Mule Deer Winter Range in the John Prince Research Forest

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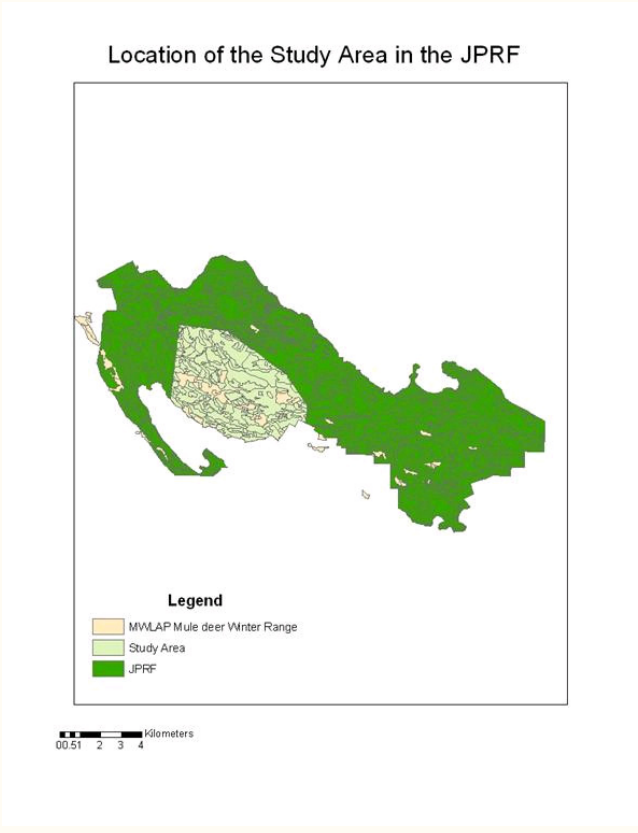
Abstracts

Mule deer in the John Prince Research Forest (JPRF) use areas that are covered by the Ministry of Water, Land and Air Protection's (MWLAP) management strategy, however not as extensively as areas not covered by the management plant.

Introduction

The John Prince Research Forest, which is located 50 km northwest of Fort St. James, B.C., is located on the Northern limit of Mule deer. This location is useful for monitoring changes in the local the Mule deer population as an indicator of regional changes and their effect on Mule deer. The Ministry of Water, Land and Air protection (MWLAP) has developed an interm model of requirements for Mule deer winter range for the Northern region. This model attempts to provide habitat requirements while allowing for some harvesting opportunities. The final model is expected to be released in 2006. This model includes habitats with Douglas fir as a leading species and are over 100 years old, have a South aspect and have a gentle slope. These physical characteristics limit snow depth. Snow depth is important when calculating winter energy budgets for the deer. Snow depths (approximately) over the front knee height of the animal exponentially increase the cost of locomotion. The purpose of this study was to evaluate Mule deer use of MWALP modeled habitats.



As you can see from the sampled area map, the Mule deer modeled habitat range is not confined to the forest or confined to the study area. Data has been collected in the JPRF for other parts of the forest but for the purposes of analysis only the light green area has been considered.

Data Source

Mule deer habitat use data was collected by Dexter Hodder, the Research Coordinator John Prince Research Forest and his research assistants in January 2003, January 2004, and February 2004. Location data was collected for mule deer sign (tracts, pellets and beds) and snow depth. Data was presented as striplines in excel files (example shown below).

	Strip Line 8												
Date	Fixed Distance (M)	Wildlife tracks	Location (M)	Snow depth (cm)	Comments	Avg. Snow Depth (cm)	Deer	Moose	Grouse	Sn. Hare	Red Squirrel	Marten	Weasel
18-Feb-04	0			19		30.50	12	2	0	0	0	0	0
	50			20									
	100	Deer (2 sets)	140	34									
	150	Deer	160	8									
		Deer (2 sets)	178										

Geographic locations for the start of the striplines and their direction of travel was added separately to the excel table. Forest cover data (coverage) and elevation (DEM) data were already a part of the GIS lab's collection of JPRF data.

Data Manipulation

To create nodes with associated attributes deer event data for each year was manipulated in excel and saved as DBASE III tables (there were problems creating tables with DBASE IV) and converted to shapefiles using ArcCatalog and ArcMap. Geographic locations were converted to UTM using Natural Resources Canada Geographic to Universal Transverse Mercator (UTM) Online Demonstration. The location of individual sampling points was then determined by trigonometry in excel (see example below).

ID_#	Ycoord	xcoord	angle	distance	Fixed Distance (M)	species	Snow depth (cm)
30101	6058010.139	400357.405	33	50	0		28
30102	=(COS(D2)*E2)+B2	=(SIN(D2)*E2)+C2		50	50		36
30103	6058008.811	400457.3962		50	100		24
30104	6058008.147	400507.3918		50	150		31

The sampled area of the JPRF was then clipped from all data sets. This eliminated sample points outside JPRF boundaries and areas not sampled for Mule deer use. All data was projected in UTM, NAD 1983, Zone 10.

Spatial Analysis Methods

In ArcMap Mule deer use of MWLAP modeled areas was determined through selection of attributes. The reverse of this selection was used to create a layer of areas outside the model that were frequented by deer. The character of these other deer areas was determined by analyzing their attribute tables.
To generate snow cover, snow depth from each sampling point was used with the Interpolate to raster function in Spatial analysist. The surface was interpolated using the Inverse Distance Weighted (IDW) geostatistical method of analysis. This model uses sample data in its exact location for surface generation (instead of trend values) and assumes that values closer to the interpreted area are more alike than values that are further away so that surfaces area based on values surrounding the prediction location. This method was to create snow surfaces for each sampling period.
Deer habitat areas, deer signs and forest cover were draped over the DEM (also used as the base elevation) in ArcScene to produce three dimensional perspectives of the study area. Elevation was exaggerated (2x) to provide greater contrast.

Analysis Results

Signs of Mule deer were found in MWLAP modeled areas in January 2004 and February 2004. No signs were found in MWLAP defined habitats in 2003. Deer sign increased with each sampling period, 28 events in 2003, 33 in January 2004 and 81 events in February 2004. Total number of deer sign found in MWLAP areas was 30 (15.0%), total deer sign in other areas of the JPRF was 158 (84.9%).

Figure 1. Looking North, MWLAP modeled Mule deer habitat is shown in tan, point events are deer sign. Brown are 2003 deer signs, red are January 2004, and orange are February 2004. Elevation has exaggerated two times the actual values.
Deer signs are predominantly confined to South facing slopes with leading tree cover most likely being Douglas fir, Lodgepole pine or Trembling aspen.

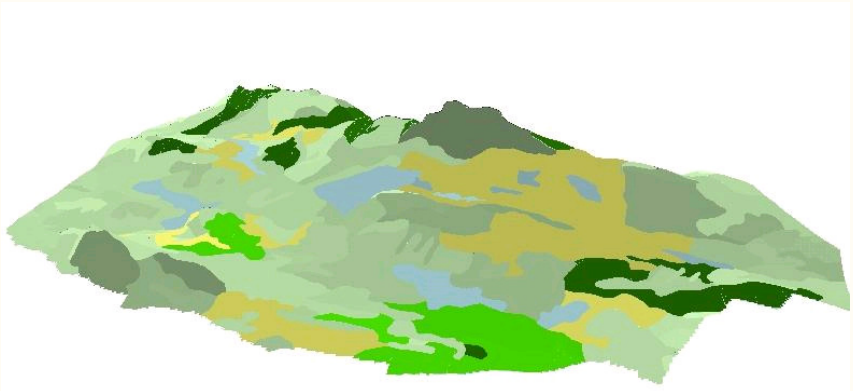


Figure 2. Areas outside MWLAP model used by Mule deer. Dark green have Lodgepole pine as the leading species, yellow is Douglas fir, bright green Trembling aspen and blue is other types of forest

cover. Elevation is exaggerated two times.

Physical characteristics of used areas outside MWLAP defined winter habitat are summarized in Table 1. Figure 3 shows the leading forest cover for areas outside MWLAP managements zone.

Table 1. Forest cover in areas used by Mule deer, excluding MWLAP habitats.

Number of Deer Events	Leading Species	Average Stand Age	Slope
9	Logepole pine	105.78	9.67
9	Douglas fir	121.11	7.75
5	Trembling aspen	90.00	4.65
3	White spruce	150.00	6.18
3	No leading speices	0.00	9.75
1	Subalpine fir	80.00	14.11
30		91.15	8.69

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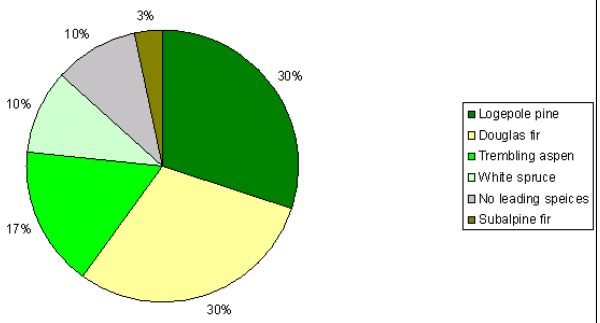
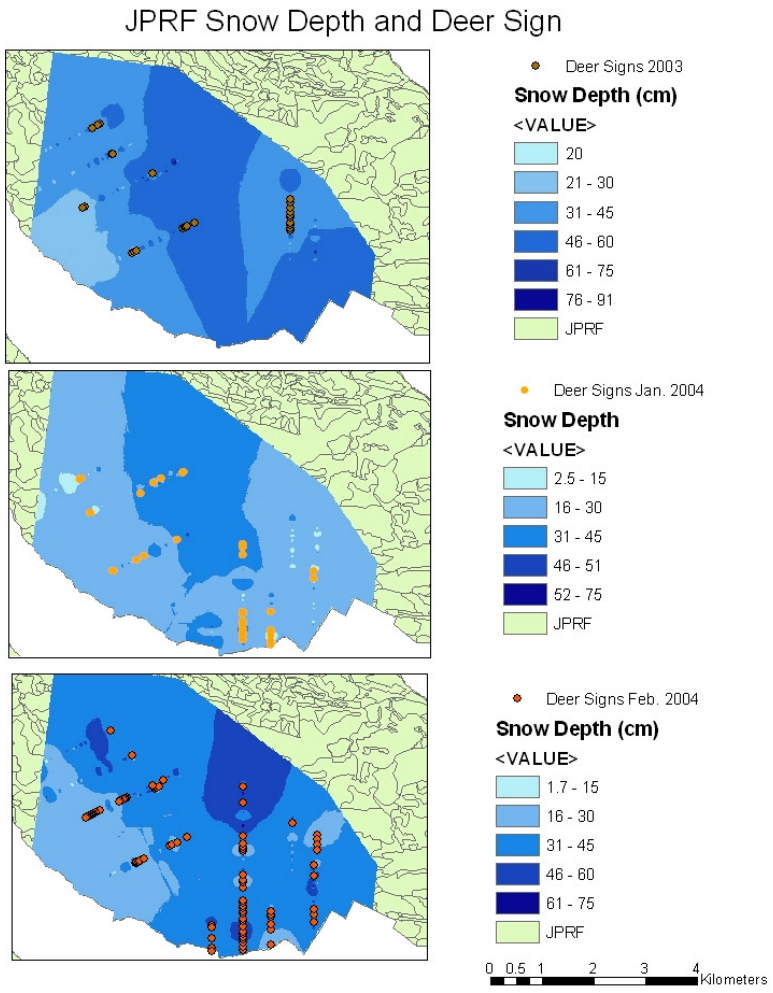
Figure 3. Percent of deer signs by leading tree species.



Snow depth was measured every 50 m along the sampling striplines and it was used to generate a snow depth surface. Snow depth is an important characteristic because it affects energy budget calculations for the deer. After snow depth reaches a critical height on the leg of the deer locomotion costs increase exponentially. Energy requirements of the animal compared to energy intakes (food energy) are used to determine the animal's chance of survival. Deer sign was usually found in areas with less than 60 cm of snow pack.



Conclusions

The analysis shows deer use in some areas of the JPRF. Sampling of deer sign was not uniform over the entire research forest; instead it focused on the MWLAP areas. Analysis was based on deer signs in the area and do not represent individual deer use (it is possible that multiple signs could have been made by a single deer) and it is not an index of deer abundance.
Mule deer in JPRF do use MWLAP areas (15.0% of signs), however not as extensively as they use other areas (84.9% of signs). A possible reason for the disproportionate use is that the areas selected by the MWLAP model are not contiguous or large enough to contain all deer movement. The MWLAP model also does not take into account any human land use changes or activities such as trails and roads or logging.
Deer sign was normally found in areas with less than 60 cm of snow, however deer sign was not concentrated around areas of low snow cover.

Future Developments

- Expand the sampling area of the JPRF for better surface representation
- Expansion of the MWLAP model to take anthropogenic effects into account (distance from roads and logged areas etc.).
- Record sampling locations with a GPS to minimize data processing time!

References

Mule Deer Winter Range Management Plan http://wlapwwww.gov.bc.ca/car/env_stewardship/ecosystems/mdwr_strat/mgmtplan.html.
Natural Resources Canada Geographic to Universal Transverse Mercator (UTM) Online Demonstration http://www.geod.nrcan.gc.ca/index_e/online_apps_e/appGSRUG_e/geo_e.html
Geog 413 Laboratory Manual http://www.gis.unbc.ca/courses/geog413/labs/index.php

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