Species – Habitat Model Review and Revisions for the Morice and Lakes Innovative Forest Practices Agreement: 2003-04

HABITAT SUITABILITY MODEL REVIEWS

The following section briefly outlines the external reviews and resulting changes for each of the habitat suitability models for the selected species.

Marten Winter Habitat Model

A draft marten winter habitat suitability model had been developed and reviewed based on the output from a test area in the Morice Forest District by the end of fiscal year 2003-04. Internal review has been completed on the draft version and the Prince Rupert regional wildlife habitat ecologist (Doug Steventon) has completed a working review. Revisions based on this review were completed by May 2003. Based on the review, the following changes were made to the model:

1) Large coarse woody debris was included as an influence variable on security cover. Crown closure value was changed to crown closure class as an influence on security cover.

2) Security cover was determined to be a factor in the evaluation of foraging habitat value. This variable was brought in as an influence variable.

3) Several variables are reported in the literature as important factors for marten winter habitat suitability; however, the data supporting mapping these variables for this project area is weak or based on assumptions. Relationships and influence paths in the model were explored and found to be relatively consistent with expected results; however, fine-tuning of these relationships occurred during this process.

4) It was decided that the habitat suitability rating based on foraging habitat value and denning value would be better represented based on an equation and after several iterations, an equation was developed. As well, habitat suitability is now expressed in five ratings (nil, very low, low, moderate, high) versus three (low, moderate, high).

5) There was concern that the spatial pattern, or configuration, of the habitats should be assessed and the configuration on the value of the habitat for marten winter use determined. This was not a component of the Netica model but should be addressed in the future.

Northern Caribou Winter Habitat Model

Mark Williams, Wildlife Ecologist, Ministry of Water, Land and Air Protection, Smithers, BC, reviewed an early version of this model and provided his concerns and comments during the review.

1) Mark Williams was concerned that the depiction of snow depth be included at a landscape level in determining suitable wintering areas during an average year. This idea was incorporated into the model by using snow depth as a factor influencing foraging availability. Snow depth information was summarized at the biogeoclimatic subzone level using information from the BEC guidebook for the Prince Rupert Forest Region and from snow station data for sites within the study area.

2) Mark Williams thought that predation risk is a large factor that modifies habitat suitability. Predation risk to caribou in the winter in these areas is largely wolf predation on caribou. Risk of predation from wolves is influenced by variables such as roads, habitat fragmentation, access, and density of alternate ungulate prey species such as moose. Snow depth affects mobility and energetics of wolf predators. Access to caribou wintering areas can be affected by recreational activities such as snowmobiling. Factors that modify habitat suitability ratings were included in the initial model to give a habitat value rating.

George Schultze, wildlife technician with the Ministry of Water, Land, and Air Protection, Smithers, BC, was consulted to define areas within the Telkwa caribou herd area that were used for snowmobiling activity in the winter. These areas were rated for level of activity from nil to high.
Patrick Williston, Mnium Ecological Research, Smithers, BC, was involved in the initial development and review of the terrestrial lichen and arboreal lichen sub-models. No major changes were made based on that review, although he cautioned that the responses of lichens due to changes in the forest by beetles is unknown and needs to be studied further.

Debbie Cichowski, Caribou Ecological Consulting, Smithers, BC reviewed a draft version of the caribou winter habitat suitability model. Her comments resulted in the following model revisions:

1) Debbie Cichowski provided a herd outline area for the Tweedsmuir-Entiako caribou herd. This herd does not use area within the ML-IFPA area in the winter; however they calve and summer in this area.

2) Conditional probability tables were refined to reflect expected results and look-up tables edited.

Alan Edie, A. Edie and Associates. Smithers, BC, provided comments on the winter model. The following alterations were made based on his comments:

1) The relationship between snow depth, slope and site quality for cratering was adjusted to incorporate Alan Edie’s comments. As well, aspect was removed from the model as an influence on site quality because of the widely variable impact of aspect on snow condition. He believed that at the scale of this modeling, the ability to model the influence of aspect was weak.

2) Alan Edie provided comments regarding consistency in suitability ratings and habitat value naming. Changes were incorporated into the model.

To coarsely capture the variability of snow depth in the alpine zone, a new variable was added into the model influences snow depth by modifying the uncertainty of snow depth in the alpine. There is a lack of snow depth information in the alpine due to no data; factors that influence snow depth such as wind, aspect and elevation.

**Northern Caribou Calving Habitat Model**

A draft caribou calving model was largely developed with the comments and advice from Mark Williams and Debbie Cichowski.

Debbie Cichowski’s comments and advice on habitat that was important to calving females were incorporated into the model.

1) During calving in the late spring, female caribou utilize specific habitat features in an effort to access food while also minimizing the risk of predation. This often results in calving caribou occupying remote and rugged terrain at high elevations in the alpine tundra whereas other female caribou may remain at lower elevations and some will utilize islands to space away from wolves and bears. The main considerations at this time are to model the risk of predation by estimating the relative density of wolves, the value of terrain that could be used as escape terrain (e.g. islands or rugged, open tundra), and secondly to consider the food resources. Specific locations that provide rugged or open terrain (such as alpine tundra) or a higher level of security (such as islands) were identified as having high potential suitability for calving. Most parturient female caribou have a high level of fidelity to calving sites and Debbie Cichowski believes that unless snow conditions impede access to these highly suitable sites, most females will return to these sites and lower elevation sites are used only when the snow conditions impede access. We identified these sites (typically sub-alpine or high elevation forests) as moderate value. Even though some female caribou calve in lower elevation forests (not including island habitats), these sites are considered to be poor quality due to high levels of predation on the calves born in these low elevation types.

Mark Williams’s comments were considered during the building of the calving model.

1) Mark Williams’s comments were mainly regarding the affect of predation risk on calving location. His belief was that calving females were trying to minimize predation risk first and only secondly acquire forage. This strategy would involve spacing away from alternate ungulate prey species and spacing away from conspecifics into areas that provide a long line of sight.
Other comments involved the impact of roads, disturbance, and fragmentation on habitat value. These factors downgrade suitable habitat to various extents and the relative impact of each of these variables was extrapolated from the literature for other areas.

**Northern Caribou Summer Habitat Model**

A draft caribou calving model was largely developed with the comments and advice from Mark Williams, Debbie Cichowski, and George Schultze (Telkwa caribou herd).

George Schultze provided review on the mapped output of the summer habitat suitability model in relation to expected high value habitats. Expected habitat was fairly consistent with model output.

Mark Williams's comments on the development of the summer habitat model were mostly around the area of predation risk and resulting caribou strategies.

1) In the summer, caribou will often form small groups of animals that are spread out across the landscape. The risk of predation to caribou in the summer is more widespread due to greater mobility of all animals at all elevations, however; the intensity of predation is more dilute than in winter or spring.

2) Caribou in summer are mainly concerned with maximizing the foraging value while minimizing the risk of predation.

The following comments and advice made by Debbie Cichowski were considered during revisions:

1) Caribou will space out in small groups across the landscape and use a wider range of habitats than in other seasons. Even though caribou space out, they tend to use higher elevation habitats.

2) Preferential forage species for the Tweedsmuir-Entiako herd can be extracted from the report: Cichowski, D.C. 1993. Seasonal movements, habitat use, and winter feeding ecology of woodland caribou in west-central British Columbia. B.C. Min. For., Victoria, B.C. Land Manage. Rep. No. 79. 54 p. The general list of vegetation was used to build the look-up table by sites series and structural stage.

Even though the effect of roads on caribou's use of habitat has not been studied in this area, it is believed that the response of caribou to roads is similar to other areas. Caribou in Alberta have low avoidance of habitat within 500m of roads and moderately avoid habitat within 100m of roads.

**Moose Winter Habitat Model**

Rick Marshall, Wildlife Biologist, and George Schultze, Wildlife Technician, with the Ministry of Water, Land, and Air Protection, Smithers, BC, reviewed the moose winter habitat model. Their comments and advice was incorporated into the model:

1) Snow depth defined by biogeoclimatic subzone was too coarse of a delineator by itself on moose elevation range in the winter. Elevation bands and aspect were incorporated into the model as an influence on the ability of moose to access and use an area (mobility).

2) Moose habitat suitability is considered to be a function of both the abundance and availability of forage and the proximity to habitat that provides cover for security or thermal needs. Because Netica® cannot evaluate the spatial pattern of habitat, polygons were assessed spatially in Arcview 3.2 GIS with respect to forage and cover suitability ratings to determine an ultimate suitability rating. A distance of 100m was used as an optimal proximity to thermal cover distance; therefore, a sum of high and moderate thermal values within this distance to each cell was calculated and a thermal layer was created. The habitat was then evaluated as the winter foraging value modified by the thermal layer. The weighting of forage habitat and thermal layer was evaluated in a mathematical expression that was developed in Arcview 3.2.

3) It was advised that the model be evaluated against the mapping and results of the regional (MWLAP) winter moose surveys that were conducted in 1992, 1997 and 2002. This information was compiled and evaluated into general ratings by Norm MacLean, 2003. This mapping and information was acquired and our output was compared to the rating system that was built from
survey results. The MWLAP survey area did not cover our entire project area; however, the overlapping portions were very complementary enabled us to calibrate our suitability ratings to real data.

**Moose Summer Habitat Model**

Rick Marshall, Wildlife Biologist, and George Schultze, Wildlife Technician, with the Ministry of Water, Land, and Air Protection, Smithers, BC, reviewed the moose summer habitat model. Their comments and advice was incorporated into the model:

1) Thermal habitat is essential to moose in the summer to counteract overheating. Habitats that are generally used as thermal cover for cooling include: high elevation north facing habitats, water features such as lakes, rivers, ponds, and mature forested habitats with high canopy closure.

2) In the summer, moose space out widely across the landscape and are essentially using foraging habitat in proximity to thermal cover. Thermal cover is most likely not limiting on the landscape and the distance from foraging habitat to thermal habitat that is optimal is not known.

3) Moose generally forage on shrub species and aquatic vegetation. Ponds and lakes also supply needed nutrients to moose in the summer.

**Fisher Winter Habitat Model**

Don Reid, Wildlife Inventory Specialist, Ministry of Sustainable Resource Management, and Doug Steventon, Wildlife Habitat Ecologist, Ministry of Forests, Smithers, BC, provided comments on an early version, on the draft version, and on mapping of the output of the fisher model. Their comments and advice was used to build the model and incorporated into look-up tables:

1) It was suggested that the relationship between maternal and natal denning habitat suitability and foraging habitat suitability is a spatial one; therefore, these components would require analysis in Arcview 3.2 GIS. In the absence of time to do this spatial analysis (and the data to define the spatial relationship), the original model of foraging habitat and denning habitat influencing winter habitat suitability was pared down to maternal and natal denning habitat suitability. Maternal and natal denning habitat suitability was deemed the limiting habitat type for fisher in the study area.

2) Structure and location of habitat on the landscape were the defining variables in identifying potential denning habitats. There is no detailed fisher data for this area, therefore parameters for habitat variable and fisher biology relationships are primarily set by information provided by Weir (1995) from south-central BC and from data collected by Weir in the Williston Lake area. It was believed that the highest potential sites included those supporting large cottonwood trees. Both riparian habitats and upland habitats were identified from the forest cover and through the PEM for mature stands.

3) Don Reid’s concern was that upland cottonwood sites would be rated the same potential as riparian cottonwood sites. These upland sites should not be rated as high potential as lower elevation riparian sites due to snow levels. Fisher are restricted to areas with lower snow loads.

4) For review of the draft, I had created mapping of several versions of the maternal denning habitat suitability. These versions differed in the cut points of the suitability ratings. It was determined that the pattern of moderate and high habitat was generally as expected, but the cut points could not be determined based on the existing knowledge of fisher in the Morice and Lakes IFPA area. This exploration of the cut points of the denning habitat suitability ratings output was a good example of how to express potential error in the absence of better data. For example, management decisions based on any one version of the denning model output could be based on incorrect values; however, we have identified what is believed to be a range of potential good habitat, which could enable a calculation of the potential error in making certain decisions. This also provides a good start place for field validation of the model.
Mule Deer Habitat Model

Rick Marshall, Wildlife Biologist, and George Schultze, Wildlife Technician, with the Ministry of Water, Land, and Air Protection, Smithers, BC, reviewed the mule deer winter habitat model. Their comments and advice was incorporated into the model and used to revise look-up tables:

1) Winter habitat suitability of mule deer was determined to be dependent on the habitat to provide adequate foraging habitat and thermal cover.

2) In the study area, mule deer are highly restricted by snow depth; therefore, low elevation, warm aspect slopes are where mule deer winter. On these sites, mule deer will use closed canopy forests that provide forage vegetation.

3) Mule deer forage on litterfall from both arboreal lichens and conifers as well as on shrub species. Information from the literature was used to create a model relationship to predict abundance of litterfall based on the abundance of the lichens and specific conifer species.

4) Habitat above 1000m elevation is not considered potential mule deer winter habitat.

Grizzly Bear Habitat Model

Todd Mahon, WildFor Consultants Ltd., Telkwa, BC who had created a suitability model for the Kispioc Forest District, reviewed early draft models for and provided input on foraging assumptions within ecosystems. Alan Edie, A. Edie and Associates. Smithers, BC, provided comments that resulted in changes in the effects of salmon spawning, slope and forest management practices on forage ratings within the model.

MODEL REPORTING

Maria Leung, Wild Tracks Ecological Consulting, Smithers, BC and Irene Ronalds, Cordillera Environmental Services, Smithers, BC, provided review and editing services for the reports outlining the models and the model assumptions. These reviews were valuable in ensuring that model components were consistently named between models and that model node names and annotations were clear and meaningful.

CONCLUSIONS AND RECOMMENDATIONS

Model development, validation, review, and verification is an iterative, ongoing process that needs to be followed through to the final stage for the model process to have predictive power (Brooks 1997). At this time, the species – habitat models have been reviewed by local experts and undergone revision. The Model process is now at the stage where ground verification should be started, which will lead to another iteration of revision and review. Models can be improved as more ecological information is acquired, data layers improved, variable relationships better defined, and population responses determined. Documentation has been compiled for each species – habitat model developed and within each report a listing of verification priorities is provided. It is important to recognize that intelligent model design, model evaluation, appropriate model application, and prudent interpretation of model outputs all need to be considered in this process.

REFERENCES