

February 2006

Future Forest Ecosystems of BC Symposium

Working Group Report: Biogeoclimatic Ecosystem Classification (BEC) as a Scientific Foundation for Management

Our working group addressed the following questions/tasks:

1. Will the current BEC system continue to serve as a foundation for ecosystem management?
2. Does the current management paradigm support or prevent the development of a robust scientific foundation for ecosystem management?
3. What changes to the current paradigm would be advantageous, or what alternative paradigm would be preferred?

Discussions and opinions on these topics are presented in sequence, followed by a list of recommendations and a general summary.

Discussion of Question 1: Will the current BEC system continue to serve as a foundation for ecosystem management?

Participants were asked to address the issue of how long they felt BEC would continue to serve us, in its present form, with climate change. The timeline was not considered to have a simple answer. Depending upon the application of the classification, the timeline for impact of climate change is wide ranging. While most ecosystem descriptions will likely be valid for quite some time, many management decisions have long-term impacts (e.g., tree species selection guidelines) already requiring changes to BEC. There was definite agreement that climate is changing, and that the magnitude and rate, although variable depending upon the model, will require changes to the BEC system in the near future.

It was noted that the ecosystem management system used in BC includes Ecoregion Classification primarily used by Ministry of Environment for natural areas protection and wildlife management. The Ecoregion Classification will also need to be updated as the units have a climatic basis in addition to physiography.

In the discussion of BEC and its usefulness in a future of modified climates, the following points were made:

- First Nations have a much longer history in managing the land and this knowledge needs to be incorporated into future management.
- The development of the BEC system has provided BC with a solid foundation of ecological knowledge. We have a wealth of information on contemporary (1970-2000) climate–site–vegetation relationships. This information provides us with a

baseline upon which to measure or monitor change. Although more data would be required to model future ecosystems with any precision, our present knowledge base can help us in understanding the potential magnitude of change, how it might affect our ecosystems, and how and when we need to change our management to address future change.

- With the BEC baseline data, we can develop a picture of BC's forests, mostly prior to large-scale industrialization of the landscape and before climate change manifested itself in the province's ecosystems. This is archival information. The picture will become a snapshot of bygone forests, or of "desirable past conditions."
- BEC has a strong climate component. As climates change, BEC must be modified. No-one stated that BEC had to be replaced by something else, but all felt that BEC, with modification could continue to provide an ecosystem model upon which to base management decision-making. The future system will not be BEC as we know it today, but the new system will have to link biological, physical, and climatic aspects and therefore will still be "bio-geo-climatic" in nature.
- With a changing climate, the biological components of the ecosystem will change the most. The soil will change more slowly. The physiographic/ landform component will remain relatively unchanged, except locally because of mass movements or massive floods. The future BEC has to focus on these more stable features for ecosystem identification, and modify applications to relate to these sites in a changing climate. This does not mean that vegetation is unimportant – but interpretation may be less straightforward.
- BEC is the foundation of ecosystem management today. We will need an ecosystem classification system to provide most of the applications that BEC presently provides, including a framework upon which to communicate and monitor management activities, an ecological inventory for various planning activities, etc. This system will have to be dynamic so that it can be updated as conditions change.
- More sampling of younger forest ecosystems is needed to better monitor and model local changes. We are more likely to see the effects of climate change on harvested or disturbed areas before they become evident in older, existing stands. We have a good climate–site–vegetation model with BEC, but we need to increase our knowledge of these relationships for species of younger forest stands.
- BEC guides and maps will need to be continually updated, based on new data, modelling, and evidence of impacts of climate change. Maps and field guides are periodically updated, when necessary. The difference in the future is that we will need to have a continuous sampling and monitoring program to make sure that the guides and maps are current and useful to practitioners. The sampling and monitoring needs to occur on existing zonal ecosystems, developing younger stands, and recently disturbed stands.
- BEC guides need to establish successional pathways so that practitioners can understand both the ecological basis for stand/vegetation development and how disturbance factors into this development.

- BEC has to impart more understanding of ecosystem principles and processes to students and users and how this is incorporated into BEC and its applications. We must move from a “cookbook” approach to ecosystem management to a knowledge-based approach.
- The climate surface model needs to be improved with more climate station data. One suggestion was to re-install the historic climate station network (from the extensive Ministry of Environment network in place in the 80’s) in order to have historical data as well as new data.
- Predictive models can be greatly improved with knowledge of the autecology of key management and indicator species.
- Present applications, like tree species selection, need to be reviewed with climate change scenarios in mind.
- There is a need for a structured, integrated approach to an adaptive management framework – one that identifies how formal research models and applications can be supported by adaptive management. For example, formal research could clearly identify causal relationships and add scientific weight needed for initiating institutional change; adaptive management, on the other hand, could be more useful at exploring options, doing trend evaluations and guiding the application of rigorous cause/effect research to maximize the application utility of research.

Discussion of Question 2: Does the current management paradigm support or prevent the development of a robust scientific foundation for ecosystem management?

In discussing whether or not the present management paradigm supports or prevents the development of a robust scientific foundation for ecosystem management, it was felt that the present system of research funding precludes implementation of a comprehensive research program (some pieces funded, others not) and generally does not fund long-term research. The present system also has a strong tendency to fund research that reinforces the system (clearcut -> site prep.-> plant with 1 or 2 fast-growing early-seral species -> manage for short rotations), thus marginalizing much other research. Considerably more money has been spent on research relating to, e.g., backlog reforestation, brush competition, growth & yield, and pest management, making it difficult to acquire funds for research on ecosystem processes, rare/endangered species, long-term ecological studies, wildlife habitat, etc.

Our group then discussed ‘Ecosystem Management’, where we considered that BEC and its many applications is the foundation of the Ecosystem Management paradigm today. In our discussion, we noted each of the applications of BEC today, and whether we felt that a future BEC system could provide the foundation to continue to support the application.

Present Application of BEC	Future Application Comments
A language for communication and monitoring	A modified biogeoclimatic system can also be the language of the future, and is needed for communication, monitoring, and application of ecosystem management.
An inventory	To apply ecosystem management, we need to be able to map the classification. A future BEC will require a regular cycle of updating to keep up with the changing climate. Mapping systems need to be reviewed now so that they provide the baseline needed for the future.
Ecosystem representation by site series	A strong site emphasis to the site series units will allow them to continue to be useful for this application.
Ecosystem representation by subzone/variant (e.g., Protected Area planning)	Changing boundaries and new, previously unrecognized subzone/variants will change representation – however, these changes will be gradual and BEC ecologists will continue to update the mapping.
Site productivity	A modified biogeoclimatic system can be used for this application, including SIBEC.
Seed zones/seed transfer	Subzone/variant is one component of seed zones/transfer. A modified biogeoclimatic system can continue to provide knowledge to this application.
Regeneration decisions <ul style="list-style-type: none"> • species • treatment 	With 'continuous improvement', a modified "bio-geo-climatic" system can be used.
Harvesting and Silviculture Systems	With 'continuous improvement', a modified "bio-geo-climatic" system can be used.
Wildlife Habitat	With 'continuous improvement', a modified "bio-geo-climatic" system can be used.
Non-forested ecosystem values (wetlands, Alpine)	With 'continuous improvement', a modified "bio-geo-climatic" system can be used.
Rare ecosystems, conservation ranking <ul style="list-style-type: none"> • Track ecosystems • Rare ecosystems, conservation ranking 	Present 'surviving' associations can be tracked. Future systems may have to go to a more site/age-based approach, along the lines of anticipated changes to BEC.
Non-timber forest products – e.g., salal, mushrooms	An emerging application of BEC. Requires autecological information on species to model.
NDT – old forest targets, seral stages	Some concern that targets set on historical natural disturbance regimes will be much less useful under a changing climate with modified disturbance regimes.
Range management	An emerging application of BEC. Need more experience with management applications before knowing the future applicability.

Discussion of Question 3: What changes to the current paradigm would be advantageous, or what alternative paradigm would be preferred?

There was overall agreement that the present forest management paradigm is to maximize timber production—treating all other resources and issues as constraints to achieving that goal. It was felt that this is a maximum risk scenario under a changing, uncertain future.

Discussion of the present forest management paradigm included the following:

- By ‘outsourcing’ most management and planning to licensees, there is an overall goal to keep costs to an industry minimum by only doing what is absolutely necessary.
- There were some comments that we need to change the present planning process. There is a need for an intervening 3rd party to manage the stewardship of the resource—to work between government and industry. They must be knowledgeable managers—without the profit objectives of industry and able to adjust to local situations.
- The management paradigm needs to change to focus on ecosystem resilience—ERM: Ecosystem Resiliency Management!
 - 3 R’s: representation, resilience, redundancy
 - Biodiversity at stand and landscape level
 - Diversity in species and stand management
 - Recognition of risk and strategies to achieve resilience
- In applying ERM, need to increase protected areas—they need to be large enough to be resilient, and allow modified ecosystem processes to play out.
- What can we do now?
 - fully represent protected areas according to PAS (protected areas strategy)
 - withdraw 1/3 draw-down letter of instruction re: Old growth management areas (OGMAs)
 - change distribution of biodiversity guidelines to 45% high – 10% low
 - double wildlife tree retention at a stand level
- Present management paradigm generally excludes First Nations
 - including First Nations will improve the science and the application of the science
 - BEC system can be used as the common language between First Nations and forest managers
 - Discussion of First Nations long term focus, e.g., on Haida Gwaii, development of 1000 year strategy for monumental cedars
- How applicable is the FRPA approach if it relies heavily on the range of natural variation at a time when climate is changing so rapidly?
 - the natural range can no longer be used as a benchmark, depending upon time scale used in determining.
 - What is the future range of un-natural variation?
- Ecological processes/principles are not considered in implementing the management processes, e.g., free growing guidelines. These guidelines have limited options available to foresters for tree species selection. Result is a lack of ecological diversity and stand resilience.

Recommendations

We modified the suggested short, mid, and long term timelines to deal with only two:

- Short Term = 1 – 5 yrs
- Mid Term = 5+ yrs

Short Term Recommendations

1. **Communicate the BC advantage** – That is, the robustness of BEC system to deal with the challenges climate change presents to land management and resource allocation. Our immense knowledge of climate–site–species relationships comes from the sampling to develop the BEC system.
2. **Establish an advisory group to design the future “bio-geo-climatic” system** – Include First Nations, key users, and BEC scientists.
 - o **Develop BEC into a dynamic system** – a climate-site model that can be used for various applications (noted above)
 - o **Focus on the stable components of the ecosystem** – BEC is three classifications: climate, site, and vegetation. The site component can provide the basis of the new system. Climate can be modelled using climate–vegetation and climate–species relationships. Vegetation will lag in response to climate change, but key indicator species can continue to be used to indicate site conditions.
 - o **We have the system, base data, and approach** – we have a good understanding of the relationships between climate, site, and vegetation classification. We have a good baseline of quality ecological data to form climate–site–species relationships. Our approach to ecosystem management is sound. We now have to adjust to the changing of a key environmental driver.
3. **Design benchmarks and monitoring program** – We need to relocate zonal plots as benchmarks to monitor change. We also need to monitor young forests and responses after disturbances.
4. **Download knowledge from present generation of ecologists and mentor the next generation** – record what hasn’t been documented and then pass on key information and experience to generation of ecologists who will have to implement a modified system of “bio-geo-climatic” classification. Almost all present BEC ecologists are eligible for retirement in 2 – 5 years.
 - o **Work with Universities** – there is a lack of training of field ecologists in Universities, at present.
 - o **Field school** – develop field schools or other field-based opportunities to train ecologists.
5. **Design Adaptive Management Framework** – need to provide tools for managers to learn from experience by an adaptive management framework to set up controls, track experience, and allow for implementation of various management options. Get controls and contrasts out on land base. Paired tests will

be necessary due to problems with controls in a changing environment. Integrate with research.

6. **Review Ecosystem Mapping Systems** – Terrestrial and Predictive Ecosystem mapping systems (TEM and PEM) need to be reviewed to ensure that they are inventorying the enduring features of ecosystems so that they are most useful into the future.
7. **Re-Establish Base Funding of Research within the Ministry of Forests and Range** – The present system of research funding precludes implementation of a comprehensive research program and generally does not fund long-term research projects.
8. **Ecoregion Classification** – add Ecoregion Classification to science foundation. Review to see how it can remain functional into the future.
9. **Initiate action to increase ecosystem resilience** – see “What can we do now?” bullet above, in section on Forest Management paradigm.

Mid Term Recommendations

1. **Implement monitoring system** – implement the system designed above (under short-term recommendations)
2. **Expand climate data collection network** – there is a need for a much more robust climate station network.
3. **Conduct Research in Autecology** – select key indicator and management species and initiate autecological studies to collect information needed in modelling.
 - a. Include important species-at-risk, those that may be saved by management
 - b. Understand key invasive species
4. **Design future field guide** – future field guides need to create a greater understanding of the ecological principles and move away from a cookbook approach. Develop successional pathways as a key element of the guides and describe how various ecosystems develop and adapt to disturbance.
5. **Implement adaptive management** – initiate controlled trials to gain new management information.
6. **Implement ecosystem resiliency management** – change Forest Management Paradigm to goal of ecosystem resiliency—to decrease risk to forests from catastrophic disturbance agents.

Workshop Report Summary

BEC is a very useful tool for forest management in British Columbia. It allows us to better manage a very diverse landscape with myriad ecosystems. With climate change, ecosystems will change. Therefore, BEC has to change. More significantly, the underpinnings of the system need to be changed—BEC has to become more site based. BEC has provided us with a climate–site–species model that will help us predict the impact of changing climate, in the near to mid term, but in the long term, we will need new data and tools. New climates are definite, i.e., combinations we have not had; and, new species or species combinations are likely. We will need to develop new climate–

site–species models. To do so will require additional data, especially on younger, developing forests.

The way we use BEC will also have to change. Already, we can foresee that species selection guidelines need to be reviewed regularly with climate change scenarios in mind. We need to be aware of the species we are putting out on landscapes—not just a sites—if we want to maintain ecosystem resiliency. Other applications will have to be modified to be able to deal with a dynamic BEC system.

The present BEC classification—maps and field guides—will be OK for some time, but the timeline is difficult to determine. It is likely in the order of 15–20 (–40) years, depending upon the climate change scenario that plays out. Components of the classification will be useful beyond that, as mature ecosystems will not change immediately with the climate. However, we cannot wait until then to make changes. We need to modify and update BEC and build the tools required to implement a new system. We need to monitor, especially zonal forests. More importantly, we need to sample younger, developing forests and monitor trends in recently disturbed stands, as this is where the effect of changing climate is likely to be demonstrated first.

Forest management has to incorporate the likelihood of greater losses in the future. In order to maintain functioning ecosystems, we need to change the forest management paradigm to one of maintaining ecosystem resilience. We need to design our future forests to reduce the risk of loss to catastrophic disturbance agents.