What is the Biogeoclimatic Ecosystem Classification?

By: Derek Marcoux R.P.Bio Selkirk College

BEC stands for Biogeoclimatic Ecosystem Classification system. The Biogeoclimatic Ecosystem Classification system was first developed by Dr. V.J. Krajina of the Department of Botany, University of British Columbia. In the 1970's, the Biogeoclimatic Classification system was adopted by the British Columbia Ministry of Forests as a method to classify and manage sites on an ecosystem-specific basis.

As the name implies, the system incorporates three distinct levels into the classification of ecosystems in BC. "Bio" indicates the biological nature of the ecosystem. This can be observed in BEC by looking at the vegetation potential on a site. "Geo" indicates the use of soils and geology in the classification. We determine this aspect of BEC by analyzing soil pits and determining the soil texture and geology of the site. Finally, "climatic" involves overriding climatic factors in the classification. For instance, many of us have experienced that the coast of BC is wetter, the north interior is drier and colder and the southern interior is hotter. The combination of geology, vegetation and climate concepts form the basis for division of Biogeoclimatic Zones in British Columbia.

Together, the three levels Bio, Geo and Climatic are used to classify any site in BC into an ecosystem. In British Columbia, there are 14 biogeoclimatic zones identified.

The Concept of Ecosystem

In BEC, the ecosystem is defined as the interactions between climate and soil that determine the vegetation potential on a site. Prevailing climate in any given area will determine the average amount of rainfall, temperature and growing-degree days that will occur on a site. The soils will determine whether a site receives moisture from adjacent hillslope, drains moisture excessively (eg sandy soils), has an abundance of soil nutrients or is depleted in soil nutrients. The combination of prevailing climate and soil type can be used to predict the potential vegetation community that may develop in any given area of the province. In BEC, ecosystems are described in terms of potential plant community or what the species composition might look like at maturity.

Zones, Subzones, Variants and Phases

Zones:

BEC Zones are the highest level of classification and represent areas of broad macroclimate. They are generally named after dominant tree species and a descriptor of the general climate or region. Examples include the Coastal Western Hemlock Zone, Interior Douglas-fir Zone and Boreal White and Black Spruce Zone.

Example:

CWH – Coastal Western Hemlock

ESSF – Engelmann Spruce Subalpine fir

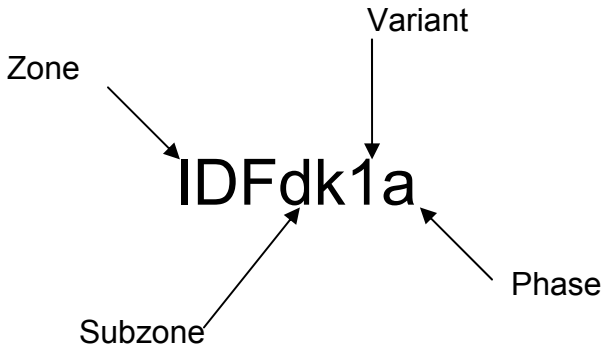
Subzones:

Subzones are divisions of zones that further define the climate of an area. On the coast, subzones are divided based on climate and continentality (the relative influence of the marine environment on the terrestrial environment). In the interior, subzones are divided based on climate and precipitation.

Variants are divisions of subzones that are slightly wetter, drier, cooler or hotter than other areas in the subzone.

Phases are used periodically to account for subtle changes in variants that are a result of different topography. Examples can include cold air drainage sites, south facing aspects and local rain shadow. These sites may be extensive within a variant but not large enough nor climatically different enough to justify creating a separate variant. A full Biogeoclimatic ecosystem label that has a zone, subzone, variant and phase would look like:

IDFdk1a – Thompson dry, cool Interior Douglas-fir variant, grassland phase



Site Series and the concept of the Zonal Site

The smallest unit of classification in BEC is the site series. Site series are defined as ecosystems that have similar soil moisture and soil nutrients and have plants species that are indicative of the potential vegetation community that can occupy a site at maturity. Therefore, the description of site series in the field manuals always represents the mature site conditions.

Central to site series is the concept of a zonal site. A zonal site is the site series that best reflects the regional macroclimate of a biogeoclimatic subzone or variant. These plant communities do not drain or collect soil moisture excessively nor do they have an overabundance or lack of nutrients. With this in mind, they tend to occupy sites that have the following characteristics:

- ✓ Gentle slopes (<25%),
- ✓ Deep (>1m) deposits of medium-textured (loamy) soils,
- ✓ Middle slope positions
- ✓ No root restricting layers
- ✓ Not subject to frost pockets or cold air drainage or other abiotic site features

Zonal sites are used to differentiate between the different BEC subzones and variants. If we consider the definition of a zonal site described above, two zonal sites that have strongly dissimilar plant communities at maturity would likely represent areas with different climates and therefore a different subzone or variant. For example, if one zonal site had a plant community that consisted of Subalpine fir, Engelmann spruce and black huckleberry while another zonal site several kilometers away had a plant community that consisted of Subalpine fir, Engelmann spruce and ladyfern we could conclude that the two zonal sites represents distinctly different climates. The occurrence of ladyfern on a zonal site would indicate a wetter climate.

Within any BEC zone the zonal site is always numbered ‘01’ and every other site series is numbered driest to wettest and from poor to rich.

Soil Moisture Regime (SMR)

Soil Moisture Regime (SMR) is defined as the average amount of soil water annually available for evapotranspiration by vascular plants over several years (Meidinger and Pojar 1991). The SMR uses nine classes to define the available soil moisture, which range from the driest (very xeric) to the wettest (hydric). This classification uses the relative soil moisture available to plants and is the system used in the interior of the province. In the Vancouver Forest Region, an actual soil moisture

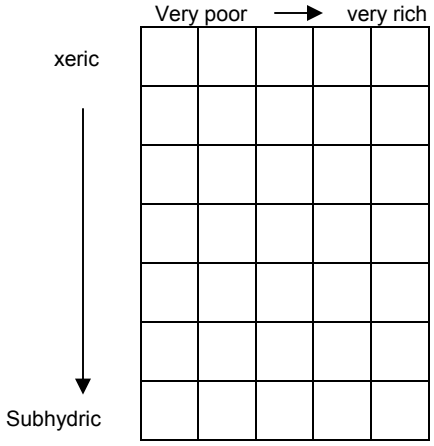
classification system is used to reflect the actual amount of water available as a function of climate (Klinka 1989).

Soil Nutrient Regime (SNR)

Soil Nutrient Regime (SNR) is defined as the amount of essential soil nutrients that are available to vascular plants over a period of several years (Meidinger and Pojar 1991). SNR is broken down into six classes that range from A (very poor) to E (very rich).

Edatopic Grid

Together, the SMR and SNR on any site are represented in a two-dimensional table known as an edatopic grid. Below is a representation of an edatopic grid for the interior of BC.



Site series are units that have a particular SMR and SNR range on an edatopic grid. Therefore, one tool for determining the site series of an area is to cross-reference the SMR and SNR on an edatopic grid. For example, if a site on the ICHdw table below has an SMR of 1 (xeric) and an SNR of 'C' (medium) then the site series might be 02-FdPy-Oregon Grape Parsley fern. This is a simple way to estimate the site series however many more factors need to be considered before a final verdict is reached as will be mentioned below.

The plant community on the site is also used as an indicator of the site series. Not every site will fit perfectly in to the species list proposed in a site series table. It up to the person in the field to judge the amount certain "indicator" plants should be used to determine the site series. For site series specific species lists, consult a regional field guide available in the references section.

References

Klinka, K., Krajina, V.J., A. Ceska and M. Scagel. 1989. Indicator Plants of Coastal British Columbia. Univ. of BC Press, Vancouver BC

Meidinger, D. and Pojar, J. 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests. 330 pp. http://www.for.gov.bc.ca/hfd/pubs/Docs/Srs/SRseries.htm

Regional Field Guides:

Banner, A., W. MacKenzie, S. Haeussler, S. Thomson, J. Pojar, and R. Trowbridge. 1993. A field guide to site identification and interpretation for the Prince Rupert Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 26. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh26.htm

Braumandl, T.F. and M.P. Curran. 1992. A field guide for site identification and interpretation for the Nelson Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 20. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh20.htm

DeLong, C., A. MacKinnon, and L. Jang. 1990. A field guide for site identification and interpretation for the northeast portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 22. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh22.htm

DeLong, C. 1996a. A field guide for site identification and interpretation for the southeast portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Draft field guide insert.

DeLong, C. 1996b. A field guide for site identification and interpretation for the Rocky Mountain Trench portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Draft field guide insert. (Update for LMH 15.)

DeLong, C. 2000. A field guide for site identification and interpretation of ecosystems of the northwest portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Draft field guide insert. (Update for LMH 21.) http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh21.htm

DeLong, C., D. Tanner, and M.J. Jull. 1993. A field guide for site identification and interpretation for the southwest portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 24. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh24.htm

DeLong, C., D. Tanner, and M.J. Jull. 1994. A field guide for site identification and interpretation for the northern Rockies portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 29.

Green, R.N. and Klinka. 1994. A Field Guide for Site Identification and Interpretation for the Vancouver Forest Region. Ministry of Forests. 185 pp. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh28.htm

Lloyd, D., K. Angove, G. Hope, and C. Thompson. 1990. A guide to site identification and interpretation for the Kamloops Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 23. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh23.htm

MacKinnon, A., A. McLeod, and D. Meidinger. 1990. A field guide for site identification and interpretation of ecosystems of the northwest portion of the Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 21

Meidinger, D., A. McLeod, A. MacKinnon, C. DeLong, and G. Hope. 1988. A field guide for site identification and interpretation for the Rocky Mountain Trench, Prince George Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 15.

Steen, O.A., and R.A. Coupé. 1997. A field guide to forest site identification and interpretation for the Cariboo Forest Region. B.C. Min. For., Res. Br., Victoria, B.C., Land Manage. Handb. No. 39. http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh39.htm