Habitat Supply Modelling in British Columbia

Draft Report

12/19/00

Please circulate.

Any comments, additions, and rewrites are appreciated. This is a very draft document that requires your input.

This document is available in Word 97 format if it will assist you in providing input.

Please pass any input to
Jeff Stone
Ministry of Forests, Timber Supply Branch
Phone: 952-6628 Fax: 953-3838
Email: jeff.stone@gems7.gov.bc.ca .

Updates will continously be posted to the Habitat Supply Modelling web site at http://www.gov.bc.ca/for/??????.

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Introduction

In this document, I summarize my views of habitat supply modelling, current forest habitat supply model development in British Columbia, and recommendations on the development of habitat supply modelling tools. This draft is not an extensive review of current activities but only those of which I am currently aware. However, I hope that this document evolves from my views and awareness to a fuller document that incorporates the views and awareness of the habitat supply modelling and user community in British Columbia. I expect this summary to evolve into components of a web site rather than it to exist as a stand alone document. This document is meant to serve as an information item for MOF Timber Supply Branch, the Forest Productivity Council Biodiversity Working Group and the MOF/MELP Habitat Supply Modelling Informal Committee.

This draft differs from the first draft in that (1) descriptions of most of the specific projects have been provided by those working on the projects (2) appendix related to timber supply modelling has been removed. I expect to continuously update projects and keep an up-to-date draft available. For April 2001 I expect to have reworked the description of habitat supply models, provide a more thorough description of where habitat supply modelling can provide a role in the management of British Columbia's forests, and do a general edit of the document (which I have not yet had time to do).

Through this document, I hope to assist with the awareness of habitat supply modelling activities in British Columbia. **I encourage you to provide comments on this document so that its clarity, breadth, and usefulness may be improved**. This document will be updated as comments and new information is received. A copy of the current draft of this review will be posted on the Ministry of Forests Incremental Silviculture habitat supply web site (http://www.???).

For additional discussion information on habitat supply and ecosystem modelling in British Columbia, you are encouraged to join an email discussion list at http://www.egroups.com/group/habitat_models

What is Habitat?

Habitat has been defined by many authors. In the context of the below discussion, I constrain the definition of habitat to be the composition, structure, and arrangement of the abiotic and vegetative component of a particular land base that is used by an individual species for its survival and reproduction. This constrained definition assumes that some processes and organisms associated with vegetation growth, decay and physical change are inherent within the habitat (e.g., decay of dead trees). I also restrict my discussion to habitat that is focused on forest.

Habitat can be defined at many scales (e.g., tree, stand, landscape). The scale needs to consider the organism/identity for which habitat is being described. This identity itself may be scaled from individual species, to a group of species, and up to "biodiversity".

For this discussion, the smallest scale considered is a forest stand. Individual plants and abiotic items within a stand are considered to be elements.

What is Habitat Supply?

Habitat supply is simply the "quantity" of the habitat present. Habitat supply may involve a composite description of the "quantity" in terms of the organism of concern (e.g., habitat suitability rating for mule deer) or simply an individual component (e.g., number of standing dead trees over 25 cm dbh). A description may also be related to a seasonal, life stage or element habitat requirement of an organism (e.g., winter range, reproductive, food source).

In some contexts (e.g., at a landscape or forest estate level) habitat supply has been considered to be the "sum" of habitat values generated at a stand level. However, for this report I consider habitat supply to describe habitat quantity at any scale.

Habitat supply excludes animal population dynamics (e.g., prey-predator relationships).

What is Habitat Supply Modelling?

Habitat supply modelling is the representation or projection of a descriptor of habitat supply. A habitat supply model takes as input information about descriptors of the composition, structure, and arrangement of the abiotic and vegetative component of particular land base (i.e., habitat) and interprets these descriptors into an output that provides information about the value of the habitat for an organism or another organizational entity (e.g., old growth using species, ecosystem).

Examples of Habitat Supply Models

It is important to recognize that models are a simplification of reality that is used to meet specific objectives. A model can take many forms. For example a model may be simply a written description or it may be a complex mathematical representation. Below I present my first attempt at describing groups of habitat supply models. I recognize that I have not cover all types of habitat supply models. Suggestions for other types or other classification schemes the models is welcome. Morrison et al. (1998:323-338)[1] provide a review of models of habitat relationships.

Common models types include the following:

Written Species Account – Describing the "habitat" by a written description is one form of habitat supply model. Within the description of habitat, the assumption is made that what is not described is not habitat (i.e., a yes or no rating). However, often species account will provide some some indication of the condition (e.g., sufficient, good) of the habitat. A written species account is often the first step in determining a model that is more tractable for calculation.

Index Based – These models assign an arbitrary habitat supply value (e.g., 0 to 1) to the amount of a given habitat attribute. These are most often expert opinion driven models to derive the relationship. The relationships are often based on a single dependent variable, though in some cases a composite of several relationships may be created. Examples are habitat suitability index, habitat capability index, or simple habitat ratings (e.g., high, medium, low).

Regression Based – These empirical models statistically determine a relationship between a dependent indicator associated with a value for an organism (e.g., nest site presence/absence) with independent habitat variables (e.g., stand age, number of standing dead trees). Examples are linear and logistic regression models

Classification Based – These empirical models use algorithms to distinguish between habitats with different assigned habitat supply values (e.g., species presence/absence). Classification may be either for similarity or difference. Examples are discriminant analysis and tree based models.

Probability relationships – These models determine a rating (or a probability) of habitat supply based on conditional relationships with habitat. These models may be derived by expert opinion, empirical, or a combination. Examples of such model types are Belief Based or Fuzzy Logic.

[1] Morrison M.L., Marcot B.G., and Mannan R.W. 1998. Wildlife-habitat relationships: concepts and applications. Univ. Wisconsin Press, Madison, WI. 435 p.

Related Modelling

Habitat supply models can be linked to other models used in forest management. This linkage may be either as an input or output requirement. In this section, I simply outline the different types of models and their roles. Rick Page in a contract to Brian Nyberg of MOF describes specifically the forest management modelling tools available in British Columbia that are relevant to habitat supply modelling.

Forest growth and yield models -- Growth and yield models are viewed as a potential source for which habitat characteristics can be model and to which habitat supply models may be linked. In BC we have many different growth and yield models, each with their own strengths and weaknesses.

Forest estate models -- The objective of these models is to provide information at the forest estate/landscape level. These models are usually based around decisions of harvesting forest stands or not, as such, are often called timber supply models. Forest estate models may use habitat supply models to describe a forest stand as is similarly done with timber volume. Furthermore, information generated from the model itself (e.g., age distribution) can be used as input into a habitat supply model.

Population dynamics models -- To understand population dynamics, knowledge of habitat supply dynamics can be an important input. In some cases, there may be feed back loops into the input of habitat supply models (e.g., amount of browse -> amount of browsing -> plant growth -> amount of browse.

Database/GIS – Habitat supply models may be incorporated within a database/GIS framework to enable interpretation of information. In a GIS spatial information may be fed back into the habitat supply model.

Objectives of Habitat Supply Modelling

Habitat supply modelling is undertaken either to provide an understanding of an ecological process and/or to enable a management decision.

Understanding: Models are useful to synthesize information that is known about a habitat and its importance to an organism. By understanding the model structure, biological knowledge and assumptions, and the model output, a researcher can improve their understanding of a habitat (or equally important identify what is poorly understood).

Decision: Decisions in forest management are made at various scales and habitat supply models at various scales can aid in those decisions. Habitat supply models may interpret an existing inventory to provide information for decision makers. Habitat supply models connected to forest management models (e.g., forest growth or forest estate models) can provide information on the impacts of management decisions that are manipulated within the forest management models.

It is important to recognize for different objectives different habitat supply models and modelling techniques may be required (or may be more efficient). One should not expect that detailed information/models that may be required for describing the physiology of a single tree is needed as information/model for decision at a forest level.

Institutional Processes Where Habitat Modelling Can Play Role

- I need to expand this list and describe briefly how habitat modelling does/can fit into these and other processes.

- AAC decision – timber supply review
- LRMP planning decisions
- Operational Plans FDP/SP – expectations of specific harvesting/silv. activities
- Stand level decisions
- IWMS guideline development
- Wildlife inventory

Existing Work in British Columbia

Habitat supply modelling is receiving greater recognition in British Columbia. A number of initiatives are underway that incorporate habitat supply models within integrated management projects. These projects are primarily directed at a forest estate level of modelling (e.g., Enhance Forest Management Pilot Projects). Many other projects have been proposed within the recent mechanisms for Forest Renewal BC funding.

Habitat supply and environmental indicators modelling is dispersed amongst many organizations. The UBC Centre for Applied Conservation Biology has the most established program and models (i.e., SIMFOR). The Ministry of Environment, Lands, and Parks effort has recently been directed towards wildlife habitat ratings integrated within the ecosystem mapping framework. A recent report by Diana Dimarchi prepared for MELP summarizes existing individual species habitat supply models in British Columbia

Habitat supply and ecosystem indicator modelling in British Columbia is still much in its infancy. There is a great need to determine how to apply habitat supply information in decision processes. In terms of the possibilities for use, much improved and more habitat supply modelling is needed. Additionally, we simply do not understand most wildlife-habitat relationships in British Columbia and need further basic research.

In terms of overall strategy, the Forest Productivity Council (FPC) through its Biodiversity Working Group (BWG) is preparing a strategic plan for incorporating biodiversity in forest management planning in British Columbia. The BWG and the Habitat Modelling Steering Committee (a joint MELP/MOF committee) have also been encouraging background summary projects to assist in the development of habitat supply modelling in British Columbia. Through these groups an email discussion list on habitat modelling has also been initiated.

Details of the work underway are listed in the appendices:

- Appendix 1: Current Initiatives
- Appendix 2: Committees
- Appendix 3: Organizations
- Appendix 4: Contacts

Needed Work/Recommendations for Habitat Supply Modelling in British Columbia

The Biodiversity Working Group of the Forest Productivity Council have developed a strategic plan for incorporating biodiversity in forest management planning in British Columbia. The goal of this strategy is that information, techniques and tools will be available and used that accurately predict consequences for habitat and indicators of biodiversity of forest management regimes in British Columbia. This strategic plan recognizes a need for a broad look at tool development as identified through 4 objectives under which further strategies are identified:

1) Maintain up-to-date information on current and future client needs
2) Acquire needed information on both coarse- and fine-filter relationships
3) Develop and implement appropriate modelling tools across a variety of spatial and temporal scales in managed and natural forests
4) Assess current habitat protection guidelines and recommended improvements where necessary.

This FPC strategic plan is presented to the Chief Forester as an informational source only. A copy of the strategy should be available soon at http://www.forestproductivity.gov.bc.ca/working/bio/index.htm.

Through the development of this draft summary and my involvement with the FPC Biodiversity Working Group and the MOF/MELP Habitat Modelling Steering Committee, I believe that a key step that MOF and MELP need to accomplish is to increase the dedicated time of staff for coordinating and developing appropriate habitat supply decision support tools. Currently, most habitat supply modelling coordination is accomplished secondarily by individuals with other responsibilities and most habitat supply modelling tends to be project specific without necessarily looking at the broader objectives (i.e., management needs, development of expertise resource that can assist elsewhere). If habitat supply models are to be an effective tool MOF and MELP need to develop a clear strategy for the implementation of these tools within the forest management processes and to provide the resources or incentives that these tools be logically developed.

Appendix 1: Current Initiatives Related to Habitat Supply Modelling I

- For each of the below identified initiatives, there should be greater description (i.e., brief description of habitat supply relationship, web site, organization, contact name)
- For the acronyms and contacts see the appendices on organizations and contacts.

Inventory Processes

- VRI, FIP (MoF RIB)
- TEM (MELP RIB)
- Habitat Ratings (MELP RIB)
- Standards (RIC, FRIC, FPC)

Information and Needs Summary

- Habitat supply modelling web site (HMSC)
- Habitat modelling discussion list (http://www.egroups.com/group/habitat_models)
- Summary of current forest management models applicable to habitat supply – Rick Page contract for Brian Nyberg (MOF FPB)
- Habitat supply model listing – Diane Dimarche contract for Kathy Paige (MELP RSC)
- Summary of habitat application of forest cover inventory variables – coop student project for Jeff Stone (MOF TSB)
- Incremental.Silviculture Strategies assessments (MOF FPB)

Modelling of Habitat

- forest growth models (MOF RB)
- forest process models (UBC)
- SIMFOR habitat projections (UBC CACB)
- forest estate models (MoF TSB, UBC, MMF, TFC, etc)
- PEM/Ecogen (MELP RIB, MOF RB)

Modelling of Habitat Supply

- See Dimarchi report
- Prognosis EI (MOF NFR ESSA, MOF FPB)
- TASS environmental indicators (MOF RB)
- HS and HC habitat ratings (MELP RIB)
- SIMFOR (UBC CACB)
- Local level indicators – CANFOR
- Canadian Columbia Basin extension Northwest Habitat Inst. database project – (MOF FPB)
- Elk HSI for Kootenay – Rob Serrouya (serrouya@kgis.com)

Modelling with Use of Habitat Supply outputs

- forest estate models (MoF TSB, UBC, MMF, TFC, Sterling Wood, etc)
- SELES project – (MoF Research)*

Integrated Management Planning Projects

- EFMPP Weyerhauser (SHS Spatial Habitat Supply model)*
- EFMPP Invermere Forest District
- EFMPP Robson Valley District
- MacGregor Model Forest
- West Arm Demonstration Forest
- Lignum IFPA
- Arrow IFPA

Appendix 2: Habitat Supply Related Committees

Forest Productivity Council (FPC) Biodiversity Working Group (BWG)

Objective: The mandate of the BWG is to support the development of inventory and sampling approaches that include non-timber considerations and ensure that stand and forest level models for projecting growth and yield implications of silvicultural systems accurately portray the consequences for habitat and biological diversity. Although the goal of the FPC is related to forest productivity, background information and recommendations from this group will be from a broader perspective.
Further information: http://www.forestproductivity.gov.bc.ca/working/bio/index.htm
Established: March 2000
Contact: Jim Rochelle, Chair
Members: Jim Rochelle (consultant), Evelyn Hamilton (MOF RB), Dave Clark (MELP RIB), Laurie Kremsater (consultant), Walt Klenner (MOF KFR), Scott McNay (Slocan Forest Products), Celine Boisvenue (consultant), Jeff Stone (MOF TSB), Raoul Wiart (consultant)

Forest Productivity Council Stand Level Working Group

Objective: The mandate of this group is to coordinate the collection of stand level data and the development of predictive tools that provide the means to accurately estimate the growth and yield of any forest stand in British Columbia. Understanding the dynamics and modelling of forest structure and growth has direct habitat supply modelling applicability. In this capacity, the SLWG will link with the FPC Biodiversity Working Group in assessing stand level forest growth modelling needs applicable to habitat supply modelling.
Further information: http://www.forestproductivity.gov.bc.ca/working/index.htm
Established: May 1999
Contact: Steve Stearns-Smith, Chair
Members: Steve Stearns-Smith (Olympic Resource Management), Ian Cameron (J.S. Thrower), Dave Carson (Timberline Consultants), Peter Marshall (UBC), Gord Nigh (MOF RB), Jon Vivian (MOF RIB), John Muir (MOF FPB), Pat Martin (MOF FPB), Jeff Stone (MOF TSB), Raoul Wiart (FPC TAC chair)

Habitat Modelling Steering Committee (HMSC)

Objective: This MOF/MELP committee was formed informally to look at projects necessary to assist with a habitat supply modelling component of the Incremental Silvicultural Strategy. This group has recommended several projects to enhance the habitat supply component of this strategy. These projects include: (a) contributing information to workshop based strategies (Type 1 Incremental Silvicultural Strategy assessments) that are occurring in all forest management units; (b) applying effective models to analysis based strategies (Type 2 ISS); developing standard inputs for Type 2 analysis and comparing various models to forecast habitat (Type 3). Products include a habitat modelling workshop (February 2001) that follows up an April 2000 workshop, a summary of forest structure descriptors and habitat uses, catalogue of habitat related models, habitat information in Type 1 analysis, and information summaries of Type 2/3 models and model inputs. These projects total about $140,000 if approved.
Current Projects: This group is planning a workshop on Habitat Supply\Environmental Indicators Modelling for February/March 2001. Rick Ellis has been contracted to organize this workshop. A coop student under Jeff Stone will be working on a summary of forest structure measures and habitat supply use (May 2001). This committee has HRMP proposals for $600,000 in projects for 2001/2002 of which 1/3 is identified for modelling.
Further information: http://www.
Contact: Tory Stevens
Members: Tory Stevens (MELP HB), Lynn Bonner (MELP RIB), Mike Fenger (MELP HB), Dave Clark (MELP RIB), Brian Nyberg (MOF FPB), Andy MacKinnon (MOF RB), Ralph Winter (MOF FPB), Jeff Stone (MOF TSB)

Appendix 3: Organizations

If your organization is involved with habitat supply modelling and you would like to see it listed please forward the appropriate information to Jeff Stone. Updates to existing entries are also appreciated.

Government

Ministry of Environment Lands and Parks - Resource Inventory Branch (MELP RIB)

Current: MELP has a well developed program for detailed ecosystem inventory (TEM) or predicted (PEM) site series and structural stages within British Columbia. Available coverage of fully quality-assured TEM and PEM is available to MELP employees through the Ministry's data warehouse ("GOAT"). TEM or PEM is currently underway for about 12% of the province.

http://www.env.gov.bc.ca/rib/wis/tem/dataware.htm

Complete coverage for BC is available at broader scales. Groups of site series, termed "Broad Ecosystem Units" are mapped within Ecosections and biogeoclimatic subzone variants at 1:250,000. Interpretations (habitat ratings - suitability and capability) of this inventory have been completed for about 16 ungulates and bears (species that were the main focus of wildlife management through the 1980's, for which we have very detailed knowledge of species-habitat relationships) and for some "species at risk".

http://www.env.gov.bc.ca/rib/wis/bei/index.htm

For clients outside MELP with access to full-function GIS, the same TEM/PEM and BEI coverages and associated polygon attributes are available through the Section's FTP site in ARC/ORACLE format.

{insert URL for MELP RIB FTP site}

Interagency efforts are underway to make "snapshots" (*.tiff or *.pdf or *.gif) of corporate data available through the WEB to clients that have internet browsers. Interpretations of ecosystem maps of all scales are done using RIC standard Wildlife Habitat Ratings methods. The basic methods and tools can be used for Forestry and other resource value interpretations.Such information will be useful for Regional and subregional management decisions by identifying areas of high value and potential.

Potential: These inventory and analysis procedures (Ecosytem mapping and subsequent interpretation of resource values) have the potential to provide a uniform first cut at habitat supply models for all of BC's 600+ vertebrate species. The habitat ratings translated from a "species account" (i.e., the assumed species/habitat relationships) provide a wide base upon which other resource supply modelling can improve. These ratings could also prove useful in processes such as timber supply modelling and intensive silviculture strategies. Projected timber harvesting and stand treatment scenarios can be used to "grow" ecosystem mapping into the future and habitat suitability for any

given species can be estimated for any time period in the future and compared to the present situation.

Staff Contacts: Dave Clark, Lynne Bonner

Ministry of Environment, Lands, and Parks - Habitat Branch (MELP HB)

Current: Environmental analysis methodology is being developed for input into the Timber Supply Review process. The approach is develop an analysis based upon output of current timber supply models (e.g., FSSIM). Information will be looking at developing "coarse" environmental risk assessments rather than a habitat supply model for an individual species. The Robson Valley TSA is to be a prototype analysis to be completed by this fall.
Potential: This analysis can provide a coarse assessment that demonstrates use of output information from models such as FSSIM. The assessment also can form a basis from which species specific assessments might be compared.
Staff:: Mike Fenger, Tory Stevens, Algis Janusaukas

Ministry of Environment, Lands and Parks - Research and Conservation Section (MELP RCS)

Current: Under the Identified Wildlife Management Strategy species and plant community accounts are being developed. Additionally there is interest in understanding stand level habitat supply impacts as related to different management regimes within wildlife habitat areas. A contractor was hired to identify and summarize existing habitat supply models in British Columbia. Within this section there are also biologists whose work might also include developing habitat supply models.

Projects: Kathy Paige contracted Diane Dimarchi to compile a listing of habitat supply models within British Columbia. (Document is available on the Habitat Supply Web page)

Potential: Habitat supply models may originate out of on going research within this section.

Staff: Kathy Paige (IWMS), Tony Hamilton (bear models)

Ministry of Forests, Timber Supply Branch (MOF TSB)

Current: The Timber Supply Branch provides forest estate (i.e., timber supply) analyses used for informational purposes within the Timber Supply Review Process for many timber supply areas. At the Timber Supply Branch level the primary focus is information for Annual Allowable Cut Determination. The forest estate analysis includes some habitat considerations as described by forest management regimes (e.g., area exclusions or seral distributions for general landscape biodiversity and for specific ungulate winter ranges). However, the objective of the analysis is primarily to model timber supply (i.e.,

merchantable volume) given the current forest management regimes (i.e., habitat is assumed to have been considered within operational guidelines which in turn is reflected in the modelled forest management regimes) and not to investigate "optimum" combinations of other objectives. Associated with Timber Supply Branch are analysts in various MOF regional and district offices who provide forest estate analyses for select timber supply areas and in many cases provide analysis support to other decision making processes such as LRMP.
Potential: The forest estate modelling tools used by Timber Supply Branch could be expanded to enable greater investigation of habitat supply at a forest level under different management regimes. This expansion could include expanded information fed from current models (e.g., PEM) and refinements of existing models outputs. Improvements to the model could enable improved reporting and constraints for resources other than timber volume. Timber Supply Branch could further support other forest estate modelling tools that provide greater habitat supply modelling options (e.g., spatial and optimization models)
Staff: All timber supply analysts consider habitat supply needs within current modelling. Jeff Stone (jeff.stone@gems7.gov.bc.ca, 250-952-6628) has been investigating habitat supply modelling concerns, needs, and future directions within the Branch. Chris Fletcher has been involved with policy background related to various wildlife concerns. Gary Townsend in director of Timber Supply Branch

Ministry of Forests, Forest Practices Branch (MOF FPB)

Current: Forest Practices Branch is leading the Incremental Silvicultural Strategy in which habitat supply is a considered component. In Type 1I analyses (i.e., information needs workshop for each management unit) habitat supply needs are considered. Further work (e.g., Type 2 and 3) will further consider habitat supply modelling needs. Within this framework a Habitat Modelling Steering Committee has been formed to provide input into necessary projects. A project as related to Type 3 analysis to extend work accomplished in the US Columbia Basin to the Canadian portion is underway
Potential: The ISS has the potential to seed through needs identification and funding a variety of habitat supply modelling initiatives.
Staff:: Bryan Nyberg, Ralph Winters

Ministry of Forests, Research Branch (MOF RB)

Current: Research Branch has a number initiatives related to habitat supply modelling. The Stand Modelling work unit of the Forest Productivity Section (led by Ken Mitchell) continues to develop the TASS/TIPSY forest stand growth models. Current development is focussed on modelling greater stand complexities. Barrie Phillips, in the Forest Productivity and Dynamics work unit, is providing a coordination/leadership role with respect to EFMPP programs. In the Ecology and Earth Sciences Section there are three work units where projects related to habitat supply modelling are being conducted. In the

Biogeoclimatic work unit Del Meidenger is leading a project to develop a set of tools for predictive ecosystem mapping (PEM) known as EcoGen. This tool can be used to produce large scale ecosystem mapping for input to habitat supply models. Marvin Eng and Don Morgan, in the landscape modeling and analysis unit, are using SELES (Spatially Explicit Land Event Simulator developed by Andrew Fall at SFU) in a variety of projects (e.g., caribou habitat supply modeling in the Columbia and Lakes forest districts, grizzly bear habitat supply modeling natural disturbance modeling in the Robson Valley forest district). Andy Mackinnon, in the Stand Ecology Unit is leading work on wildlife habitat supply modeling related to Type III Incremental Silviculture Strategies. Evelyn Hamilton, who leads the Wildlife Habitat unit, has been providing a informational/coordination role with respect to various habitat supply modelling initiatives. This unit is also developing grizzly bear habitat suitability indices/cumulative effects models through Bruce McLellan and Fred Hovey situated in the Revelstoke Forest District.
Potential: While TASS has many immediate habitat linkages, greater linkages and use of this model could be made to understand stand structural dynamics under different stand treatments. PEM tools and information on structural stage relationships can provide important forest level information for forest level habitat supply modelling. Further work with SELES and familiarity by a greater audience could provide a valuable working interface for modelling habitat supply. Research Branch could provide a valuable and necessary lead in coordinating information needs and models for habitat supply modelling particularly as related to forest stand structure and development. Research Branch and Timber Supply Branch talking about initiating further work related to environmental indicators for timber supply analysis.

Staff: Ecology and Earth Sciences Section: Marvin Eng, Evelyn Hamilton, Fred Hovey, Andy MacKinnon, Bruce McLellan, Del Meidenger, Don Morgan; Forest Productivity Section: Ken Mitchell, Barrie Phillips, Ken Polsson, Catherine Statland, Jim Goudie

Ministry of Forests, Invermere Forest District (MOF IFD)

Current: The Invermere EFMPP in conjunction with UBC CACB, has been investigating the use of habitat supply modeling as decision support for the EFMPP's habitat supply review. Empirical species\habitat relationships for Songbirds, Cavity Nesters and Goshawks were evaluated against spatially explicit representations FSSIM harvest supply schedules. Ground truthing in the field, for Songbirds and Goshawks, was carried out in the 2000 field season to test the validity of the scaled up projections of species\habitat relationships. The Songbird and Goshawk models are currently being applied to the whole of the Invermere TSA and are evaluating harvest supply runs as projected by FSSIM. Other disturbance agents are currently being modeled in SELES.
Tools used: SIMFOR, SELES, GIS (Arc\Info, Pamap), FSSIM. Other tools can be used if suited to the task at hand.
Potential: Habitat supply models, based on empirical species\habitat relationships, are transparent and have explicit biases. This provides the opportunity for interested parties

to review the projection of habitat attributes through time as they are affected by disturbance (both deterministic and stochastic). It has been observed through the course of EFMPP modeling, that information sources for habitat modeling can be varied; MOF Veg. inventory, TEM, Cruise\recce databases, other field collected data.
Staff: Eric Valdal
Web Site: http://www.for.gov.bc.ca/nelson/district/invermer

Ministry of Forests, Kamloops Forest Region (MOF KFR)

Current: In conjunction with ESSA, Walt Klenner has developed TELSA (Tool for Exploratory Landscape Analysis). This is a spatially explicit model that looks at landscape change in the context of natural disturbance.
Potential: The TELSA model can provide a useful tool for looking a natural change and could be expanded to other areas. Walt is looking at a project that looks specifically at available forest growth models and evaluates the models for the project of specific habitat structures.
Staff: Walt Klenner

Ministry of Forests, Prince Rupert Forest Region (MOF PRFR)

Current:
Potential:
Staff: Doug Steventon, Don Morgan

Ministry of Forests, Nelson Forest Region (MOF NFR)

Current: Prognosis EI was developed for the West Arm Demonstration Forest (WADF) There are habitat supply initiatives related to the Arrow IFPA (see .
Potential: More documented understanding of the usefulness of the model to the real life situation of the demonstration forest.
Staff: (Also see ESSA)

Ministry of Forests, Robson Valley Forest District (MOF RVFD)

Current: A number of initiatives are present in the Robson Valley Forest District. Environmental indicators were developed by MELP HB to assess environmental risks associated with timber flows. An EFMPP project is present for the district.
Potential:
Staff: Jeff Beale, District Manager

Enhanced Forest Management Pilot Project (EFMPP)

Current: Within the EFMPP, there are several habitat supply modelling related projects. Particularly, Weyerhauser (TFL 39) have developed forest estate modelling tools that include habitat supply. The MOF Invermere Forest District have in conjunction with

UBC CACB been working to incorporate SIMFOR algorithms into the MOF forest estate model, FSSIM. See specifics described under each separate organization.

Contacts: Overall - Barrie Phillips (MOF RB); Rick Brand (MOF, Corporate policy & Planning Branch), Greg Anderson (MOF IFD); Glen Dunsworth (Weyerhauser); Jeff Beale (MOF RVFD).

Web sites:

EFMPP	www.for.gov.bc.ca/cpp/enhanced/index.htm
Invermere EFMPP	www.for.gov.bc.ca/nelson/district/invermer
Weyerhaeuser EFMPP	www.mbltd.com/enviro/forestry/efmpp/default.htm
Babine EFMPP	www.babineefmpp.com
Robson Valley EFMPP	www.for.gov.bc.ca/pgeorge/district/robson/index.htm

Ministry of Employment and Investment (MEI)

Current: MEI staff currently manage the independent consultants that undertake the socio-economic and environmental "Multiple Accounts" impact assessments for strategic-level Land and Resource Management Plans in BC. Due to lack of tools such as habitat supply modeling, the consulting wildlife/fisheries biologists on these projects have relied primarily on static GIS-generated area statistic overlays (e.g., how much grizzly habitat is in new/existing parks, special management zones, etc.), the management language in the LRMP documents, and assumptions based on generally accepted conservation biology research to generate conclusions about risks to various species under the Base Case and LRMP Scenarios. Other than MOF's timber supply modelling which can project future seral stage distribution at the Plan Area (i.e., Forest District) level, habitat supply modeling has not been an available tool, due to lack of resources and dedicated government agency personnel.

Potential: It would be potentially beneficial to have MoF and/or MELP undertake habitat supply modeling in order to better inform strategic land use planning processes about the impacts/trade-offs (and their temporal nature) that involve various species of the Base Case and suggested Scenarios. The caveat is that any model needs to have clear direction on the quantitative timber constraints that would be imposed under both the Base Case and Scenario management regimes, in order for reliable conclusions about habitat supply to be generated; in the past, these constraints have not been clear due to the uncertainty/disagreement about the Base Case management regime and for the Land Use Plan regime, the problem has been the "broad" management direction specified by LRMPs,

Staff: Gord Enemark, Judi Sigurdson

Academia

UBC – Centre for Applied Conservation Biology (CACB)

Current: Applications and further development of the SIMFOR library of species habitat models.
Potential: The SIMFOR library of habitat supply models provides an intiation point for a variety of uses and further model development.
Staff and Associates: Fred Bunnell, Ralph Wells, Laurie Kremstater, Dave Huggard, Mark Boyland
Web Site: http://sustain.forestry.ubc.ca/cacb

Forest Industry

Weyerhauser TFL 39

Current: Developed as part of an EFMPP project, Weyerhaeuser has a habitat supply model (SHS- Spatial Habitat Supply) linked to a spatially explicit harvest model. The model handles guilds or individual species and works by evaluating habitat based on the projected abundance of attributes required by guilds or species. It also estimates dispersal and effects of natural disturbances like fire and wind. Examples of species habitat maps are available on the web site. Weyerhaeuser is currently reevaluating its habitat supply modeling structure to align it with implementation of its Adaptive Management and Monitoring Program.

Potential: Strategic planning and adaptive management

Staff: Glen Dunsworth
Web Site: http://www.mbltd.com/enviro/forestry/efmpp/default.htm

CANFOR TFL 30

Current: As part of their management planning process CANFOR will be using local level indicators. In a draft document prepared by Gilbert Proulx. it was indicated that there was a potential to use caribou, marten, and moose habitat indicators. Most likely marten habitat will be used as a performance indicator and an initial model will be developed over the next year.
Staff: Bill Wade

Lignum IFPA

Objective: As part of its IFPA, Lignum has been looking at a number initiatives some of which relate directly to habitat supply. The goal of their managed stand growth and yield permanent sample plot program is to determine the change in tree, stand, and habitat

development patterns relative to different harvesting and silvicultural treatments. One specific objective is to contribute towards the development of growth and yield and habitat attribute models. Products include: (1) determining impacts of forest management on the amount and kind of habitat produced and (2) to validate existing models which describe changes in habitats and timber in response to management and natural disturbance. In the pursuit of this goal Lignum held a workshop of a variety of growth and yield and habitat professionals to discuss how they might pursue their goals. Identify that habitat measures should be consistent with lifeforms approach adopted by Lignum and are calibrated to the habitat attribute model.
Further Information: Lignum, Ltd. 2000. Recommendations for managed stand growth and yield program.
Contact: Tracy Earle
Web Site: http://www.lignum.com
Steering Committee Members: Bill Bourgeois (Lignum), Tracy Earle (Lignum), Ian Moss (consultant), Jim Flewelling (consultant), Jim Rochelle (consultant), Val LeMay (UBC), Albert Nussbaum (MOF RB), Peter Eligh (consultant)

Consultant

ESSA

Current: ESSA has worked and continues to work on a variety of "habitat supply" related projects and models. These include Prognosis EI and TELSA.
Potential:
Staff: Julie Greenough

MacGregor Model Forest Group

Current:
Potential:
Staff: Keith McLean

Diane Dimarchi

Current: Compiled a listing of habitat supply models in BC for Kathy Paige of MELP.
Contact: 920-5464

Rick Page

Current: Compiled a listing of models (growth and yield, forest estate, …) in BC that have relevance for habitat supply. Contracted by Brian Nyberg of MOF.
Contact:

Appendix 4: Contacts

Contact information for names mentioned within this document are noted in the below table. If you are working with habitat supply models and would like to see your name listed here please contact Jeff Stone.

Name	Biologist	Habitat modeller	GY modeller	Forest state modeller	Forest management	Forest inventory	Organization	Phone	Email
Anderson, Greg					x		MOF IFD	(250) 342-4226	Greg.Anderson@gems2.gov.bc.ca
Beale, Jeff							MOF RVFD	(250) 569 - 3700	Jeff.Beale@gems9.gov.bc.ca
Bonner, Lynn							MELP	(250)387-1158	Lynne.Bonner@gems1.gov.bc.ca
Boisvenue, Celine							consultant		celine@boisvenue.com
Bourgeois, Bill					x		Lignum		
Boyland, Mark							UBC CACB		markbo@interchange.ubc.ca
Brand, Rick							MOF	(250) 356-6675	Rick.Brand@gems2.gov.bc.ca
Bunnell, Fred		x					UBC CACB	(604) 822-5928	fbunnell@unixg.ubc.ca
Cameron, Ian				x			J.S. Thrower	250-314-0875	Ian.Cameron@jsthrower.com
Carson, Dave							Timberline	250-480-1101 ext 227	dmc@timberline.ca
Clark, Dave							MEP RIB	(250)387-9785	Dave.Clark@gems5.gov.bc.ca
Dimarchi, Diane							consultant	250-920-5464	
Dunsworth, Glen							Weyerhauser		glen.dunsworth@weyerhaeuser.com
Earle, Tracy					x		Lignum	(250) 392-3371	Tearle@lignum.com
Eligh, Peter									
Enemark, Gord							MEI	952-0699	Gordon.Enemark@gems8.gov.bc.ca
Eng, Marvin		x					MOF RB	(250) 387-2710	Marvin.Eng@gems5.gov.bc.ca
Fenger, Mike							MELP HB	(250)387-9779	Mike.Fenger@gems3.gov.bc.ca
Fletcher, Chris							MOF TSB	(250) 356-5959	Chris.Fletcher@gems8.gov.bc.ca
Flewelling, Jim				x			consultant	253 520-6732	jimflew@eskimo.com
Goudie, Jim				x			MOF RB	(250) 387-6535	Jim.Goudie@gems4.gov.bc.ca
Greenough, Julie		x					ESSA		jgreenough@msmail.essa.com
Hamilton, Evelyn							MOF RB	(250) 387-3650	Evelyn.Hamilton@gems8.gov.bc.ca
Hamilton, Tony	x						MELP RCS	(250)387-9761	Tony.Hamilton@gems3.gov.bc.ca
Hovey, Fred		x					MELP RB	(250) 837-7619	Fred.Hovey@gems8.gov.bc.ca
Huggard, Dave							UBC CACB		huggard@interchg.ubc.ca
Janussaukas, Algis							MELP HB	(250)356-9295	Algis.Janusauskas@gems4.gov.bc.ca
Klenner, Walt							MOF KFR	(250) 828-4158	Walt.Klenner@gems7.gov.bc.ca
Kremsater, Laurie							consultant		lkrem@uniserve.com

LeMay, Val				x	x		UBC	604-822-4770	lemay@interchange.ubc.ca
MacKinnon, Andy							MOF RB	(250) 387-6536	Andy.Mackinnon@gems1.gov.bc.ca
Marshall, Peter				x	x		UBC	604-822-4918	marshall@interchange.ubc.ca
Martin, Pat				x			MOF FPB	(250) 356-0305	Pat.Martin@gems8.gov.bc.ca
McLean, Keith							MacGregor Model Forest		
McLellan, Bruce							MOF RB	(250) 837-7767	Bruce.McLellan@gems9.gov.bc.ca
McNay, Scott							Slocan		mcnays@mackenzie.slocan.com
Meidenger, Del							MOF RB	(250) 387-6688	Del.Meidinger@gems2.gov.bc.ca
Mitchell, Ken				x			MOF RB	(250) 387-6673	Ken.Mitchell@gems7.gov.bc.ca
Morgan, Don							MOF RB	(250) 847-7440	Don.Morgan@gems7.gov.bc.ca
Moss, Ian				x			consultant		
Muir, John							MOF FPB	(250) 387-8740	John.Muir@gems1.gov.bc.ca
Nigh, Gord				x			MOF RB	(250) 387-3093	Gordon.Nigh@gems2.gov.bc.ca
Nussbaum, Albert				x			MOF RB	(250) 387-6708	Albert.Nussbaum@gems3.gov.bc.ca
Nyberg, Brian							MOF FPB	(250) 387-3144	Brian.Nyberg@gems6.gov.bc.ca
Page, Rick							consultant	652-8895	rick-page@home.com
Paige, Kathy	x						MELP RCS	(250)356-7788	Kathy.Paige@gems4.gov.bc.ca
Phillips, Barrie							MOF RB	(250) 387-6642	Barrie.Phillips@gems9.gov.bc.ca
Polsson, Ken							MOF RB	(250) 387-6948	Ken.Polsson@gems5.gov.bc.ca
Rochelle,Jim							consultant	360 491 3961	rochellej@olywa.net
Serrouya, Rob		x					consultant		serrouya@kgis.com
Sigurdson, Judi							MEI	(250) 952-0499	Judi.Sigurdson@gems8.gov.bc.ca
Statland, Catherine				x			MOF RB	(250) 387-5447	Catherine.BealleStatland@gems1.gov.bc.ca
Stearns-Smith, Steve							Olympic Resource Mgmt	642-7689	SStearnssmith@ormcanada.com
Stevens, Tory							MELP HB	(250)953-5140	tstevens@victoria1.gov.bc.ca
Steventon, Doug							MOF PRFR	(250) 847-7761	Doug.Steventon@gems3.gov.bc.ca
Stone, Jeff							MOF TSB	250-952-6628	jeff.stone@gems7.gov.bc.ca
Townsend, Gary							MOF TSB	250-356-5958	gary.townsend@gems1.gov.bc.ca
Valdal, Eric							MOF IFD	(250) 342-4249	Eric.Valdal@gems9.gov.bc.ca
Wade, Bill					x		CANFOR	250-962-3259	bwade@mail.canfor.ca
Wells, Ralph		x					UBC CACB	822-0943	rwells@unixg.ubc.ca
Wiart, Raoul							consultant	592-3365	rwiart@home.com
Winter, Ralph							MOF FPB	(250) 387-8906	Ralph.Winter@gems9.gov.bc.ca

Appendix 5: Habitat Supply Models Availability

See contractor report: Dimarchi, Diane. 2000. Habitat Supply Modelling Survey Project Summary at http:// … to be added to a forthcoming habitat supply modelling web page on the Ministry of Forests, Forest Practices Branch, Incremental Silviculture web site.

Appendix 6: Comments outstanding to consider

Ron Kot comment: P5. What is Habitat Supply? - first sentence is a problem. Would find this a better definition: Habitat supply is the quantity (by area) of specified levels of habitat quality over a specified area. Quality specified by importance indicator - suitability rating for a specific single species or perhaps some broader habitat importance indicator such as rating for red and blue listed species. Area by study area, watershed, etc. Currently the definition seems to equate habitat supply with habitat suitability mapping. Suitability rating models are a rating system and by themselves are not a supply model as they alone give no indication of supply in a time, space or level of quality (suitability rating) context. The just rate suitability. Seems to me suitability models and consequent mapped ratings could be one component in broader, spatially-based habitat supply assessment, but for this the other factors (quality/area and possibly time) would then need to be added into the assessment.

"Habitat Supply Modeling in B.C"
This is the title of the paper but the focus TSR. So I am wondering if the scope of this paper should be:

- targeted to TSR, specifically noting what TSR does and then what specific protection methods and concepts (paradigms) (e.g. natural conditions maintenance) work to produce information for this process?
- broadened papers context to different decision processes as it is now, but for each decision process, being more specific about why some models are appropriate for some processes? Problem here is various approaches are under development for various decision processes.

If doing the latter broad approach, in reviewing/developing habitat needs and definitions for habitat supply, it seems necessary to context the definition by identifying:

- what target decision processes and what the info needs are.
- what HP concepts are behind the approach (natural forest condition) used to develop habitat-supply based information for the process.
- what indicators are used, and what key supporting attributes are needed, and when are ecosystems are mapped or not.

Jeff: Look at reorganization the main appendix of this document to be by projects (current and recently completed). In the appendix on organizations it should list projects and generalities about mandate and people.

Brian Nyberg: you might find the enclosed document (see email attachement) to be useful when you update your habitat models paper. Bruce Marcot wrote this up when reviewing model types they might find useful in the USFS for population viability assessments.

Mark Boyland: some brief comments on your document Habitat Supply Modelling in BC: Draft
of December 2000.

1) Perhaps the scope of the document could be extended to outside BC? Exposure to initiatives in WA and OR in particular could help modellers understand our forests and modelling techniques better. In as much as the document is an aid to future modelling, it should include all modelling developments, whether home grown or not.

2) I found it interesting that a search of your document does not reveal "time" or "temporal" in context of modelling. Is the exclusion of the third dimension deliberate -- ie. limitting the scope to current suitability mapping rather than developmental trajectories? Perhaps the definitions of habitat, supply, and modelling could be ammended to include reference to time as an important factor.

3) You have limitted the scope of habitat to the stand-level. Is that the most biologically relevant division? My experience is stands are used because of the link to timber supply models and FS1 maps (both of which use stands). But other divisions are possible: site series, riparian areas cutting across stands, rocky knolls, plant communities other than trees, etc. Using a stand in your definition seems to exclude these other approaches.

4) Using a stand as the smallest unit of habitat is appropriate only for those critters that perceive their surroundings at that scale (as you mention), to the exclusion of the majority of species in our forests. It limits the species that we can effectivly model to those that we could photograph from a distance. Should your document also inlcude smaller spp?

keep up the good work. we need a document such as this to help focus our efforts and broaden our perspectives.

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