A MOOSE HABITAT ASSESSMENT OF THE BULKLEY-ENDAKO AREA OF BRITISH COLUMBIA

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ABSTRACT

The capability of land to meet the needs of wildlife is a central concept in habitat protection and habitat enhancement. This paper describes the application of a biophysical ungulate capability classification to moose (Alces alces andersoni) habitat in west-central British Columbia. The land surface is separated into ecological units of similar physical and biological (biophysical) characteristics reflected by terrain, soil and vegetation parameters. Capability classes are assigned on the basis of this information, moose habitat requirements, historical and current census data. Mapping illustrates the location, size and relative importance of a biophysical unit to an area. In the study area moose winter range was shown to be restricted to the lower elevations of main river valleys. Floodplains had the highest potential density of use but were very limited in extent. Uplands provided the greatest potential for winter use because of their high percentage of the area. The potential importance of uplands as moose winter range was stratified on the basis of climate (especially snow depth) and potential to produce forage.

The study area lies primarily within the Bulkley and Endako River watersheds of west central British Columbia and contains moose populations of provincial significance. The area is dominated by coniferous subboreal forest (Cotic et al., 1974). Average annual precipitation is about 450 mm, of which 38 to 45 percent falls as snow (Cotic et al., 1974). Average maximum snow depths over much of the area are in excess of one metre with the exception of major valley systems where snow depths average about one-half metre (Ministry of Environment, 1980). Moose winter range is restricted to the valleys of lowest snow depth, which comprise about one quarter of the area. This report summarizes some of the content of a report by B. Fuhr and B. Pendergast (1982).

This study was conducted by the Surveys and Resource Mapping Branch of the British Columbia Ministry of Environment in response to a need for more detailed ungulate habitat information than that provided by the Canada Land Inventory. Alienation of winter range on public land by agricultural and other private use is of particular concern. Since it is ultimately the amount and quality of land that determines the carrying capacity of winter range (Nasimovitch, 1955), a method for habitat assessment must describe these values. The system used here is described in: Wildlife Capability Classification for British Columbia - An Ecological Approach for Ungulates (Demarchi et al., 1983). Capability refers to the carrying capacity of the optimal seral stage for the species and site under consideration. It describes an area's potential carrying capacity with proper habitat manipulation. Other habitat assessment methods which describe the importance or carrying capacity of present seral stage rather than optimal seral stage often underestimate the potential importance of many areas. In this area present use by moose is often less than capability because advanced seral stages with suppressed browse production are predominant. As well as providing a basis for priorizing habitat protection efforts against land alienation, a capability assessment can be used in conjunction with present seral state to identify the best areas for habitat enhancement and to make general population estimates.

METHODS

The biophysical classification concept as used here integrates information about climate, landforms, soils and potential vegetation to form ecologically significant units (Walmsley, 1976). In this case a single biophysical unit would be one of potentially uniform ecological significance to moose. Here a biophysical unit may contain differing seral stages with correspondingly different present use by moose, but it should have similar ecological conditions that will have similar potential importance if managed for moose. The degree of ecological uniformity which can be presented is a function of both mapping scale and survey intensity (Fenger, in prep.). This project is of a low level of survey intensity at an intermediate scale of mapping (1:50 000).

Biophysical units are separated on the basis of seasonal use and habitat preferences of moose in the study area. Winter range was considered to be the most important seasonal use area because of its limited extent and intensive use by moose. Winter range importance is related mainly to snow depth, forage availability and cover (Silver, 1976). The upper elevation of winter range was considered to be near the one metre snow depth isoline for late winter (Telfer, 1970, Nasimovitch, 1955). Since the area available for winter range varies depending on winter severity, an estimate was made of the extent of winter range for an average winter. This was done from recorded snow information (Ministry of Environment, 1980) and from direct measurements of snow depth and observations of snow condition and winter use.

Within the area determined to be winter range there is usually a wide variation in potential habitat importance to moose. This importance is primarily based on the potential production and availability of suitable forage. Important forage species were determined from field observation information from biologists familiar with the area and information available in the literature. These variables can be assessed

by sampling the vegetation and forage utilization of representative sites. Seral stage must be considered during this assessment since potential habitat importance may not be reflected by the current seral stage. Methods for collecting this information are described by Walmsley et al. (1980).

Areas of similar potential importance to moose can be grouped into biophysical types. These types can be separated into summer or winter range and can be ranked in potential importance value for moose. An estimate of carrying capacity can be made by assigning capability classes to each biophysical type. Measurements of current moose density in areas of good seral condition may be used as a baseline to extrapolate to similar biophysical types with less favourable seral conditions. This must be done with consideration of current survey conditons, other factors which may be limiting current use and available historical data. Potential carrying capacity estimates for moose in units of animals per square kilometre per year are presented in Table 1 and described more completely by Demarchi et al. (1983).

TABLE 1

POTENTIAL CARRYING CAPACITY ESTIMATES (MOOSE/SQUARE KILOMETRE/YEAR) FOR UNGULATE CAPABILITY CLASS RATINGS

CLASS	CARRYING CAPACITY
1 - very high	4.6 - 6.0
2 - high	3.1 - 4.5
3 - moderate	1.6 - 3.0
4 - low	0.4 - 1.5
5 - very low	<0.3
6 - nil	0

Class 1 areas are the the best sites in the province and are the benchmarks by which other classes are ranked. These areas were assigned following consultation with regional biologists and from information in the literature (for sources see Demarchi et al., 1982). The lower classes are determined as percentages of the class 1 value. Superclasses (25% increments above class 1) may be used where unusually high potential is encountered.

A knowledge of habitat preference and utilization is necessary for both habitat assessment and enhancement. Track abundance and utilization data were gathered from several cutovers to examine the relationship of use to coniferous cover and snow depth. Track abundance was recorded every ten metres over a one hundred metre transects perpendicular to cutover edges. Coniferous forest, selective cutovers and clear cutovers were sampled. Snow depths in all sampling areas ranged from 70 to 85 cm.

HABITAT CAPABILITY IN THE STUDY AREA

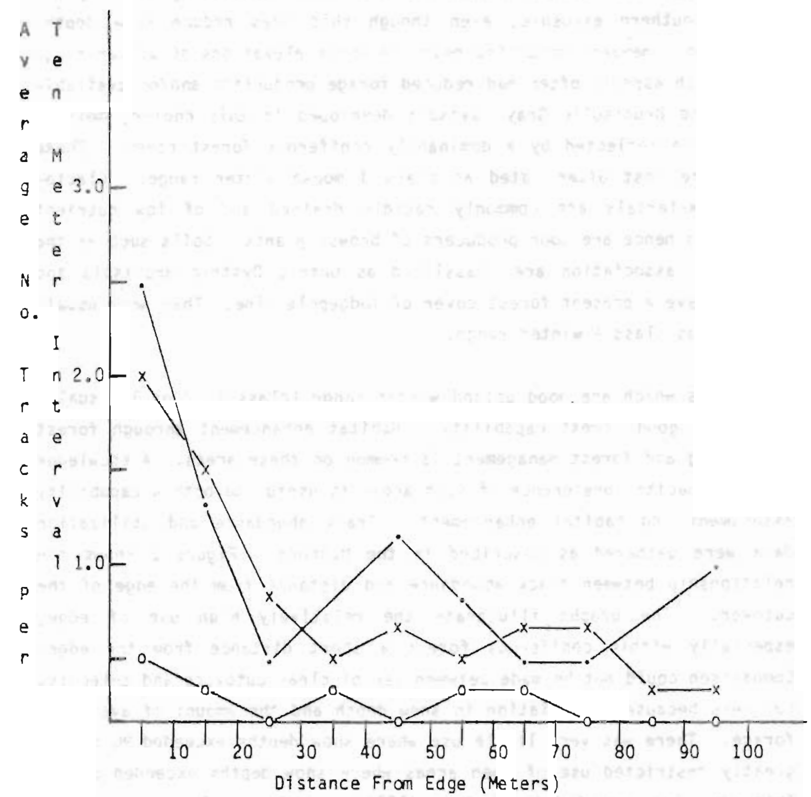
Nineteen maps at a scale of 1:50 000 or an area of about 16,000 square kilometres were mapped for ungulate capability. Only 24% of this area was considered to be moose winter range. Floodplains provide the highest quality winter habitat for moose as they tend to have abundant preferred forage (Salix spp. and Cornus sericea) and lower snow depth than adjacent areas. The floodplain soils described as the Stellako soil association (soil names from Runka, 1972 and Cotic et al., 1974) generally provided the most browse. This soil is described as dominantly a Gleyed Orthic Regosol with imperfect drainage. These characteristics in part encourage and maintain a high degree of browse production. The Nadina River floodplain was estimated to support approximately 200 moose on 12.5 square kilometres during the winter of 1967-68 (Fish and Wildlife Branch files, Smithers), or an approximate density of 16 moose per square kilometre. This area was assigned a capability class of 1C (a superclass 50% higher than class 1), implying a carrying capacity of 7.6-9.0 moose per square kilometre per year, or 15.2-18.0 moose per square kilometre for six months. Although floodplains provide the most productive habitat they occupy only 2% of the area mapped and are largely alienated by sale of crown land for agricultural use.

Uplands provide the majority of the potential winter range. Almost all areas above the main floodplains to the elevation of the one metre snow depth isoline have some potential for winter range. The capability of upland areas ranged from class 1 on the best areas to class 4 on areas of deeper snow and/or low forage productivity. The more productive areas most often occur with a combination of fine textured soil, high moisture and relatively low snow depth. The Barrett soil association, an Orthic Gray Luvisol, was the most extensive of these types. The Barrett 7 soil member frequently occurs on south aspects with a correspondingly reduced snow depth and preference by moose for winter range. These areas are currently mainly aspen forest with locally abundant herb and upland willow growth as a result of fire.

These areas were most often rated as class 2 winter range for moose because potential browse production is often limited by the dryness of the southern exposure, even though this does reduce snow depth. Barrett soil members occurring near the upper elevations of winter range or on north aspects often had reduced forage production and/or availability. The Brunisolic Gray Luvisols developed in this cooler, moister climate are reflected by a dominantly coniferous forest cover. These areas were most often rated as class 3 moose winter range. Glaciofluvial materials are commonly rapidly drained and of low nutrient status and hence are poor producers of browse plants. Soils such as the Alix soil association are classified as Orthic Dystric Brunisols and usually have a present forest cover of lodgepole pine. They were usually rated as class 4 winter range.

Sites which are good upland winter range (class 1, 2 or 3) usually also have good forest capability. Habitat enhancement through forest harvesting and forest management is common on these areas. A knowledge of moose habitat preference of such areas is useful to both a capability assessment and habitat enhancement. Track abundance and utilization data were gathered as described in the Methods. Figure 1 shows the relationship between track abundance and distance from the edge of the cutover. The graphs illustrate the relatively high use of edge, especially within coniferous forest a short distance from the edge. Comparison could not be made between use of clear cutovers and selective cutovers because of variation in snow depth and the amount of available forage. There was very little use where snow depths exceeded 90 cm and greatly restricted use of open areas where snow depths exceeded 80 cm. This was also reported by Eastman (1974) near Prince George. Use appeared to decline rapidly in the first 30 metres from the cutover edge both in selective cutovers and in adjacent forest. This distance is expected to vary with snow depth and the amount of available forage (Hamilton et al., 1980 and McNicol and Gilbert, 1980). Although greater sampling would be required to better assess the effects of these variables, it does indicate the importance of coniferous cover during periods of restrictive snow conditions.

Figure 1: Average moose track abundance per 10 meter interval.



. Transects in Coniferous Forest N=4

x Transects in Selective Cutovers N=10

o Transects in Clear Cutovers N=11

(each transect was 100 m in length)

The following points summarize the biophysical ungulate capability classification methodology:

1. The land surface is separated into ecological units of similar physical and biological characteristics reflected by terrain, soil and vegetation parameters.

2. Each unit is assigned a capability class on the basis of all known or inferred information about the unit, including soil parameters, surficial materials, climate, vegetation, ungulate species behavior and productivity.

3. Capability for ungulate species is considered as the maximum number of animals of each species that can be sustained on a biophysical unit under non intensive management practices (Demarchi et al., 1983); capability classes are an expression of the number of each species that can be supported on a square kilometre of that biophysical unit for a period of one year.

4. The capability classification allows for some human activities to have permanently altered the potential of some land units to produce forage. The land is rated on its new (altered) potential rather than on its past potential.

5. The capability classification reflects the ability of the habitat in a favorable successional stage to support ungulates; hunting, disease, predation and other mortality factors are not considered to have an effect on the habitat's ability to support animals and therefore these factors are not considered when applying a rating.

The presentation of wildlife capability and habitat information in map form has numerous advantages. It illustrates the location, size and relative importance of a unit to an area. This has obvious application to the formulation of habitat protection and enhancement strategies as well as to wildlife management and impact assessment. Given current land use and other resource values, the capability assessment provides the rationale for focussing these activities on specific areas.

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