah Chief TEM	1.0	Not completed	4	**All** and **Approved**	
1073	Hope IFPA TEM	2.0	Not completed	4	**All** and **Approved**	108
3006	Clearwater PEM	1.0	Not completed		**All**	
3037	Sarita TEM	2.0	Completed; approved	4	**All** and **Approved**	
3057	Escalante TEM	2.0	Not completed	4	**All** and **Approved**	
3058	Toquart Effingham TEM	2.0	Not completed	5	**All** and **Approved**	
3072	Block 4/Port McNeill TEM	2.0	Completed; approved	4	**All** and **Approved**	203
4000	Johnston TEM	1.0	Not completed		**All**	
4001	Bella Vista TEM	1.0	Not completed	4	**All** and **Approved**	
4006	Mission TEM	2.0	Not completed	4	**All** and **Approved**	
4018	Bell Pole PEM	1.0	Not completed	P	**All**	
4019	Boundary TSA PEM	1.0	Completed; approved		**All** and **Approved**	1055, 4029
4029	Osoyoos Okanagan Area A Mapping TEM	1.0	Not completed	4	**All** and **Approved**	4778
4033	TFL 23 PEM	1.0	Completed; **not approved**		**All**	1055, 4018
4034	Upper Wood River PEM	1.0	Not completed	P	**All**	
4039	Abitibi PEM 2001/2002	1.0	Not completed	R	**All**	185
4041	INVERMERE TSA PEM	1.0	Completed; conditionally approved	P	**All** and **Approved**	6135
4044	TFL48 PEM	1.0	Completed; conditionally approved		**All** and **Approved**	
4045	TFL 49 PEM	1.0	Completed; approved		**All** and **Approved**	4024
4051	TFL 30 PEM	1.0	Not completed	P	**All**	
4052	Prince George TSA PEM	1.0	Completed; conditionally approved		**All** and **Approved**	
4053	Blackwater Retrofit PEM	1.0	Completed; conditionally approved	P	**All**	
4056	QCI Husby TEM	2.0	Completed; **not approved**	5	**All**	52
4078	Deer Vernon TEM	2.0	Not completed	R	**All**	
4119	Flores Island TEM	2.0	Not completed		**All**	
4201	Klaskish TEM	2.0	Not completed	4	**All** and **Approved**	
4202	Lull Sallie TEM	1.0	Not completed	4	**All** and **Approved**	46, 4776, 6067
4212	Chadsey TEM	2.0	Not completed		**All**	

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
4296	Fort Nelson TSA PEM	1.0	Not completed		**All**	
4299	Cortez LU TEM	1.0	Not completed	4	**All** and **Approved**	
4301	Fullmore LU TEM	1.0	Not completed	4	**All** and **Approved**	5437
4303	Dewdney Cedarflat TEM	2.0	Not completed	4	**All** and **Approved**	
4316	Revelstoke PEM	1.0	Completed; conditionally approved **(ICH units only)**		**All** and **Approved**	4018
4322	TFL 55 PEM	1.0	Completed; approved	P	**All** and **Approved**	
4475	Fort St. John PEM	1.0	Not completed	R	**All**	4296
4477	Commonage TEM	1.0	Not completed	4	**All** and **Approved**	
4482	Bulkley Woodlots TEM	1.0	Completed; approved	4	**All** and **Approved**	
4489	Indian LU TEM	2.0	Not completed	4	**All** and **Approved**	
4490	Bute East LU	1.0	Not completed	4	**All** and **Approved**	
4492	King Island TEM	1.0	Not completed	R	**All**	
4493	Ingram Lake TEM	1.0	Not completed	R	**All**	1029
4498	Lake Country TEM	1.0	Not completed	4	**All** and **Approved**	
4508	McBride Community Forest TEM	2.0	Not completed	4	**All** and **Approved**	
4510	Burns Lake Community Forest Integrated VRI/PEM	1.0	Not completed	4	**All** and **Approved**	4482
4511	Morice & Lakes TSA PEM	1.0	Completed; conditionally approved		**All** and **Approved**	149, 240, 4482, 4510
4516	Soo LU TEM	2.0	Not completed	4	**All** and **Approved**	
4517	Callaghan LU TEM	2.0	Not completed	4	**All** and **Approved**	
4518	Mamquam LU TEM	2.0	Not completed	4	**All** and **Approved**	
4519	Lower Squamish LU TEM	2.0	Not completed	4	**All** and **Approved**	4518
4520	East Howe TEM	2.0	Not completed	4	**All** and **Approved**	
4521	Siska Watershed TEM	2.0	Not completed		**All**	
4522	CDFmm TEM	1.0	Not completed	5	**All** and **Approved**	234, 4904
4677	Chapman LU TEM	1.0	Not completed	4	**All** and **Approved**	
4678	Sechelt LU TEM	1.0	Not completed	4	**All** and **Approved**	4522
4679	Sloquet LU TEM	2.0	Not completed	4	**All** and **Approved**	
4680	Sloquet High LU TEM	2.0	Not completed	4	**All** and **Approved**	
4681	Tuwasus LU TEM	2.0	Not completed	4	**All** and **Approved**	
4682	Meager LU TEM	2.0	Not completed	4	**All** and **Approved**	
4683	Birkenhead LU TEM	2.0	Not completed	4	**All** and **Approved**	

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
4684	Howe LU TEM	1.0	Not completed	4	**All** and **Approved**	
4685	Ryan LU TEM	2.0	Not completed	4	**All** and **Approved**	
4776	TFL45 TEM Augmentation	1.0	Not completed	R	**All**	
4777	Kingcom TSA TEM	1.0	Not completed	4	**All** and **Approved**	179
4778	Okanagan - very dry belt PEM	1.0	Not completed		**All**	91, 108
4834	Joe Rich SEI	1.0	Not completed	4	**All** and **Approved**	
4883	QCI Husby - Kootenay Inlet TEM	2.0	Not completed		**All**	
4884	QCI Husby - Skidegate Inlet TEM	2.0	Not completed		**All**	
4890	QCI Husby - Hibben Island TEM	2.0	Not completed		**All**	
4902	Henderson Lake TEM	2.0	Completed; approved		**All** and **Approved**	
4903	Alberni West TEM	2.0	Not completed	4	**All** and **Approved**	171, 175, 178, 180, 204, 206, 3058
4904	Powell River Block 1 TEM	1.0	Not completed	4	**All** and **Approved**	
4906	Skidegate TEM	2.0	Not completed	4	**All** and **Approved**	4884
4907	North Island Block3 TEM	1.0	Not completed	4	**All** and **Approved**	4777
4908	Railroad LU TEM	2.0	Not completed	4	**All** and **Approved**	
4909	Gates LU TEM	2.0	Not completed	4	**All** and **Approved**	
4910	Rogers LU TEM	2.0	Not completed	4	**All** and **Approved**	
4911	Lizzie LU TEM	2.0	Not completed	4	**All** and **Approved**	
4912	Billygoat LU TEM	2.0	Not completed	4	**All** and **Approved**	
4913	Jervis LU TEM	1.0	Not completed	4	**All** and **Approved**	
4914	Salmon LU TEM	1.0	Not completed	4	**All** and **Approved**	
4915	Brittain LU TEM	1.0	Not completed	4	**All** and **Approved**	
4916	Bulkley TSA PEM	1.0	Completed; conditionally approved		**All** and **Approved**	4482
4917	Westbank First Nation Community Forest TEM	1.0	Completed; approved	4	**All** and **Approved**	4778, 5433, 5511
5433	Updated Central OK Valley Central OK South Slopes Kelowna Ellison Joe Rich	1.0	Not completed	5	**All** and **Approved**	4045, 4778, 4834
5435	Vanderhoof Forest District PEM	1.0	Not completed		**All**	
5437	Strathcona TSA TEM	1.0	Not completed	4	**All** and **Approved**	92, 166, 179
5438	Kitasoo TEM	1.0	Not completed	R	**All**	1029, 1039, 4493
5492	Okanagan TEM	1.0	Not completed		**All**	108

BAPID	Project Name	Earliest Site Prod Version	Accuracy Assessment	ESIL	Site Prod Editions	Superseded Overlapping BAPIDs
5511	OK TSA PEM	1.0	Completed; conditionally approved		**All** and **Approved**	91, 108, 121, 235, 1055, 3006, 4018, 4029, 4316, 4778, 4834
5512	Cariboo PEM	1.0	Completed; approved		**All** and **Approved**	4052
5627	Teal Jones TEM	2.0	Not completed		**All**	
5638	Sunshine Coast TSA Haslam LU TEM	2.0	Not completed	4	**All** and **Approved**	4522, 4904, 6122
5639	Sunshine Coast TSA Skwawka LU TEM	2.0	Not completed	4	**All** and **Approved**	
5640	Sunshine Coast TSA Bunster LU TEM	2.0	Not completed	4	**All** and **Approved**	4522, 4904
5641	Soo TSA Upper Lillooet LU	2.0	Not completed	4	**All** and **Approved**	
5666	Soo TSA Whistler LU	2.0	Not completed	4	**All** and **Approved**	
5672	Kingcome TSA Ahta-Charles-Miriam LU TEM	2.0	Not completed	4	**All** and **Approved**	
5676	Belize LU TEM	1.0	Not completed		**All**	
5677	Kootenay Lake PEM	4.0	Incomplete for some non-forested site series		**All**	4033
5681	EBM TEM Midcoast TSA	2.0	Not completed	R	**All**	
5682	EBM TEM Kingcome TSA	2.0	Not completed	R	**All**	4202, 4907
6065	North Coast TSA North TEM	3.0	Not completed	R		
6066	North Coast TSA South TEM	3.0	Not completed	R		
6067	Mid-Coast Kingcome TSA TEM	3.0	Not completed	R		4000, 5681
6118	Narrows LU TEM	1.0	Not completed	4	**All** and **Approved**	
6122	Lois Lake West TEM	1.0	Completed; approved	4	**All** and **Approved**	
6123	Lois Lake East TEM	1.0	Completed; approved	4	**All** and **Approved**	
6135	Stoddart Creek TEM	1.0	Not completed		**All**	
6309	Cranbrook PEM	4.0	Completed; approved		**All** and **Approved**	4041, 5677
6420	Arrow PEM	4.0	Completed; approved		**All** and **Approved**	198, 1055, 4018, 4019, 4033, 4316, 5511, 5677
6421	Merritt PEM	4.0	Completed; approved		**All** and **Approved**	108, 121, 4045, 4778, 4917, 5511

Appendix C – Maps of PEM/TEM Datasets

The figures on the following pages illustrate the relative locations of the PEM and TEM datasets used in this project. Each figure illustrates the full coverage areas of the datasets.

The first three maps show the PEM/TEM datasets that were incorporated into the “Site Prod with All PEM/TEM” dataset. The last three maps depict only the PEM/TEM datasets that were incorporated into the “Site Prod with Approved PEM/TEM” dataset.

The area covered by PEM/TEM polygons whose ecosystem units were used for site index calculations is shown in **dark green**. The areas where ecosystem codes indicate the presence of forest, but the codes could not be cross-walked to any ecosystem listed in the SIBEC table, are shown in **olive green**. Non-productive and non-forested ecosystems are shown in **blue**. Areas that have not been mapped by any PEM/TEM project are shown in **white**.

Note again that Biophysical Model site index values have been calculated in **all** forested areas of the province. Site index estimates derived from PEM and TEM data, where available, take precedence over site index estimates derived from the Biophysical model.