

# EcoGen: A model for predictive ecosystem mapping

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## INTRODUCTION

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Over the past few years, predictive ecosystem mapping (PEM) approaches to resource inventory have presented an alternative to more conventional mapping and classification methods such as terrestrial ecosystem mapping (TEM). This PEM information, as with TEM, is purported to support a wide range of resource planning needs ranging from strategic-level planning to more detailed on-site applications. Although PEM is new to British Columbia, PEM models have been evolving over the past decade. The EcoGen model is a PEM method being developed by the B.C. Ministry of Forests. It will provide TEM-like information for more geographically extensive areas, more readily and more cost-effectively, and will be used for site quality and ecologically based yield analyses.

Conventional resource inventories, as we have known them for decades, are undergoing radical technical and business model changes. This technical evolution is being driven by new digital capabilities in acquiring, processing, integrating, and sharing resource information and knowledge. It involves various technologies, such as remote sensing, image processing, GIS, and knowledge-based systems and information networks. Concurrent with this technical evolution is a trend towards greater data and information integration across inventory programs. With the present fiscal environment, people are now looking at opportunities for gaining efficiencies and greater information integration. The development of predictive ecosystem mapping is a result of these changes.

## PREDICTIVE ECOSYSTEM MAPPING

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Ecological classification systems provide a framework to organize and communicate our knowledge about the nature of physical and biotic features of landscapes. In British Columbia, the biogeoclimatic ecosystem classification (BEC) system has provided a classification of the basic ecological units in the province and is an integral component of forest management. The PEM and TEM approaches map the ecosystem units of the BEC at a large scale.

Predictive ecosystem mapping is a new and evolving inventory approach designed to use available spatial data and knowledge of ecological and landscape relationships to automate the computer generation of ecosystem maps. It typically involves the spatial overlay of mapped themes and the processing of the resultant attributes against a formalized knowledge base using automated inference methods. It offers the promise of providing surrogate terrestrial ecosystem maps. Figure 1 illustrates the overall principle of PEM—that ecological map delineation can be derived from other digital maps and the attributes associated with their polygons.

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### CITATION —

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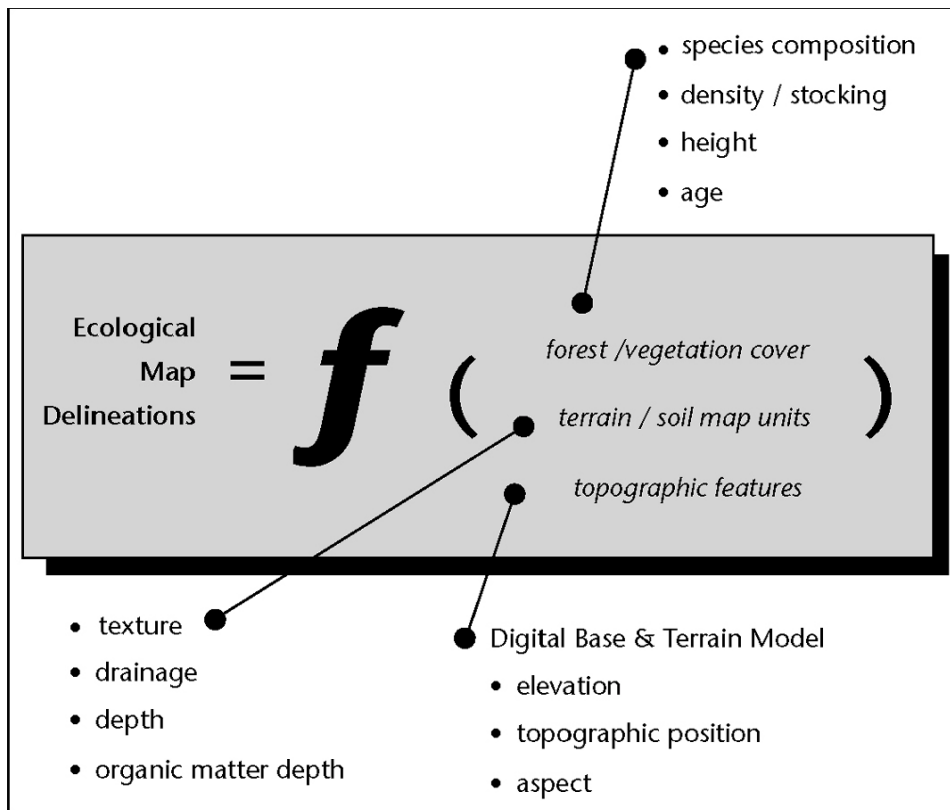


FIGURE 1 *General model of predictive ecosystem mapping.*

The advantages of PEM are many. The development of PEM has been driven by the need to address the high cost of conventional ecosystem mapping approaches. While savings in costs and time are possible over traditional approaches, other advantages deserve equal emphasis.

- Improvements in inventory cost, production, and human resource capacity: PEM approaches provide a more systematic, consistent, and repeatable stratification process; are reasonably flexible; adjust to changing information and knowledge sources; and offer opportunities to increase the rate and efficiency of mapping.
- Capitalize on, add value to, and protect investments in classifications and resource inventories: as many inventories are already available digitally, and we have an existing ecological classification system, PEM will provide more explicit and documented capture of the relationship knowledge. This will provide greater understanding of ecosystem and landscape relationships and how to best map these features in subsequent iterations.

Predictive ecosystem mapping also presents some disadvantages.

- Existing map information bases lack quality: existing map input sources for PEM may be absent, non-digital, of an inappropriate scale or survey intensity level, or may simply be of poor positional or thematic quality.
- Existing ecological knowledge lacks adequate quality: ecological classifications may be absent or of limited value for the area under consideration.
- Relationships between ecosystem classes and attributes in existing digital data are poor: poor linkages may result in unacceptable or ambiguous predictions.

## THE ECOGEN MODEL

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Figure 2 provides an overview of the EcoGen model. EcoGen uses available geographic and inventory data to map site series. Ecosystem maps produced by EcoGen can be used for wildlife interpretations in land management planning, for analyses of potential timber yields using site index–biogeoclimatic ecosystem classification (SIBEC) relationships, or for any other ecosystem-based interpretive needs.

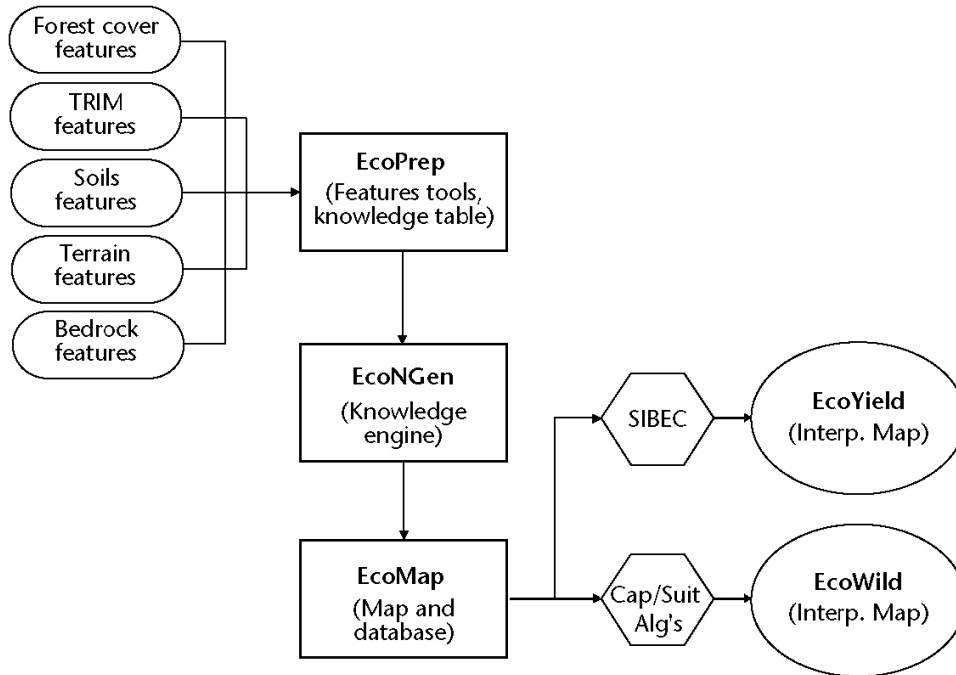


FIGURE 2 Components to EcoGen Model (see also: <http://www.for.gov.bc.ca/research/EcoGen>)

At present, EcoGen is not fully functional. The EcoNGen module is available and is being used to process data and knowledge tables for several large projects. The “features tools” within EcoPrep are nearly completed and are being evaluated in a pilot project in the Telkwa area. The EcoMap module will compile the attribute data in a TEM-like database format, as soon as the custodian for PEM has determined the final format. The interpretive algorithms for the EcoYield or EcoWild modules are concepts at this point and have not been programmed into the model.

The EcoGen model engine, EcoNGen, is in use for projects in the Merritt District (IFPA), Arrow District (IFPA), and Wood River. There is also interest in applying it in the Clearwater District, as a pilot project. We project that a “beta” release of the model will be available for testing in March 2000.

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