Upper Deadman River Moose Habitat Study

Results and Recommendations

March 1998

Prepared for:

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Savona, British Columbia

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EXECUTIVE SUMMARY

This report presents the results of a two-year intensive monitoring project focussing on the seasonal habitat requirements of a southern interior moose population. Concerns have been raised by local wildlife managers, forest companies and First Nations councils regarding the potential impacts of forest development on the upper Deadman River/Criss Creek moose population, with the proposed harvesting of mixedwood stands on identified seasonal ranges. The project began with 25 radio-collared animals, a sample that has been depleted over the course of the study through natural mortality, predation and hunter harvest, both legal and illegal. Study animals were relocated by fixed-wing aircraft or helicopter on a bi-weekly or tri-weekly basis throughout the year (weather dependent), with more frequent flights during the breeding and calving periods. Incidental sightings were recorded on every possible occasion. Observations including habitat type, elevation, vegetation species, activity, snow depth and group size were recorded for each location.

Temporal analysis of patterns of habitat use revealed extensive utilization of the mixed coniferous/deciduous forest type throughout the year. These stands provide important forage during all seasons, but especially during late summer, autumn and early winter, when other forage sources are reduced in digestibility or are unavailable. This forest type also provides thermal and escape cover in the advanced coniferous components. Coniferous stands exhibit excellent year-round cover attributes, in particular providing thermal cover during the summer and late winter, and important security cover during hunting seasons. Wetland habitats, particularly the spruce/sedge meadow type, are of particular value as foraging areas during the spring and early summer, when high quality vegetation is abundant. These areas have also been identified as critical calving sites. Aquatic habitats are utilized frequently during the heat of summer, when moose feed on succulent aquatic plants and escape the heat and insect pests of the season. Dense stands of riparian willow represent excellent sources of winter and early spring forage, in addition to providing crucial security cover to cow moose during parturition and the days following birth.

Integrated forest resource management recommendations, which will ensure the maintenance of adequate quality moose winter habitat and enhance year-round foraging areas with appropriate cover characteristics, are presented. The development of an access management plan, which will minimize the impact of human disturbance on the moose population, is a prime objective of these guidelines.

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1.0 INTRODUCTION

Seasonal habitat requirements of moose have received considerable study throughout much of their North American range. Their extensive use of the mixed coniferous/deciduous forest type has been well documented (e.g. Pierce and Peek 1984; Eastman and Ritcey 1987; Timmerman and McNicol 1988; Renecker and Hudson 1992). However, in the southern interior of British Columbia, moose utilization of these stands is poorly understood. Recently, development plans have been approved for the extraction of mixedwood stands for pulpwood and sawlog timber in the upper Deadman River and Criss Creek areas, on the Thompson and Fraser Plateaus. Concerns have been raised by wildlife managers, forest companies, First Nations groups and local residents, regarding the potential impacts of this development on the local moose population. Key issues in maintaining habitat suitability for moose include the maintenance of an optimal mix of forage and cover characteristics on moose ranges, in concert with effective access management.

Moose require large daily quantities of forage for maintenance and growth, from a minimum of 18 kg in early summer for a yearling cow to 51 kg for an adult bull in October (Gasaway and Coady 1974). Moose are known to eat several hundred plant species, although usually not more than 25-30 species are eaten in any one local area (Morrow 1976, cited by Timmerman 1991). Aspen (*Populus tremuloides*) is reported to be one of the top seasonally preferred terrestrial browse species, along with red-osier dogwood, mountain ash, balsam fir and willow, among others (Thompson and Vukelich 1981). Harvesting in mixedwood stands, with the removal of mature deciduous trees, may enhance these areas as moose foraging habitat. Natural regeneration of aspen is rapid following disturbance, and removal of canopy cover increases the biomass and diversity of shade-intolerant forb and shrub growth in the understory. However, for moose to utilize the increased forage production, cover values within and adjacent to the harvested stands must be preserved.

The purpose of this project was to monitor the upper Deadman River/Criss Creek moose population over a 2-year period in an effort to identify habitat requirements as they relate to forest stand types in this region, particularly the mixed aspen/conifer type. The goal was to observe the animals throughout the year and define habitat use and migratory patterns, with particular emphasis on important seasonal habitats. Results and recommendations from the study have been, and will continue to be applied in the development of guidelines for access management and harvest prescriptions within the study area, and in other areas facing similar development.

ACKNOWLEDGMENTS

I wish to extend my sincere thanks to Doug Jury, Regional Game Biologist, Ministry of Environment, Lands & Parks (Kamloops), for his direction and encouragement. Special thanks also to Doug Smallman of Cariboo-Chilcotin Helicopters Ltd., for his enthusiasm, 'fancy flying' and outstanding telemetry skills. Many thanks also to Brad Bennett, Paul Christensen and Mark Hopkins of Ainsworth Lumber Company Ltd. for their continuing support.

I would also like to express my appreciation to the following for their contributions to the project:

British Columbia Conservation Foundation

Eddy Jules, Ross McNab and Don Ignace, Skeetchestn Indian Band

Michael Burwash, FRBC Coordinator, Ministry of Environment, Lands & Parks

Glenna Boughton, GIS Coordinator, Ministry of Environment, Lands & Parks

Tom Gaines and Andy Morris, GIS Technicians, Ministry of Environment, Lands & Parks

Mike Rudniski, Atlas Information Management

Dan Nelson, Spring Aviation Ltd.

Reuben Irvine and Jim Fox, Ministry of Forests

Don Brimacombe and Jamie Skinner, Weyerhaeuser Ltd.

Phil Holman, Forest Ecosystem Specialist, Ministry of Environment, Lands & Parks

2.0 STUDY AREA

Management Unit 3-29 is located northwest of Kamloops, British Columbia, encompassing approximately 2050 km^2 north of Kamloops Lake (Figure 1). The northern boundary of the unit lies to the south of Bonaparte Lake. Hihium Lake defines the western edge and the North Thompson River tributaries the eastern extent of the unit. The two main watersheds in the area are those of the Deadman and Tranquille Rivers. Elevations within the unit range from 450 m on the shores of Kamloops Lake to 1800 m on Porcupine Ridge and the Silwhoiakun Plateau in the northeast. Much of the area lies between the 1000 and 1300 m elevations on the Fraser and Thompson Plateaus.

The Interior Douglas Fir (IDF) biogeoclimatic zone occurs in the lower elevations of the Deadman and Criss Creek valleys. The Sub-boreal Pine and Spruce (SBPS) and Montane Spruce (MS) biogeoclimatic zones define the upper Deadman River, the region of particular interest in this work. The predominant forest types in this area include (successional) lodgepole pine (*Pinus contorta* var. *latifolia*) and mixed pine and trembling aspen (*Populus tremuloides*) stands associated with valley slopes and low hills. Spruce (*Picea glauca x engelmannii*) occurs predominantly on riparian bands and wet sites. The understory vegetation consists of a high percentage of pinegrass (*Calamagrostis rubescens*), with birch-leafed spirea (*Spirea betulifolia)*, soopalallie (*Shepherdia canadensis*), twinflower (*Linnaea borealis*) and kinnikinnick (*Arctostaphylos uva-ursi*) also common. The eastern portion of the study area (above 1525 m on Porcupine Ridge) lies within the Engelmann spruce – Sub-alpine Fir zone (ESSF).

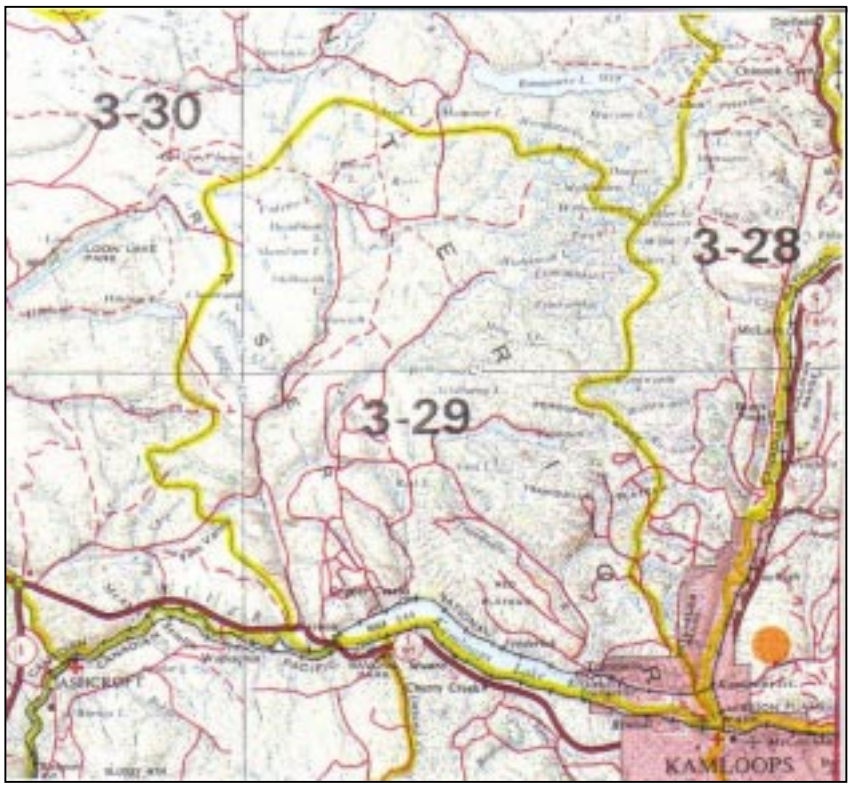

Figure 1. Study area map – Management Unit 3-29

3.0 METHODS

Aerial monitoring of the moose population was conducted using both helicopter (Bell 206) and fixed-wing aircraft (Cessna 182). The helicopter was equipped with one forward mounted Yagi 'H' (2 element) antenna, the fixed-wing with two (one forward-mounted and one mounted at 90° to the line of flight). A Telonics TR-2 receiver/scanner received input from these antennae. To obtain specific habitat and behavioural information, a 'visual' location of the animal was required; therefore, the helicopter was favoured due to its maneuverability and slower speeds. Fixed-wing flights were made to obtain general locations of radio-collared animals during less critical times of the year, i.e. animals established on summer ranges. During Year 2, the helicopter was used exclusively. Monitoring flights were flown on a bi-weekly basis (on average, weather dependent). Additional flights were attempted during periods of special interest, including the rut and the spring calving season.

The initial flight path chosen for each flight was random; when a signal was received from a radio-collared animal, the aircraft would systematically narrow the search until the animal was sighted (helicopter searches only). Once located and the pertinent habitat data recorded, the animal's collar frequency would be deleted from the receiver unit and scanning of additional frequencies would recommence as the flight continued in another random direction. During unproductive scanning intervals, visual surveying continued for uncollared animals.

For each location, a number of geographic and habitat characteristics were recorded, including a general map location (place name) and Global Positioning System (GPS) coordinates, elevation, aspect, and the general habitat type inhabited by the animal. In addition, more specific behavioural and habitat data such as activity engaged in by the animal at the time of sighting, proximity to other animals of the same or opposite sex, and estimated age of group members, vegetation types and canopy cover being utilized were noted. This information was recorded on a standardized data form (Appendix 1).

Location data were assigned to a particular period based on the date of the location. Seasonal divisions were determined through examination of previous location data and a review of the literature, indicating seasonal shifts in habitat use, as indicated below:

Winter locations: December 1 - March 31	Spring locations: April 1 - June 30
Summer locations: July 1 - September 15	Autumn locations: September 16 – November 30

Statistical comparisons of seasonal data were made using standard t-tests, analysis of variance, and chi-square analysis. Radio collared animal locations were plotted using the 'Calhome' home range software program (U.S. Forest Service, California Fish and Game Department) which output minimum convex polygons (100%) representing annual and seasonal home range sizes. Within each animal's annual home range, the availability of each specified habitat type was estimated from 1:30,000 scale range vegetation map coverage, using a grid overlay. It was assumed for the purpose of statistical analysis that all habitat within the home range was available to the animal. Use/availability analysis was performed using the Prefer (V 5.1) preference assessment software (Pankratz, 1994).

4.0 RESULTS

4.1 Seasonal Habitat Use

A total of 725 animal locations were recorded during 43 flights and 8 ground monitoring sessions between February 7, 1996 and January 13, 1998 (Appendix 2). Six hundred and nine (609) of these records were complete in all respects, i.e. all data parameters available and subject to analyses. A total of 244 locations (40% of the total locations) were recorded in coniferous forest stands. Two hundred and three (203) locations (33%) were noted in mixed coniferous/deciduous habitats, 131 (22%) in spruce meadow complexes, 28 (5%) in willow patches and 3 (<1%) in aquatic habitats (e.g. ponds, swamps) (Table 1 and Figure 2).

Table 1. Moose locations by habitat type

	Winter		Spring		Summer		Autumn			
	Locations	**%**	**Locations**	**%**	**Locations**	**%**	**Locations**	**%**	**Totals**	**% of total locations**
Coniferous	67	44	58	31	77	49	42	37	244	**40**
Mixed coniferous/deciduous	55	36	61	33	40	26	47	41	203	**33**
Spruce/sedge meadow	25	16	54	29	29	19	23	20	131	**22**
Willow	6	4	13	7	7	4	2	2	28	**5**
Aquatic	0	0	0	0	3	2	0	0	3	**<1**
Totals	**153**	**100**	**186**	**100**	**156**	**100**	**114**	**100**	**609**	**100**

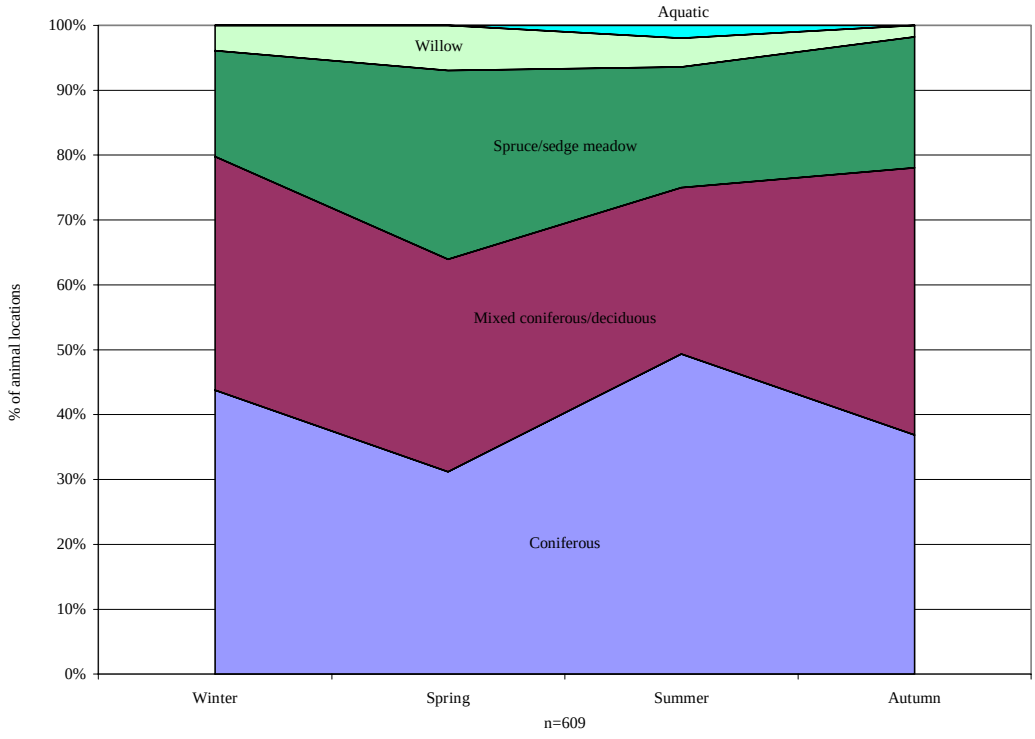

Figure 2. Seasonal habitat use patterns

Winter monitoring resulted in a total of 153 animal locations. Sixty-seven (44%) were recorded in coniferous habitats, 55 (36%) in mixed coniferous/deciduous stands, 25 (16%) in spruce/sedge meadows and 6 (4%) in riparian willow patches.

A total of 186 sightings were recorded during spring monitoring. Fifty-eight (31%) occurred in coniferous stands, 61 (33%) in mixedwood habitat, 54 (29%) in meadow complexes, and 13 (7%) in willow.

Particular attention was paid to cows during the periods immediately prior to and following parturition. Pregnant cows retreated to calving sites predominantly represented in spruce/sedge meadow and riparian willow habitats. The first calves were observed in late May. During the course of the study, 21 (64%) initial sightings of newborn calves (approximately 1 week old) were recorded in spruce/sedge meadows and 6 (14%) in riparian willow patches. These habitats continued to be used extensively by cows tending offspring throughout the spring (Figure 3).

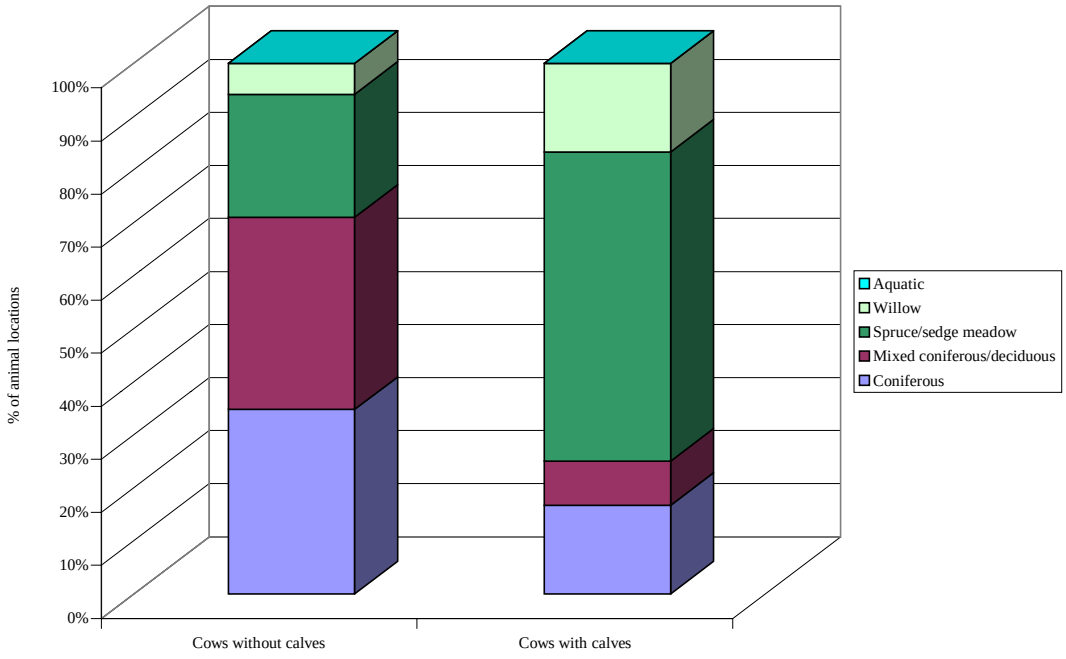

Figure 3. Spring habitat use by cow moose

Summer monitoring resulted in 156 animal locations. Coniferous habitats were represented in 77 (49%) of the total records. Mixed coniferous/deciduous forest was recorded in 40 instances (26%), meadow in 29 (18%), willow in 7 (4%) and 3 locations were noted in aquatic habitats, e.g. ponds or swamps.

One hundred and fourteen records contributed to the analyses of autumn habitats. The majority of these were noted in mixedwood and coniferous stands (47 and 42 records, respectively), representing 41% and 37% of the total. Sedge meadows appeared in 23 records (20%).

Monitoring intensity was increased during the period of the annual rut; over the course of two years, 19 bull/cow pairs and 7 bull/cow groups were observed, beginning in mid-September. From mid-September

through early October, 50% of sightings of breeding pairs were recorded in coniferous habitats and 50% in mixed coniferous/deciduous stands. Average canopy closure was 50% in the coniferous type, and 52% in the mixedwood forest. One group was observed during this period in a spruce/sedge meadow habitat, utilizing the spruce component (50% canopy cover). Seven pairs and 6 groups were sighted during the predicted second estrus in late October through to early November. Five of the 7 pairs (71%) were observed in meadow habit under 10% canopy cover in the spruce component, with one each of the remaining two occupying coniferous and mixed coniferous/deciduous stands, exhibiting 65% and 60% canopy cover, respectively. Four groups were located in regenerating coniferous cutblocks, with an average canopy closure of 26%, with the fifth group recorded in the mixedwood forest type (70% cover). Two additional bull/cow groups were located in mid-December, 1997. These groups were observed in cutblock habitats.

'Post-rut' bull aggregations were observed during late November through mid-December. One group of 5 immature bulls was located in mid-December 1996. A pair of bulls (1 adult, 1 immature) and a group of three adult males were observed in late November 1997. These locations were recorded in regenerating coniferous cutblocks (≈ 5 years post-harvest), with residual deciduous components present within the block.

Chi-square analyses revealed significant differences in the seasonal occurrence of observed and expected frequencies of locations in particular habitat types (Table 2). Observations in winter and autumn did not differ significantly from expected proportions in each habitat type (χ^2=3.645 and χ^2=5.084, respectively). During the summer months, coniferous habitats and aquatic habitats, e.g. ponds and swamps, were utilized significantly more than expected (χ^2=5.609, χ^2=6.490, respectively). Mixed coniferous/deciduous stands were occupied less frequently than expected during summer (χ^2=4.156). Meadow complexes were utilized significantly more in spring (χ^2=6.240), and coniferous habitats less than expected (χ^2=6.111).

Table 2. Observed and expected frequencies of animal locations

	Winter		**Spring**		**Summer**		**Autumn**	
	Observed	Expected	Observed	Expected	Observed	Expected	Observed	Expected
Coniferous	67	61.3	58	74.52*	77	62.5*	42	45.67
Mixed coniferous/deciduous	55	51	61	62	40	52*	47	38
Spruce/sedge meadow	25	32.91	54	40*	29	33.55	23	24.52
Willow	6	7	13	8.55	7	7.17	2	5.24
Aquatic	0	0.75	0	0.92	3	0.77*	0	0.56

* significant α=0.05

Use/availability analysis revealed an overall preference for the mixed coniferous/deciduous habitat type (Appendix 3). This type was preferred significantly over all other defined habitat categories (W=2.18). The available map coverage precluded a confident determination of seasonal habitat preferences.

Canopy cover use was found to vary significantly between seasons (F=2.30). The highest mean percentage cover was utilized during the rut (48%), the lowest, during winter. Canopy cover averaged 38% over the winter period (December 1 through March 31); however, the data were analyzed based on a temporal separation between early winter (early December through early February) and late winter (mid-February through late March) habitats. Significantly heavier cover was occupied during the late winter period (t=-2.28). Mean canopy cover use during these periods was 32% and 47%, respectively.

Seasonal shifts were apparent in elevational data. Occupation of the highest elevations was during the summer months, while lower elevations were utilized in winter. The mean elevations calculated for moose sightings were 1233 m, 1258 m, 1374 m and 1342 m for winter, spring, summer and autumn, respectively (Figure 4).

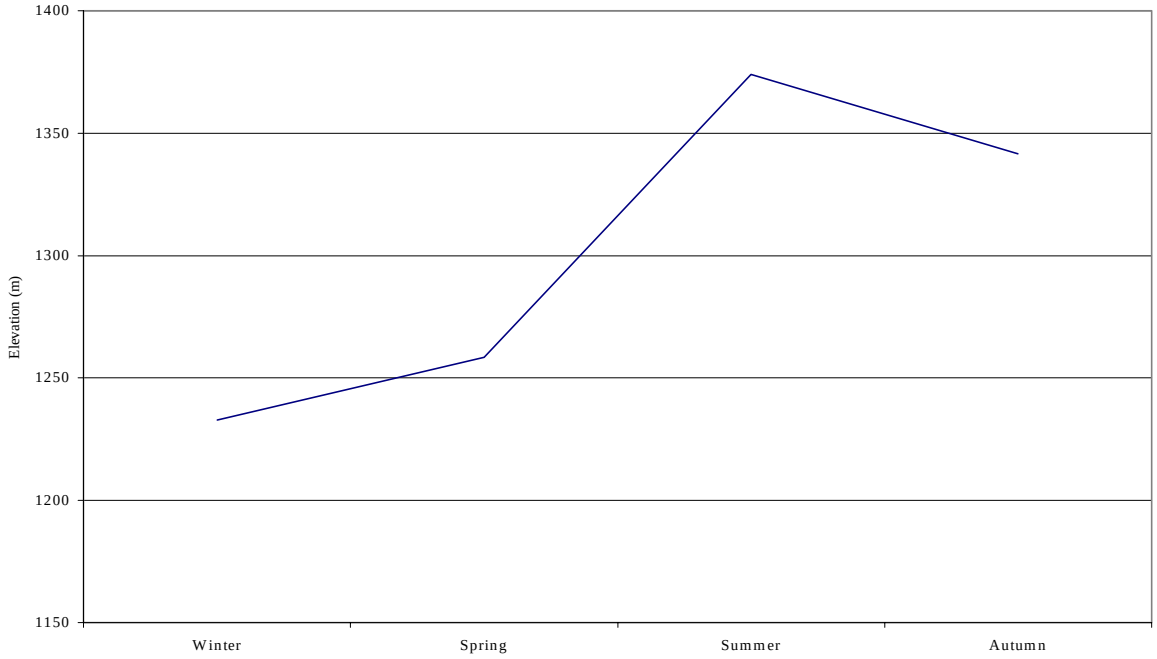

Figure 4. Mean elevations occupied by season

4.2 Sex Differences in Seasonal Habitat Use

Locations recorded for bull moose were predominantly in coniferous habitats, accounting for 109 of 208 total locations (52%). Mixed coniferous/deciduous stands were represented in 77 locations (37%). Twenty locations (11%) were in riparian willow patches and 2 sightings (<1%) of bull moose in spruce/sedge meadows were recorded. No locations were noted in aquatic habitats (Table 3 and Figure 5).

Table 3. Bull moose locations by habitat type

	Winter		Spring		Summer		Autumn			
	Locations	**%**	**Locations**	**%**	**Locations**	**%**	**Locations**	**%**	**Totals**	**% of total locations**
Coniferous	34	74	23	41	35	55	17	39	109	**52**
Mixed coniferous/deciduous	12	26	27	48	20	32	18	42	77	**37**
Spruce/sedge meadow	0	0	0	0	2	3	0	0	2	**<1**
Willow	0	0	6	11	6	10	8	19	20	**11**
Aquatic	0	0	0	0	0	0	0	0	0	**0**
Total Locations	**46**	**100**	**56**	**100**	**63**	**100**	**43**	**100**	**208**	**100**

Cow moose were observed most frequently in coniferous habitats: 124 (36%) locations were noted in these stands. Mixed coniferous/deciduous types were represented in 108 (31%) records. Riparian willow accounted for 49 (18%) and meadow complexes 64 (14%) of the total locations. Three (<1%) sightings were recorded in aquatic habitats (Table 4; Figure 5).

Table 4. Cow moose locations by habitat type

	Winter		Spring		Summer		Autumn			
	Locations	**%**	**Locations**	**%**	**Locations**	**%**	**Locations**	**%**	**Totals**	**% of total locations**
Coniferous	26	31	32	30	42	46	24	36	124	**36**
Mixed coniferous/deciduous	32	39	28	26	20	22	28	43	108	**31**
Spruce/sedge meadow	4	5	10	9	23	25	12	18	49	**14**
Willow	21	25	37	35	4	4	2	3	64	**18**
Aquatic	0	0	0	0	3	3	0	0	3	**<1**
Total Locations	**83**	**100**	**107**	**100**	**92**	**100**	**66**	**100**	**348**	**100**

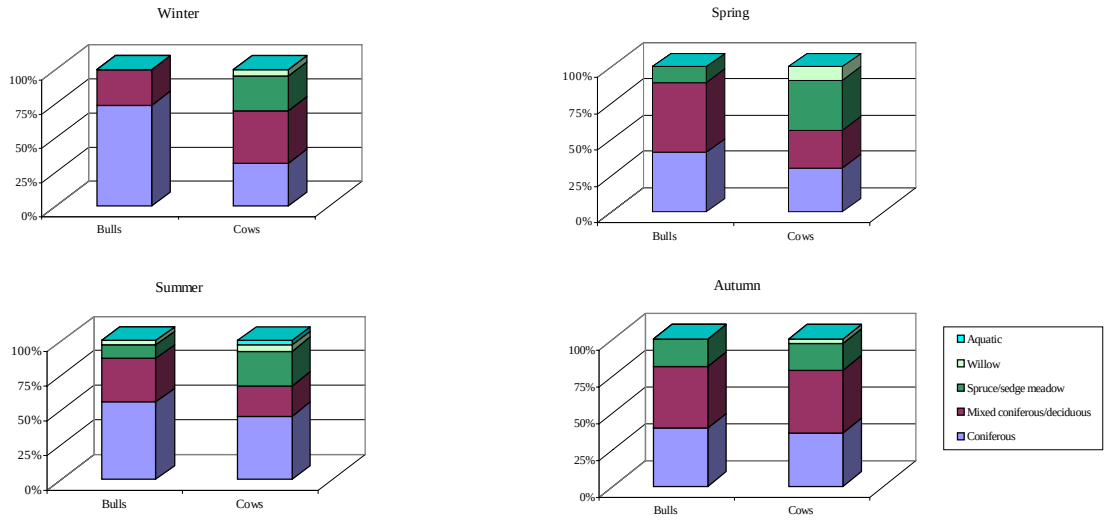

Figure 5. Sex differences in seasonal habitat use

4.3 Local Seasonal Habitats and Migratory Routes

Based on data from 2 years of monitoring under this project, in addition to locations collected since 1991 by B.C. Environment wildlife staff, some patterns of seasonal habitat use for the Deadman River/Criss Creek moose population are apparent. Critical winter habitats appear to be concentrated in the upper Deadman River valley (east from Vidette Lake to Tuleric Lake and north from Fatox Lake to Uren Lake). Incidental

sightings of animals in the lower Deadman Valley, near Snohoosh and Mowich Lakes indicate that this area may also represent important wintering habitat. Winter locations have been prevalent in Criss Creek (north of Heller Creek to Tsintsunko Creek). Spring locations are represented, generally, in a pattern east of wintering grounds, toward Doughnut Lake in the upper Deadman and Beaverhut Lake in Criss Creek. Summer and autumn locations have been recorded at Eagan and Sharpe Lakes, north-west of Bonaparte Lake, and east in the higher elevation Tsintsunko Creek/Porcupine Ridge areas.

These seasonal movement patterns appear to be more pronounced in the Criss Creek area, with a distinct separation of seasonal locations apparent. Only one of seven radio-collared cows remained faithfully in Criss Creek year-round, with no marked bulls behaving as residents in this area. The upper Deadman River valley has been established as an important year-round residence for moose. Sightings of animals have been recorded in this area during all seasons. Three of four radio-collared cows were located in this area on each monitoring flight, regardless of time of year (see home range information below). Two of eight radio-collared bulls appear to utilize this area on a year-round basis; one mature bull (approximately 7 years of age) and a younger bull (3-4 years old). One mature bull in the Heller Creek area was also determined to be a resident animal. Jamieson Creek, on the eastern edge of the study area, has also been identified as year-round habitat (see study area map, Figure 1 above).

From these patterns of seasonal habitat use, it is possible to determine the most likely migration corridors between winter and summer ranges. The upper Deadman population appears to use a route north through Joe Ross Creek for access between winter and summer ranges. Those animals utilizing the Tsintsunko Creek/Porcupine Ridge areas as summer range appear to travel southeast up the river towards Doughnut Lake and beyond. From Criss Creek, moose travel eastward through the Beaverhut Lake area and onto summer ranges on Porcupine Ridge.

4.3.1 Home Ranges

Home range sizes of radio collared animals in the present study ranged from a maximum of 235 km^2 to a minimum of 11 km^2 (Appendix 4). The mean annual home range for bulls was 67 km^2, while the mean for cows was 72 km^2. As expected, resident animals' annual and seasonal ranges were considerably smaller than those of migratory individuals. The mean annual home range sizes for resident and migratory bulls were 37 km^2 and 90 km^2, respectively. The mean home range size for cow moose identified as nonmigratory was 28 km^2, while the average for migratory cows was considerably larger, at 140 km^2. Seasonal home ranges varied from a mean of 16 km^2 in autumn to 29 km^2 in spring.

5.0 DISCUSSION

5.1 Seasonal Habitats

5.1.1 Winter

Winter habitat is generally thought to be of critical importance to the overall health of moose populations. A negative energy balance between forage intake and energy expended on metabolism, thermoregulation and locomotion lead moose to minimize daily movement during winter and utilize readily available food items, including leaf litter and dense patches of riparian willow (Renecker and Hudson 1992; Pierce and Peek 1984; Thompson and Vukelich 1981; Gillingham and Klein 1992). Mixedwood stands provide quality forage at this time of year in the form of aspen leaf litter, which remains up to 60% digestible (Renecker and Hudson 1988). Renecker and Hudson (1992) reported that willow and leaf litter comprised 73% and 79% of the daily intake of moose in their study in central Alberta during the months of December and February, respectively. Tracks and 'pawing' activity in areas of shallow snow were noted in January within these stands in the upper Deadman River valley, indicating that animals may have been accessing leaf litter at this time. Risenhoover (1989) reported that willow accounted for >94% of the biomass consumed by radio-collared moose in Denali National Park and Preserve, Alaska. Animals in this study utilized the extensive riparian willow complexes more frequently during the late winter and early spring than at any other time of year. Bark stripping from fallen and standing aspen was evident in mixed aspen/pine stands in the upper Deadman (Figures 6 & 7). Good bark digestibility and a shortage of other available forage are thought to be responsible for bark stripping behaviour (Baker et al 1975; Renecker and Hudson 1985; Miquelle and Van Ballenberghe 1989).

Figure 6. Evidence of aspen bark stripping in the upper Deadman River valley

The present study, among many others (reviewed by Peek 1997), observed that moose tend to shift their activity to dense coniferous cover in late winter. The reasons for this shift may include escape from mobility restricting snow depths (Thompson and Vukelich 1981; Telfer 1970; Peek 1971b), and relief from thermal extremes (Schwab and Pitt 1991). Other explanations proposed have been predator avoidance, learned behavioural patterns and human disturbance (reviewed in Sopuck, Ovaska and Jakimchuk 1997). These studies suggest that the spatial relationship between forage and shelter in late winter can be a critical and possibly limiting characteristic of moose habitat (reviewed by Thompson and Stewart 1997). Because energy expenditures in winter may be greater than intake, the availability of forage within or very near to coniferous cover, which provides snow interception, protection from weather and security from predators and disturbance, may determine survival.

With respect to human activities occurring on identified moose winter range, it is imperative that disturbance be minimized during this critical period. Human disturbance, whether through forest development operations or recreational activities, may lead to altered behaviour which can negatively impact an animals' ability to forage effectively. Main haul roads on or adjacent to identified moose winter ranges, should be located to minimize the extent of open road required to complete operations. Vehicular access following harvest on or near these sites must be eliminated through permanent road deactivation or, where silvicultural obligations are outstanding, the placement of effective road blockages. The integrity of important habitat features, such as riparian willow complexes, should be preserved through the retention and/or creation of adequate coniferous buffer zones. These buffers will provide adequate screening and escape cover to foraging moose if conifers are of adequate height and crown closure to preserve the thermal and snow-interception cover values within these zones. This study suggests a minimum 50% crown closure, overall, is required. Crown closure in buffer zones should be higher, possibly 60 – 80%. Winter activities, such as snowmobiling and cross-country skiing, should be discouraged within identified moose winter habitats.

The importance of the mixed coniferous/deciduous forest type is magnified during the winter months, when other sources of forage are of poor quality or are no longer available (see above). To retain the value of these sites as foraging habitat following timber harvest, cover values within and adjacent to these stands must be maintained. Patches of advanced coniferous regeneration within mixedwood blocks will provide immediate security cover for moose. The integrity of coniferous stands bordering the mixed type must be maintained to allow for secure travel corridors between these and other important foraging areas and as refuges from extreme weather conditions.

5.1.2 Calving

With the coming of spring, moose must replace fat and weight losses incurred by subsistence on low quality forage over the winter months. Cow moose in the late stages of pregnancy at this time are especially in need of high quality forage for fetal growth and lactation requirements. Wetland habitats are of particular importance with their flush of succulent, new vegetation. Altmann (1958, 1963a), in Wyoming, described

three characteristics of typical moose calving sites– secluded shelter, available browse and close proximity to water. Peterson (1955), Edwards (1983), Stephens and Peterson (1984) and Cederlund et al. (1987) also suggest that cow moose select sites to avoid detection of calves during and immediately following birth. Jackson et al. (1991) in a review of the literature, concluded that isolated stands of timber in bogs or clearcuts, or on islands or peninsulas in lakes, are preferred sites. Calving sites in the present study included riparian willow habitats, spruce/sedge meadows and wetlands (Figures 7, 8 & 9). These sites provide adequate security cover and abundant forage for the cow (Langley and Pletscher 1994), as well as access to water.

The importance of riparian and wetland sites to cow moose throughout the year, and particularly during and immediately following parturition, must be addressed when timber harvest prescriptions are developed. Thermal and, more importantly, security cover, surrounding these areas can be provided for by the retention of a coniferous buffer zone as described above. Where spruce borders wetland habitats, harvesting should only occur only where there are significant forest health concerns. Spruce stands, because of their structure (dense, low branch growth) provide excellent security cover.

Later in spring, mixedwood stands become important foraging areas for cows attending young offspring. Aspen bark stripping is common among females when their movements are restricted by newborn calves (Miquelle & Van Ballenberghe 1989). Ground surveys conducted in the upper Deadman River valley in June and July revealed evidence of spring bark stripping from fallen and standing aspen.

Figure 7. Riparian willow calving habitat – upper Deadman River

Figure 8. Spruce/sedge meadow calving habitat – Criss Creek

Figure 9. Wetland calving habitat – Tsintsunko Creek

5.1.3 Summer

During summer, most habitats can fulfill nutrient demands. However, Renecker and Hudson (1992) found that use of meadow and willow habitats by moose increased, whereas use of forested habitats for foraging declined, in their study in central Alberta. Wet meadows and willow patches are used as bedding sites as well, as they provide cool water and access to breezes that may relieve thermal stress and insect annoyance. The moose population in the upper Deadman River valley and Criss Creek areas appeared to increase their use of aquatic habitats during the summer months, but their use of large riparian willow complexes dropped off following late spring. This may be a result of the availability of a variety of quality browse species within the adjacent mixed coniferous/deciduous forest, where more cover was available. Canopy cover in these stands delays plant development, thereby providing more palatable forage than other, more open, sites (Peek 1997). Dense coniferous stands increase in importance at this time of year, as they provide shelter from heat and predation pressures, especially for cows with young calves (reviewed in Timmermann and McNicol 1988).

The continued importance of wetland habitats requires preservation of coniferous buffer zones surrounding these sites for visual screening (security) and thermal cover. Additionally, continuous coniferous corridors must be maintained between these sites to ensure moose may travel in security and find relief from extreme summer temperatures. As during other seasons, the mixedwood forest type is utilized extensively for foraging. The maintenance of cover values within and adjacent to these stands will ensure their continued value for moose.

5.1.4 Autumn and the Rut

The mixed coniferous/deciduous forest type is especially important for providing abundant forage in preparation for the coming of the difficult environmental conditions of winter. As suggested above, mixedwood stands provide readily digestible forage due to the delayed plant phenology beneath the canopy. In addition, aspen leaf matter and bark retain their digestibility during this period, when twig digestibility falls (Renecker and Hudson 1988). One direct observation of a cow stripping and consuming bark from a fallen aspen was recorded during late October of 1997. Quality forage allows cows to recover from the demands of lactation and to build an adequate store of fat, and permits calves to attain maximum weight and condition before winter. Bulls must also attain peak condition prior to the rut by building fat reserves. These stands provide excellent security cover in the advanced coniferous regeneration component, of increased importance when animals attempt to elude recreational hunters. Coniferous stands also provide security from detection, and alleviate any effects of temperature extremes.

Currently there is a lack of substantive information describing preferred rutting habitats for moose in British Columbia. Costain (1989) reported habitat characteristics on four rutting sites in Montana were variable, but all exhibited some degree of security cover. Peek (1997) suggested that open habitats are used during this period. The present study has recorded observations of 28 breeding groups, with a variety of habitat types represented. Regenerating cutovers, mixedwood stands with 50-70% canopy cover and spruce/sedge

meadow habitats with little cover value were all represented. A local guide outfitter has observed the use of regenerating cutblocks and coniferous stands during the rutting period. Pair and group sightings recorded during the second estrus in late October/early November suggest a possible trend toward use of more open, wetland type habitats. In general, it does not appear that specific habitat characteristics are selected for during the breeding period. However, more information relating to habitat utilization during this critical time is needed in order to determine whether certain attributes are in fact critical to breeding animals.

5.2 Migratory Behaviour and Seasonal Home Ranges

The traditional view of migratory behaviour is that it has evolved as an adaptive strategy to minimize the deleterious effects on food resources that are limited seasonally (Baker 1978). The typical pattern of migration observed in moose populations is movement between a common winter range and distinct summer ranges. Moose generally move between seasonal ranges in response to the accumulation of snow (Coady 1974a). Sinclair (1983) suggested that migration, in addition to a response to snow accumulation, might be a mechanism for placing an animal in an area with an abundance of high quality food before mating.

Weather conditions can affect the timing of migratory movements. Several researchers (Houston 1968, Van Ballenberghe 1977, Ballard et al. 1991) have reported that traditionally migratory populations have not migrated or delayed movement to winter range in a year of little or no snowfall. Movement patterns of the migratory segment of the upper Deadman River/Criss Creek moose population follow this typical sequence, with animals escaping mobility restricting snow depths and unavailable forage of higher elevation summer ranges on the Bonaparte Plateau and Porcupine Ridge for the lower elevation, mixedwood stands and extensive riparian willow complexes of the upper Deadman River valley and Criss Creek. Migratory routes and the tendency to migrate are traditional in moose. Migratory moose tend to use the same routes year after year, and seasonal range fidelity is often prevalent (particularly in established populations). A study in Norway presented archaeological evidence that a migration route had been used by moose for at least 5,000 years, despite habitat deterioration (Anderson 1991b). Migratory moose in central Sweden were found to inhabit traditional winter ranges during years and in areas of varying population density, snow conditions and browse damage (Sweanor and Sandegren 1989). Over the past 7 years, some radio-collared animals observed in this study and previous monitoring work, have consistently returned to the same general seasonal areas (D. Jury, pers. comm.). Due to budgetary constraints, monitoring frequencies did not allow for the precise identification of individual migratory routes. However, a compilation of 7 years of location data for some of the study animals indicates the existence of traditionally utilized travel corridors.

Moose must benefit from migration and, if snow depths and availability of forage are uniform over an area, migratory behaviour will not be prevalent. The nonmigratory segment of the Deadman River/Criss Creek moose population apparently satisfies all its seasonal habitat requirements within the local riparian and adjacent habitats.

5.2.1 Home Range Size

Great variation in home range size has been reported in the literature (reviewed in Hundertmark 1997). In northwestern Alaska, annual home range sizes exceeded 259 km^2 (Grauvogel 1984). Estimates of annual home range size in northwestern Minnesota, by contrast, were no greater than 3.6 km^2 (Phillips et al. 1973). Because of such variability, external factors such as sex and age of the animal, season, habitat quality and weather conditions have been implicated in the determination of moose home range size. When differences in home range size are attributed to sex, bull moose generally occupy larger areas (Ballard et al. 1991). In the present study, however, the mean annual home range size for cow moose was larger than that of bulls. A plausible explanation for this apparently contradictory result stems from the limited sample of radio collared animals. Sufficient location data (>20 location points) from 12 cows were used to calculate home range sizes. The large annual home range estimates for one of these animals (a migratory cow with a calculated home range of 235 km^2) was responsible for skewing the mean to a value greater than the average male home range size. With this individual removed from the calculation, the mean home range size area for cows dropped below that of the radio collared bulls.

The juxtaposition of habitats types within the study area presents another possible explanation for this contrary finding. Habitat utilization data from this study indicate that cow moose prefer high quality forage areas in greater proportion than do males, at all times of year. In order to access these sites, within a matrix of other unsuitable or undesirable habitats, females may be forced to travel longer distances (Ballard et al. 1991). Another interesting possibility described by Ballard et al. (1980) is related to predator avoidance strategies. These researchers were interested in determining the effect of bear densities on the behaviour of cow/calf pairs during the first 2 months following birth of the calf. Brown bears were translocated out of the study area in south-central Alaska, after which the home ranges of cow/calf pairs were significantly smaller than when the bears were present. Local ranchers and a trapper in the Deadman River and Criss Creek valleys have reported an increase in the wolf population in the area over the past 2 years, and both the cougar and black bear populations are reported to be healthy. The increase in wolf pack activity may explain, in part, the larger mean home range size of females in this study.

6.0 RECOMMENDATIONS – A REVIEW

The fact that aspen suckers regenerate so rapidly following disturbance, such as fire or logging, offers a unique opportunity to enhance the value of deciduous and mixedwood stands to moose. The production of aspen suckers and understory biomass peaks approximately 5 years following disturbance, and moose browse production may continue for an additional 15 years (reviewed by Timmerman 1991). However, in order for animals to utilize this enhanced forage source, other critical habitat characteristics must be preserved. Retention of advanced coniferous regeneration within the blocks will provide immediate visual cover for moose during foraging bouts. Limiting block size to no greater than 10 hectares will minimize the distance to adjacent coniferous stands, which serve as important thermal cover and travel corridors between foraging sites. Where development plans call for the harvesting of adjacent stands, timing must allow for

adequate green-up in previous cutovers to maintain adequate security cover values. A 5-meter green-up adjacent to high value moose foraging areas is recommended. Researchers in Saskatchewan (TAEM 1988) recommended that a rotation age of 40-50 years in mixed aspen stands would maximize the benefits of forage and cover. This work also suggested that maintenance of one-third to one-half of the planning area in stands less than 20 years of age would result in the maximum forage benefits to moose.

Critical habitat features, as identified in the present study, as elsewhere, include wetland, meadow and riparian willow complexes. Moose utilizing these important foraging areas must be protected from disturbance at all times, but particularly during calving season and the winter months. Extensive coniferous buffer zones must border any identified high value sites. Cutblocks within these buffer zones should open a maximum of 25% of the wetland/riparian edge in a single pass (Figures 10 & 11). Excessive harvest and the accompanying human disturbance around these areas may result in decreased utilization or abandonment of these critical sites.

Figure 10. Inadequate cover bordering one complete side of wetland complex – Tsintsunko Creek

Figure 11. Inadequate cover bordering riparian complex – Criss Creek

Human disturbance related to forest development operations or recreational activities can lead to altered behaviour which can negatively impact the ability of moose to forage and breed effectively. The long-term impacts of increased access on important moose ranges because of timber harvesting can be limited through thoughtful access planning and management. Minimizing the extent of open road required for harvest and silviculture activities, locating main haul roads strategically, minimizing road standards and rehabilitating or blocking roads which are no longer needed once all operational requirements are met, will all help to minimize disturbance.

The impact of domestic livestock grazing on recently harvested blocks has been documented in the upper Deadman River valley. Removal of overstory vegetation increases forage production within the block, with a concomitant increase in use by cattle, if access is unrestricted. This situation is problematic for the local moose population, especially in mixedwood stands. Following harvest, aspen suckering accelerates, along with increased production in shrubby growth. These forage species are preferred by moose and cattle, particularly in areas where seasonally unpalatable grasses represent the bulk of ground cover. The status of aspen regeneration in recently clearcut mixedwood blocks near Rail Lake, in south-central B.C. was assessed. Where cattle have been permitted to graze, aspen suckers were struggling to maintain a foothold in their third growing season (Figures 12 & 13). Evidence of wild ungulate browsing was evident in these blocks as well; however, examination of twig browsing patterns indicated that the majority of damage was a result of livestock grazing. Remedial options include pushing livestock through newly harvested blocks quickly, allowing limited grazing only on road and trailsides, and/or the construction of cattle exclosures to permit the establishment of aspen regrowth to a point where cattle may shift their preference to other, more accessible species. Practices which have historically attracted livestock to cutblocks, such as salting in or near blocks and the seeding of grass on roads and landings, should be discouraged. Currently, the Ministry

of Forests is proposing experimental cattle and cattle/moose exclosure fencing on a number of mixedwood blocks scheduled for harvest in the upper Deadman area. Results from these trials will increase resource managers' understanding of the impacts of both domestic livestock and wildlife foraging on deciduous growth in newly harvested stands.

Figure 12. Mixedwood cutblock near Rail Lake, B.C. – under cattle grazing pressure

Figure 13. Mixedwood cutblock near Rail Lake, B.C. – little or no livestock grazing pressure

7.0 CONCLUSION AND FUTURE RESEARCH

Habitat use by the Deadman River/Criss Creek moose population is characterized by a focus on riparian willow forage during the critical winter months, a marked increase in the use of wetland complexes as the search for quality forage begins in spring and early summer, and extensive use of dense coniferous stands in summer and winter, as the animals seek shelter from environmental extremes. The utilization of the mixed coniferous/deciduous forest type remains significant all year, as these stands are comprised of a matrix of good cover and adequate forage.

The harvesting of mixedwood forests in this area, skillfully managed, can maintain, and even increase the value of these stands to the moose population. Age class and species diversity on these blocks may be increased with the removal of mature aspen stands. However, in order for moose to utilize any enhanced forage source, other critical habitat characteristics must be preserved. These important features include patches of advanced coniferous regeneration within mixedwood blocks, which will provide security cover adjacent to foraging sites, and contiguous coniferous stands bordering these blocks, to allow for unrestricted travel and adequate security and thermal cover. A carefully planned spatial and temporal harvest strategy can lead to enhanced moose habitat by increasing available forage and maintaining critical cover values. In fact, with integrated resource management at both the stand and landscape levels, biodiversity values in these forests can be increased.

An effectively managed access plan on important seasonal moose ranges is key to maintaining sustainable populations. Excessive harvest and abandonment of suitable habitat can result from uncontrolled vehicular access and the accompanying human disturbance.

The management prescriptions presented here, like others proposed for the maintenance and/or enhancement of the aspen and aspen/conifer forest types, have not been tested extensively in the field (Timmerman, 1991). Further research will determine which strategies are effective in achieving both commercial forest productivity and biodiversity objectives.

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APPENDIX 1. Deadman River Moose Habitat Study Survey Data Form

APPENDIX 2. Upper Deadman River Moose Habitat Study Survey Data

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
1	07/02/1996	HIGH CLOUD	G	1213	X	UPPER CRISS CR.	SIG	1160			P				WEAK SIGNAL
2	10/02/1996	CLEAR	G	1325	D	S X-J	SIG	1160			W	95		70	
3	10/02/1996	CLEAR	G	1335	S	S X-J	SIG	1160			W	95		70	
4	10/02/1996	CLEAR	G	1430	UNK F	N X-J	VIS	1160			W	0			
5	10/02/1996	CLEAR	G	1435	UNK M	N X-J	VIS	1160			W	0			
6	10/02/1996	CLEAR	G	1435	UNK	N X-J	VIS	1160			W	75			
7	10/02/1996	CLEAR	G	1435	UNK	N X-J	VIS	1160			FD/AT	75			
8	10/02/1996	CLEAR	G	1645	UNK F	S END OF SNOHOOSH LK.	VIS	850	E		FD/AT	60		40	
9	04/03/1996	CLEAR	A	1055	AA		VIS				AT				
10	04/03/1996	CLEAR	A	1119	BB		VIS				P/FD/AT				
11	04/03/1996	CLEAR	A	1119	Z		VIS				P/AT				
12	04/03/1996	CLEAR	A	1119	DD		VIS				P/S				
13	04/03/1996	CLEAR	A	1150	CC		VIS				S	80			
14	04/03/1996	CLEAR	A	1201	EE		VIS				P	70			
15	04/03/1996	CLEAR	A	1201	GG		SIG				FD/S/P				
16	04/03/1996	CLEAR	A	1235	FF		VIS				P				
17	12/03/1996	RAIN/SNOW	G	1030	O	CRISS CR.	VIS	1160			S/AT	60		45	
18	12/03/1996	RAIN/SNOW	G	1100	X	CRISS CR.	VIS	1190			W/AT/S			45	
19	14/03/1996	CLEAR	A	1000	A	RED LAKE	SIG	1190			FD/AT				
20	14/03/1996	CLEAR	A	1016	R	S OF JULES LAKE	VIS	1250			AT/S				
21	14/03/1996	CLEAR	A	1030	EE	CRISS CR. S OF FINGER	VIS	1125			S/FD/P				
22	14/03/1996	CLEAR	A	1047	O	SW OF KULTOX LAKE	VIS	1160			FD/S				
23	14/03/1996	CLEAR	A	1055	X	E CRISS	VIS	1160			AT/FD				
24	14/03/1996	CLEAR	A	1103	I		VIS	1220			FD/S				WITH YEARLING CALF
25	14/03/1996	CLEAR	A	1118	C		VIS	1190			P				
26	14/03/1996	CLEAR	A	1136	Z	NE OF FATOX LAKE	VIS	1125			AT				
27	14/03/1996	CLEAR	A	1138	D	X-J	VIS	1160			AT/P				
28	14/03/1996	CLEAR	A	1142	U	X-J	VIS	1160			AT				
29	14/03/1996	CLEAR	A	1220	S	NW OF SEMLIN LAKE	VIS	1190			AT				
30	14/03/1996	CLEAR	A	1306	T	CRISS CR.	VIS	1280			AT/P/FD				
31	14/03/1996	CLEAR	A	1334	E	WILLOWGROUSE	VIS	1525			S				MORTALITY
32	19/03/1996	CLEAR	G	1030	AA	X-J	VIS	1160			W/AT/FD				
33	21/03/1996	CLEAR	A	917	F	S CRISS	VIS	1250			AT/S/P				
34	21/03/1996	CLEAR	A	945	W	JOE ROSS	VIS	1250			P				
35	21/03/1996	CLEAR	A	1007	K	N JOE ROSS	VIS	1370			P				WEAK SIGNAL
36	10/04/1996	CLOUD	G	1018	Z	X-J	SIG	1160	N		P/AT			0	
37	10/04/1996	CLOUD	G	1018	D	X-J	SIG	1160	N		P/AT			0	
38	10/04/1996	CLOUD	G	1018	BB	X-J	SIG	1160			W			0	
39	10/04/1996	CLOUD	G	1018	U	X-J	SIG	1160	E		W/P/AT			0	.734 BETTER SIGNAL
40	11/04/1996	OVERCAST/LIGHT RAIN	A	905	A	E OF RED LAKE	VIS	1190	N		P/AT	80		0	
41	11/04/1996	OVERCAST/LIGHT RAIN	A	925	EE	CRISS SE OF FINGER	SIG	1100			P/AT	75		0	
42	11/04/1996	OVERCAST/LIGHT RAIN	A	944	UNK	MEADOWS E OF LILY	VIS	1310			P	75		0	
43	11/04/1996	OVERCAST/LIGHT RAIN	A	944	UNK	MEADOWS E OF LILY	SIG	1310			P	75		0	
44	11/04/1996	OVERCAST/LIGHT RAIN	A	955	DD	MEADOWS E OF LILY	VIS	1310			P	65		0	
45	11/04/1996	OVERCAST/LIGHT RAIN	A	1000	I	MEADOW SE OF LILY	VIS	1310			P/AT	50		0	WITH YEARLING CALF; WEAK SIGNAL
46	11/04/1996	OVERCAST/LIGHT RAIN	A	1031	GG	NW OF BEAVERHUT LAKE	VIS	1430	N		P/AT	80		0	
47	11/04/1996	OVERCAST/LIGHT RAIN	A	1040	O	MEADOW W OF BEAVERHUT	VIS	1465			P/AT	50		0	
48	11/04/1996	OVERCAST/LIGHT RAIN	A	1050	X	MEADOW E OF LILY	VIS	1310	E		P/AT	50		0	
49	11/04/1996	OVERCAST/LIGHT RAIN	A	1058	D	UPPER DMC E OF CONFLUENCE	VIS	1190	N		AT/P	20		0	
50	11/04/1996	OVERCAST/LIGHT RAIN	A	1105	Z	DMC S OF LOOP	VIS	1160	N		AT/P	30		0	
51	11/04/1996	OVERCAST/LIGHT RAIN	A	1117	S	SW OF UREN LAKE	VIS	1190	N		P/AT	30		0	WITH YEARLING CALF
52	11/04/1996	OVERCAST/LIGHT RAIN	A	1233	AA	SE OF UREN LAKE	VIS	1190	N		P/AT	50		0	
53	11/04/1996	OVERCAST/LIGHT RAIN	A	1238	UNK	SW X-J	VIS	1160			W	50		0	
54	11/04/1996	OVERCAST/LIGHT RAIN	A	1238	UNK	SW X-J	VIS	1160			P/AT	50		0	COW WITH YEARLING CALF
55	11/04/1996	OVERCAST/LIGHT RAIN	A	1240	N?	E OF FATOX LAKE	VIS	1160			P/AT	65		0	COW WITH YEARLING CALF
56	11/04/1996	OVERCAST/LIGHT RAIN	A	1242	BB	E OF FATOX LAKE	VIS	1160			AT/P	50		0	
57	11/04/1996	OVERCAST/LIGHT RAIN	A	1256	U	E OF FATOX LAKE	SIG	1160			P/AT/FD	70		0	WEAK SIGNAL
58	11/04/1996	OVERCAST/LIGHT RAIN	A	1312	FF	W OF LILY LAKE	VIS	1250			P/AT	60		0	
59	11/04/1996	OVERCAST/LIGHT RAIN	A	1340	R	SE OF JULES LAKE	VIS	1160	N		P	95		0	INJURED RIGHT FRONT LEG
60	15/04/1996	OVERCAST	A	100	W	SHARPE LAKE	SIG		S		P/AT	80			
61	15/04/1996	OVERCAST	A	1006	Y	NW END OF EAGAN LAKE	SIG		E		P/AT	80			
62	15/04/1996	OVERCAST	A	1040	CC	W OF TULERIC LAKE	SIG	1250	E		P	75			
63	15/04/1996	OVERCAST	A	1050	T	N CRISS CR. E OF LILY	SIG	1340			P/AT	80			WEAK SIGNAL
64	15/04/1996	OVERCAST	A	1050	C	N CRISS CR. E OF LILY	SIG	1340			P/AT	80			
65	15/04/1996	OVERCAST	A	1100	F	GISBORNE LAKE	SIG	1310			P/AT	55			
66	15/04/1996	OVERCAST	A	1110	K	E OF HAMMER LAKE	SIG	1340	N		P	75			
67	01/05/1996	OVERCAST/SNOW	G	1800	R	N JULES LAKE	VIS	1160	S		P	95		4	MOBILE BUT BLEEDING; FEEDING INDICATED BY FRESH SCAT
68	08/05/1996	CLOUD	A	1345	F	SW OF GISBORNE LAKE	SIG	1250	N		P/AT	50			
69	08/05/1996	CLOUD	A	1350	R	NE JULES LAKE	SIG	1160	S		P	85			

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
70	08/05/1996	CLOUD	A	1355	EE	SHOVEL' LAKE	SIG	1250			P/AT	50			
71	08/05/1996	CLOUD	A	1402	BB	LILY LAKE	SIG	1300			P	60			
72	08/05/1996	CLOUD	A	1404	S	SHOVEL' LAKE	SIG	1250			P/AT	50			
73	08/05/1996	CLOUD	A	1405	Z	SHOVEL' LAKE	SIG	1250			P/AT	50			
74	08/05/1996	CLOUD	A	1406	I	S OF FATOX LAKE	VIS	1160			AT	40			
75	08/05/1996	CLOUD	A	1409	O	LILY LAKE	SIG	1310			P	60			
76	08/05/1996	CLOUD	A	1411	T	SE X-J	SIG	1160	S		P/AT	40			
77	08/05/1996	CLOUD	A	1413	AA	DMC NW OF LOOP	SIG	1160	S		P/AT	65			
78	08/05/1996	CLOUD	A	1416	W	SW OF UREN LAKE	SIG	1190			P	75			
79	08/05/1996	CLOUD	A	1441	DD	SW OF MOOSE LAKE	SIG	1400			P	85			
80	08/05/1996	CLOUD	A	1443	D	DOUGHNUT LAKE E	SIG	1430	N		P	35			
81	08/05/1996	CLOUD	A	1445	CC	SW OF STADIA	SIG	1430	N		P	30			
82	08/05/1996	CLOUD	A	1445	C	DOUGHNUT LAKE S	SIG	1430	N		P	40			
83	08/05/1996	CLOUD	A	1447	X	CRISS KNOB	SIG	1280	S		P/AT	60			
84	08/05/1996	CLOUD	A	1449	FF	UPPER CRISS CR.	SIG	1280	S		AT/P	25			
85	08/05/1996	CLOUD	A	1450	GG	BEAVERHUT	SIG	1465	E		P	40			
86	08/05/1996	CLOUD	A	1513	A	RED LAKE AREA - E OF LITTER MINE	SIG	1190			P/AT	50			
87	21/05/1996	CLOUD	A	1343	R	N OF JULES LAKE	SIG	1280			P/SEDGE	80			
88	21/05/1996	CLOUD	A	1355	O	S OF KULTOX LAKE	VIS	1160			AT/P	60			NO CALF
89	21/05/1996	CLOUD	A	1421	DD	W OF DOUGHNUT	VIS	1370			P/SEDGE	0			NO CALF
90	21/05/1996	CLOUD	A	1445	Z	DMC S OF LOOP	VIS	1160	N		AT/P	5			NEW CALF
91	21/05/1996	CLOUD	A	1505	T	LARGE MEADOW W OF LILY	VIS	1250			SEDGE	2			NEW CALF
92	21/05/1996	CLOUD	A	1500	UNK F	LARGE MEADOW W OF LILY	VIS	1250			SEDGE	2			NEW CALF
93	21/05/1996	CLOUD	A	1520	S	DMC S OF LOOP	VIS	1160			P/AT	40			YEARLING CALF
94	21/05/1996	CLOUD	A	1536	CC	W OF HELLER BUTTE	VIS	1280	N		P	60			NO CALF
95	21/05/1996	CLOUD	A	1547	FF	E OF DOUGHNUT	VIS	1465	W		P	35			NO CALF
96	21/05/1996	CLOUD	A	1600	X	SW OF BEAVERHUT	SIG	1465			P	90			
97	29/05/1996	HIGH CLOUD	A	1350	FF	SW OF CRISS KNOB	VIS	1160	S		S/F/SEDGE	0			NO CALF
98	29/05/1996	HIGH CLOUD	A	1355	I	E OF KULTOX LAKE	VIS	1160			P/S/SEDGE	5			YEARLING CALF
99	29/05/1996	HIGH CLOUD	A	1405	CC	S OF HELLER BUTTE	VIS	1370			P/AT	70			
100	29/05/1996	HIGH CLOUD	A	1423	S	DMC E OF LOOP	VIS	1160			S/W/SEDGE	0			YEARLING CALF
101	29/05/1996	HIGH CLOUD	A	1420	UNK F	DMC E OF LOOP	VIS	1160			AT/P/F	10			NO CALF
102	29/05/1996	HIGH CLOUD	A	1435	R	S OF MEADOW W OF LILY	VIS	1250			W/SEDGE	0			NO CALF/WEIGHT ON LEG?/FEEDING IN WATER
103	29/05/1996	HIGH CLOUD	A	1450	W	W OF LASTCOURSE	VIS	1190	E		P/AT	60			NEW CALF-BRIGHT RED COLOURING
104	29/05/1996	HIGH CLOUD	A	1447	UNK F	W OF LASTCOURSE	VIS	1190			W/S/SEDGE	0			NEW CALF
105	29/05/1996	HIGH CLOUD	A	1510	X	SW OF BEAVERHUT	VIS	1495	W		P	80			NEW CALF
106	29/05/1996	HIGH CLOUD	A	1530	EE	W OF GISBORNE	VIS	1280			P	80			VERY NEW CALF/ BARELY STANDING/SUCKLING
107	07/06/1996	CLEAR	A	1338	UNK F	CRISS S PLATEAU	VIS	1370	N	M	P	0	F		
108	07/06/1996	CLEAR	A	1338	UNK F	CRISS S PLATEAU	VIS	1370	N	M	P	0	F		
109	07/06/1996	CLEAR	A	1400	GG	SW OF BEAVERHUT	SIG	1430	N	C	P/S	80			
110	07/06/1996	CLEAR	A	1419	UNK F	NW OF DOUGHNUT	VIS	1340		M	SEDGE	0	F		NEW CALF
111	07/06/1996	CLEAR	A	1419	UNK F	NW OF DOUGHNUT	VIS	1340		M	SEDGE	0	F		NEW CALF
112	07/06/1996	CLEAR	A	1430	DD	W SIDE OF DOUGHNUT	SIG	1430	W	C	P/S	75			
113	07/06/1996	CLEAR	A	1500	FF	CRISS KNOB	SIG	1250	S	C/D	AT/P	90			
114	07/06/1996	CLEAR	A	1523	S	DMC E OF LOOP	VIS	1160		C	S/P	75	F		YEARLING CALF
115	07/06/1996	CLEAR	A	1517	UNK M	CUTBLOCK E OF DMC LOOP	VIS	1160	S	C/D	S/AT	30	F		
116	07/06/1996	CLEAR	A	1517	UNK F	CUTBLOCK E OF DMC LOOP	VIS	1160	S	C/D	S/AT	30	F		
117	07/06/1996	CLEAR	A	1519	UNK	CUTBLOCK E OF DMC LOOP	VIS	1160	S	M	AT/SEDGE	0	F		
118	07/06/1996	CLEAR	A	1519	Z	SE X-J	VIS	1160	N	C/D	P/AT	50	B		NEW CALF
119	07/06/1996	CLEAR	A	1540	T	MEADOW W OF LILY	VIS	1280		M	S	0	F		NEW CALF
120	07/06/1996	CLEAR	A	1549	O	SW OF BEAVERHUT	VIS	1465	W	C	P	80	F		NEW CALF
121	07/06/1996	CLEAR	A	1555	X	SW CORNER OF BEAVERHUT	VIS	1495		M	S	0	F		NO CALF
122	07/06/1996	CLEAR	A	1604	R	SE OF KULTOX LAKE	SIG	1220	N	M	F	0			
123	07/06/1996	CLEAR	A	1605	EE	N OF GISBORNE	SIG	1250		C	P	60	T		
124	13/06/1996	HIGH OVERCAST	A	905	GG	SE OF BEAVERHUT	VIS	1428	E	C	S	50	T		NEW CALF
125	13/06/1996	HIGH OVERCAST	A	914	UNK	SW OF DOUGHNUT	VIS	1280		C	P	50	T		STANDING ON ROAD
126	13/06/1996	HIGH OVERCAST	A	916	FF	W OF DOUGHNUT	VIS	1280	E	C	P	30	T		KNOLL/NO CALF
127	13/06/1996	HIGH OVERCAST	A	925	CC	W OF HELLER BUTTE	VIS	1280	E	C	P/F	40	T		KNOLL SLOPE
128	13/06/1996	HIGH OVERCAST	A	926	UNK	W OF HELLER BUTTE	VIS	1280	E	C	P/F	40	T		POSSIBLY YEARLING CALF OF 'CC'
129	13/06/1996	HIGH OVERCAST	A	939	R	SE OF KULTOX LAKE	VIS	1130		M	S/SEDGE	65	B		NEW CALF/5-7 DAYS OLD
130	13/06/1996	HIGH OVERCAST	A	953	W	W OF LASTCOURSE	VIS	1160		M	S/SEDGE	0	F		COULDN'T SEE CALF/COW NOT MOVING FAR
131	13/06/1996	HIGH OVERCAST	A	1019	I	W OF TSINTSUNKO LAKE	VIS	1480	E	M	P	0	F		YEARLING CALF/FEEDING IN CUTBLOCK
132	13/06/1996	HIGH OVERCAST	A	1033	EE	CRISS SE OF FINGER	VIS	1130	W	C	P	60	T		CALF SEEMS TO BE GONE/BEAR IN AREA
133	13/06/1996	HIGH OVERCAST	A	1055	DD	SE OF DOUGHNUT	VIS	1430	E	C	P	30	T		NEW CALF/RUNNING WELL
134	13/06/1996	HIGH OVERCAST	A	1111	C	SW OF CRISS KNOB	VIS	1190	W	M	S/W	0	F		FEEDING ON BOG BIRCH
135	13/06/1996	HIGH OVERCAST	A	1133	A	WATCHING CREEK E	VIS	1550	E	C	P/S	10	T		SELECTIVE CUTBLOCK
136	02/07/1996	HIGH THIN CLOUD	A	932	DD	SW OF DOUGHNUT	SIG	1400		C/D	P/AT	85			
137	02/07/1996	HIGH THIN CLOUD	A	936	O	W OF BEAVERHUT	SIG	1465		C/M	P/SEDGE	0-85			
138	02/07/1996	HIGH THIN CLOUD	A	939	C	SE CORNER OF BEAVERHUT	SIG	1495		C/M	P/SEDGE	0-70			

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139	02/07/1996	HIGH THIN CLOUD	A	950	GG	MOW CREEK	SIG	1675		C/M	P/SEDGE	85			
140	02/07/1996	HIGH THIN CLOUD	A	953	R	TSINTSUNKO CREEK	SIG	1530		C/M	P/SEDGE	0-85			
141	02/07/1996	HIGH THIN CLOUD	A	957	FF	W SIDE OF DOUGHNUT	SIG	1430	E	C	P	65			
142	02/07/1996	HIGH THIN CLOUD	A	1000	CC	N OF CRISS KNOB	VIS	1310		M	SEDGE	0			
143	02/07/1996	HIGH THIN CLOUD	A	1012	T	NE OF LILY LAKE	SIG	1340	S	C/D	P/AT	65			WEAK COLLAR
144	02/07/1996	HIGH THIN CLOUD	A	1014	Z	S X-J	SIG	1160		C/M	P/SEDGE	0-55			
145	02/07/1996	HIGH THIN CLOUD	A	1016	AA	W SIDE OF UREN LAKE	SIG	1190	E	C/D	P/AT	65			PINE BEETLE PREVALENT
146	02/07/1996	HIGH THIN CLOUD	A	1022	BB	DMC LOOP	SIG	1160	S	C/D/W	P/AT/W	0-50			
147	02/07/1996	HIGH THIN CLOUD	A	1030	S	SE OF TULERIC LAKE	SIG	1280	S	C/D	P/AT	60			
148	02/07/1996	HIGH THIN CLOUD	A	1100	U	NE OF DOUGHNUT	SIG	1495	N	C	P	70			WEAK COLLAR
149	02/07/1996	HIGH THIN CLOUD	A	1106	D	NE OF DOUGHNUT	SIG	1495	N	C	P	70			KNOB
150	02/07/1996	HIGH THIN CLOUD	A	1113	EE	NE OF GISBORNE	SIG	1310		C/D/M	P/AT	0-60			
151	02/07/1996	HIGH THIN CLOUD	A	1116	F	SW OF GISBORNE	SIG	1250		C/D	P/AT	30			CUTBLOCKS ABOUND
152	02/07/1996	HIGH THIN CLOUD	A	1135	W	N OF UREN	SIG	1230		C/D	P/AT	60			PINE BEETLE PREVALENT
153	02/07/1996	HIGH THIN CLOUD	A	1146	K	S OF SPECTACLE LAKE	SIG	1220	N	C	P	60			
154	02/07/1996	HIGH THIN CLOUD	A	1200	Y	W OF WHITEWOOD LAKE	SIG	1430		C/D	P/F/AT	40			JAMIESON HEADWATERS
155	02/07/1996	HIGH THIN CLOUD	A	1208	I	TSINTSUNKO CREEK	SIG	1370		M	SEDGE	0			
156	02/07/1996	HIGH THIN CLOUD	A	1212	X	SW CORNER OF BEAVERHUT	SIG	1495		C/M	P/SEDGE	0			MORTALITY @ BEAVERHUT LAKE
157	26/07/1996	CLEAR	A	930	AA	E OF LASTCOURSE	VIS	1310	N	M	S/SEDGE	90	F		BROWN COLLAR
158	26/07/1996	CLEAR	A	940	W	SE OF LASTCOURSE	VIS	1250		M	S/P/SEDGE	0	B		CALF GONE/BEDDED IN SUN
159	26/07/1996	CLEAR	A	956	Z	DMC E OF LOOP	VIS	1160		W	W/SEDGE	85	B		CALF HEALTHY
160	26/07/1996	CLEAR	A	1024	S	DMC NE OF LOOP	VIS	1160	S	C/D	P/AT/S	50	T		CALF HEALTHY
161	26/07/1996	CLEAR	A	1030	BB	W SIDE OF MASSEY HILL	VIS	1220	W	C/D	P/AT	60	T		NICE RACK
162	26/07/1996	CLEAR	A	1031	UNK M	W SIDE OF MASSEY HILL	VIS	1220	W	C/D	P/AT	60	T		NICE RACK
163	26/07/1996	CLEAR	A	1048	CC	SE OF JERRY HILL	SIG	1310	E	C	P/S	95	T		
164	26/07/1996	CLEAR	A	1115	DD	N OF BEAVERHUT	SIG	1465	E	C	P	60	B		
165	26/07/1996	CLEAR	A	1218	A	SE OF TRANQUILLE LAKE	VIS	1525	E	C	S/P	90	B		NICE RACK/EDGE OF CUTBLOCK
166	26/07/1996	CLEAR	A	1238	GG	MOW CREEK	SIG	1765	E	C	S	90	T		
167	26/07/1996	CLEAR	A	1230	UNK F	MOW CREEK	VIS	1765	E	C	S	80	T		
168	26/07/1996	CLEAR	A	1230	UNK M	MOW CREEK	VIS	1765	E	C	S	80	T		
169	26/07/1996	CLEAR	A	1245	O	MOW CREEK	VIS	1765		C	S	30	B		
170	26/07/1996	CLEAR	A	1324	R	TSINTSUNKO CREEK	VIS	1495		C	S/P	80	B		COULDN'T SEE CALF BUT COW/CALF BED PRESENT
171	26/07/1996	CLEAR	A	1254	C	NW OF TSINTSUNKO LAKE	VIS	1615	N	C	P	50	B		NICE RACK
172	26/07/1996	CLEAR	A	1254	UNK F	TSINTSUNKO CREEK	VIS	1615	N	C	P	50	T		
173	26/07/1996	CLEAR	A	1301	D	E OF DOUGHNUT	VIS	1465	E	C	P	30	T		NICE RACK/LIGHT BACK COLOUR
174	26/07/1996	CLEAR	A	1314	UNK F	TSINTSUNKO CREEK	VIS	1615	N	C	S/P	80	T		
175	26/07/1996	CLEAR	A	1344	EE	HELLER CREEK	VIS	1160	N	C/M	S/SEDGE	40	B		CALF GONE
176	26/07/1996	CLEAR	A	1405	F	SW OF GISBORNE	SIG	1250	W	C	P/FD	75	T		
177	19/08/1996	OVERCAST/RAIN	A	835	O	MOW CREEK	VIS	1740		C	S/P	85	T		NO CALF
178	19/08/1996	OVERCAST/RAIN	A	827	UNK F	MOW CREEK	VIS	1740		M	S/SEDGE	2	F		LARGE COW
179	19/08/1996	OVERCAST/RAIN	A	846	GG	MOW CREEK	VIS	1700		C	S/P	90	T		WITH NEW CALF
180	19/08/1996	OVERCAST/RAIN	A	852	C	CRISS CREEK	VIS	1585	W	C	P/F	80	T		
181	19/08/1996	OVERCAST/RAIN	A	923	DD	TSINTSUNKO CREEK	VIS	1400	N	C	P/F	80	B		COULDN'T SEE COLLAR
182	19/08/1996	OVERCAST/RAIN	A	911	UNK F	TSINTSUNKO CREEK	VIS	1400	N	C/D	P/AT	80	B		
183	19/08/1996	OVERCAST/RAIN	A	939	D	TSINTSUNKO CREEK	SIG	1555	S	C	P	90	F		
184	19/08/1996	OVERCAST/RAIN	A	929	UNK F	N OF TSINTSUNKO LAKE	VIS	1615		M	S/SEDGE	0	F		
185	19/08/1996	OVERCAST/RAIN	A	930	UNK F	TSINTSUNKO CREEK	VIS	1555		M	S/SEDGE	0	F		
186	19/08/1996	OVERCAST/RAIN	A	1028	AA	SE OF LASTCOURSE	SIG	1340		C	P/F	85	T		
187	19/08/1996	OVERCAST/RAIN	A	1040	K	DMC N OF LOOP/W OF TULERIC	VIS	1280	S	C/D	P/S/AT	90	T		
188	19/08/1996	OVERCAST/RAIN	A	1050	S	NE LILY LAKE	VIS	1340	S	C/D	P/S/AT	60	F		
189	19/08/1996	OVERCAST/RAIN	A	1055	Q	DMC NE OF LOOP	VIS	1160	S	C/D	P/AT	75	T		WITH NEW CALF
190	19/08/1996	OVERCAST/RAIN	A	1110	U	S OF FATOX LAKE	VIS	1190	S	C/D	P/AT	50	T		
191	19/08/1996	OVERCAST/RAIN	A	1155	T	NE OF LILY LAKE	VIS	1340		C	P/F	50	T		WITH NEW CALF
192	19/08/1996	OVERCAST/RAIN	A	1217	EE	N OF STODDARD MEADOWS	SIG	1340		C/D	P/F/AT	50			
193	19/08/1996	OVERCAST/RAIN	A	1227	F	LOWER DMC	VIS	1125		C	F	10	B		
194	13/09/1996	HIGH CLOUD	A	1523	F	W OF GISBORNE	VIS	1250		C/D	P/AT	65	B		
195	13/09/1996	HIGH CLOUD	A	1537	C	HELLER CREEK	VIS	1495	W	C	P	85	F		WITH ANOTHER BULL
196	13/09/1996	HIGH CLOUD	A	1544	O	MOW CREEK	VIS	1615	W	C	P/S	50	T		NO CALF
197	13/09/1996	HIGH CLOUD	A	1541	UNK F	MOW CREEK	VIS	1740		M	S/SEDGE	5	T		NO CALF
198	13/09/1996	HIGH CLOUD	A	1557	DD	UPPER CRISS CREEK	VIS	1370	S	C	P	50	F		NO CALF
199	13/09/1996	HIGH CLOUD	A	1617	GG	PORCUPINE RIDGE	VIS	1800		C	S	85	T		CALF GROWING WELL
200	13/09/1996	HIGH CLOUD	A	1629	R	UPPER CRISS CREEK	VIS	1525	N	M	S/SEDGE	0	F		NO CALF
201	13/09/1996	HIGH CLOUD	A	1655	D	UPPER CRISS CREEK	VIS	1400		C/D	P/AT	35	F		
202	13/09/1996	HIGH CLOUD	A	1653	UNK F	UPPER CRISS CREEK	VIS	1400	N	M	S/SEDGE	0	F		
203	13/09/1996	HIGH CLOUD	A	1655	UNK M	UPPER CRISS CREEK	VIS	1400		C/D	P/AT	35	F		WITH 'D'
204	13/09/1996	HIGH CLOUD	A	1717	AA	JOE ROSS CREEK	VIS	1160		C/D	P/AT/F	40	T		WITH ANOTHER BULL
205	13/09/1996	HIGH CLOUD	A	1734	T	SE JERRY HILL/MT. SWIMM	SIG	1280		C/D	P/F	70	T		
206	13/09/1996	HIGH CLOUD	A	1749	EE	CRISS SE OF FINGER	VIS	1125	N	C/D	AT/F	75	T		WITH COW
207	16/09/1996	HIGH CLOUD	A	1516	Y	JAMIESON CREEK	VIS	1465	E	C	S/P	35	T		WITH ANOTHER COW

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208	16/09/1996	HIGH CLOUD	A	1529	S	DMC E OF LOOP	VIS	1160	W	C/D	P/AT	20	T		NO CALF
209	16/09/1996	HIGH CLOUD	A	1536	Q	SE X-J	VIS	1160	N	C/D	P/AT	40	T		
210	16/09/1996	HIGH CLOUD	A	1544	U	S OF FATOX LAKE	VIS	1160		C/D	P/F/AT	35	F		
211	16/09/1996	HIGH CLOUD	A	1617	K	S BONAPARTE	VIS	1280	N	C	P/S	80	T		WITH COW
212	16/09/1996	HIGH CLOUD	A	1640	W	S TIP OF SCOT LAKE	SIG	1220	N	C/D	P/S/AT	50	T		
213	16/09/1996	HIGH CLOUD	A	1710	A	WATCHING CREEK	VIS	1495	S	C	S/P	35	F		WITH COW/SELECTIVELY LOGGED BLOCK
214	07/10/1996	CLEAR	A	1425	Y	JAMIESON CREEK S	VIS	1370	W	C/D	P/F/AT	50	T		NEAR CUTBLOCK/ROAD
215	07/10/1996	CLEAR	A	1454	AA	NE OF LASTCOURSE	VIS	1280	N	C/D	P/AT	50	T		NEAR CUTBLOCK
216	07/10/1996	CLEAR	A	1504	S	E OF JOE ROSS CREEK	VIS	1340	W	C/D	P/AT	75	F		NEAR CUTBLOCK
217	07/10/1996	CLEAR	A	1504	UNK M	E OF JOE ROSS CREEK	VIS	1340	W	C/D	P/AT	75	F		WITH 'S'
218	07/10/1996	CLEAR	A	1526	K	S BONAPARTE	SIG	1310	N	C	P/S	95	F		
219	07/10/1996	CLEAR	A	1548	Q	DMC N OF LOOP	VIS	1250	S	C/D	P/AT/S	80	F		TIMBER ADJACENT TO RIPARIAN/NO CALF
220	07/10/1996	CLEAR	A	1600	T	DMC E OF LOOP	VIS	1250	N	C	P/S	65	F		WITH BULL/NO CALF
221	07/10/1996	CLEAR	A	1600	UNK M	DMC E OF LOOP	VIS	1250	N	C	P/S	65	F		WITH 'T'
222	07/10/1996	CLEAR	A	1612	D	NE OF DOUGHNUT	VIS	1400	N	C/D	P/AT	50	T		WITH COW
223	07/10/1996	CLEAR	A	1612	UNK F	NE OF DOUGHNUT	VIS	1400	N	C/D	P/AT	50	T		WITH 'D'
224	07/10/1996	CLEAR	A	1618	U	W OF DOUGHNUT	VIS	1430	N	C/D	P/AT	40	F		
225	07/10/1996	CLEAR	A	1630	DD	TSINTSUNKO CREEK	VIS	1430	S	C/M	P/S/SEDGE	50	F		NEW ROAD WITHIN 500M
226	07/10/1996	CLEAR	A	1630	UNK F	TSINTSUNKO CREEK	VIS	1430	S	C/M	P/S/SEDGE	50	F		WITH 'DD'
227	07/10/1996	CLEAR	A	1630	UNK M	TSINTSUNKO CREEK	VIS	1430	S	C/M	P/S/SEDGE	50	F		WITH 'DD'
228	07/10/1996	CLEAR	A	1630	UNK M	TSINTSUNKO CREEK	VIS	1430	S	C/M	P/S/SEDGE	50	F		WITH 'DD'
229	07/10/1996	CLEAR	A	1630	UNK M	TSINTSUNKO CREEK	VIS	1430	S	C/M	P/S/SEDGE	50	F		WITH 'DD'
230	07/10/1996	CLEAR	A	1646	R	MOW CREEK	SIG	1645	W	C	S/P	90	F		
231	07/10/1996	CLEAR	A	1653	GG	MOW CREEK S	VIS	1645	N	C	S/P	80	T		NO CALF
232	07/10/1996	CLEAR	A	1656	O	PORCUPINE RIDGE	SIG	1615	N	C	S/P	90	T		
233	07/10/1996	CLEAR	A	1704	A	WATCHING CREEK	SIG	1495		C/D	P/S/B				
234	08/10/1996	HIGH THIN CLOUD	A	1144	C	TRUDA LAKE	SIG	1400		C/D	P/AT/F				NEAR CUTBLOCK
235	08/10/1996	HIGH THIN CLOUD	A	1154	F	GISBORNE LAKE	SIG	1250		C/D	P/AT				NEAR CUTBLOCK
236	08/10/1996	HIGH THIN CLOUD	A	1200	EE	CRISS S OF FINGER	SIG	1190	W	C	P				NEAR CUTBLOCK
237	08/10/1996	HIGH THIN CLOUD	A	1214	I	NE OF BEAVERHUT	SIG	1525		C/D	P/AT				CUTBLOCKS
238	08/10/1996	HIGH THIN CLOUD	A	1228	W	W OF HAMMER LAKE	SIG	1340		C/D	P/AT				CUTBLOCKS
239	29/10/1996	SNOW/LOW CLOUD	A	944	EE	CRISS SW SIDE OF FINGER	VIS	1125	S	C	P/F	0	T		
240	29/10/1996	SNOW/LOW CLOUD	A	951	D	NW OF KULTOX	VIS	1125					X		MORTALITY - ILLEGAL HARVEST (COLLAR THROWN)
241	29/10/1996	SNOW/LOW CLOUD	A	1022	C	E OF BEAVERHUT	VIS	1555		M	S/SEDGE	0	F		WITH COW
242	29/10/1996	SNOW/LOW CLOUD	A	1022	UNK F	E OF BEAVERHUT	VIS	1555		M	S/SEDGE	0	F		WITH BULL 'C'
243	29/10/1996	SNOW/LOW CLOUD	A	1030	DD	TSINTSUNKO CREEK	VIS	1400	W	M	S/SEDGE	50	F		WITH YOUNG BULL
244	29/10/1996	SNOW/LOW CLOUD	A	1030	UNK M	TSINTSUNKO CREEK	VIS	1400	W	M	S/SEDGE	50	F		WITH COW 'DD'
245	29/10/1996	SNOW/LOW CLOUD	A	1051	K	S BONAPARTE	VIS	1220	N	C	P	75	F		
246	29/10/1996	SNOW/LOW CLOUD	A	1052	UNK F	S BONAPARTE	VIS	1465		W	W	0	F		
247	29/10/1996	SNOW/LOW CLOUD	A	1105	AA	W OF HAMMER LAKE	VIS	1280	N	C/D	P/AT	60	F		WITH COW
248	29/10/1996	SNOW/LOW CLOUD	A	1105	UNK F	W OF HAMMER LAKE	VIS	1280	N	C/D	P/AT	60	F		WITH BULL 'A'
249	29/10/1996	SNOW/LOW CLOUD	A	1119	W	S OF LASTCOURSE	VIS	1190	N	C/D	P/AT	75	T		
250	29/10/1996	SNOW/LOW CLOUD	A	1129	Q	DMC S OF LOOP	VIS	1160	N	C/D	P/AT	65	T		
251	29/10/1996	SNOW/LOW CLOUD	A	1133	UNK F	DMC S OF LOOP	VIS	1160	N	C/D	P/AT	65	F		
252	29/10/1996	SNOW/LOW CLOUD	A	1133	Z	DMC S OF LOOP	VIS	1160	N	C/D	P/AT	65	F		
253	29/10/1996	SNOW/LOW CLOUD	A	1136	BB	UPPER DMC	VIS	1220	S	C/D	P/AT	10	T		EDGE OF CUTBLOCK
254	29/10/1996	SNOW/LOW CLOUD	A	1142	S	UPPER DMC	VIS	1220	S	C/D	P/AT	70	T		WITH YEARLING CALF?
255	29/10/1996	SNOW/LOW CLOUD	A	1142	UNK	UPPER DMC	VIS	1220	S	C/D	P/AT	70	T		YEARLING CALF OF 'S'?
256	29/10/1996	SNOW/LOW CLOUD	A	1149	T	S OF SAWMILL LAKE	VIS	1190		C/D	P/AT	60	T		
257	29/10/1996	SNOW/LOW CLOUD	A	1200	O	MOW CREEK	VIS	1615		M	S/SEDGE	0	X		MORTALITY - NATURAL
258	29/10/1996	SNOW/LOW CLOUD	A	1235	GG	PORCUPINE RIDGE	VIS	1800		M	S/SEDGE	0	T		WITH BULL
259	29/10/1996	SNOW/LOW CLOUD	A	1235	UNK M	MOW CREEK	VIS	1800		M	S/SEDGE	0	T		WITH COW 'GG'
260	29/10/1996	SNOW/LOW CLOUD	A	1237	UNK M	MOW CREEK	VIS	1615	N	M	S/SEDGE	0	F		
261	29/10/1996	SNOW/LOW CLOUD	A	1237	UNK F	MOW CREEK	VIS	1615	N	M	S/SEDGE	0	F		
262	29/10/1996	SNOW/LOW CLOUD	A	1248	F	HELLER CREEK	VIS	1585		C/D	P/AT	10	B		
263	22/11/1996	HIGH CLOUD	A	1000	EE	CRISS SW OF FINGER	VIS	1160	N	C	P	65	T	<	WITH YOUNG BULL
264	22/11/1996	HIGH CLOUD	A	1000	UNK M	CRISS SW OF FINGER	VIS	1160	N	C	P	65	T	<	WITH COW 'EE'
265	22/11/1996	HIGH CLOUD	A	1013	GG	MOW CREEK	VIS	1525	W	C	S	85	R	<	ALONE
266	22/11/1996	HIGH CLOUD	A	1019	C	TSINTSUNKO CREEK	VIS	1615	N	C	S	0	T	<	CUTBLOCK;HEALTHY
267	22/11/1996	HIGH CLOUD	A	1018	UNK M	TSINTSUNKO CREEK	VIS	1615	N	M	S/SEDGE	0	R	<	HEALTHY
268	22/11/1996	HIGH CLOUD	A	1028	DD	TSINTSUNKO CREEK	VIS	1615	S	C	P/S	65	R	<	WITH ANOTHER COW
269	22/11/1996	HIGH CLOUD	A	1028	UNK F	TSINTSUNKO CREEK	VIS	1615	S	C	P/S	65	R	<	WITH COW 'DD'
270	22/11/1996	HIGH CLOUD	A	1040	S	DMC E OF LOOP	VIS	1220	N	M	S/SEDGE	65	R	<	WITH CALF
271	22/11/1996	HIGH CLOUD	A	1056	AA	E OF SCOT LAKE	VIS	1280	N	C	P	55	T	<	CUTBLOCK EDGE
272	22/11/1996	HIGH CLOUD	A	1052	UNK F	E OF SCOT LAKE	VIS	1280		M	W/S	0	R	<	CUTBLOCK MEADOW WITH BULL 'AA'
273	22/11/1996	HIGH CLOUD	A	1053	UNK F	E OF SCOT LAKE	VIS	1280	N	C	P	55	T	<	CUTBLOCK EDGE WITH CALF
274	22/11/1996	HIGH CLOUD	A	1118	UNK F	SE X-J	VIS	1160		C/D	P/AT	10	F	<	
275	22/11/1996	HIGH CLOUD	A	1118	UNK F	SE X-J	VIS	1160		C/D	P/AT	10	F	<	
276	22/11/1996	HIGH CLOUD	A	1119	Q	S X-J	VIS	1160		C/D	P/AT	10	F	<	WEAK SIGNAL

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
277	22/11/1996	HIGH CLOUD	A	1135	UNK F	MEADOW N OF 'SHOVEL' LAKE	VIS	1280		M	S/SEDGE	0	F	<	WITH CALF
278	22/11/1996	HIGH CLOUD	A	1148	R	SE OF KULTOX	VIS	1190	N	C	P/S	65	R	<	WITH ANOTHER COW
279	22/11/1996	HIGH CLOUD	A	1148	UNK F	SE OF KULTOX	VIS	1190	N	C	P/S	65	R	<	WITH COW 'R'
280	22/11/1996	HIGH CLOUD	A	1215	F	SE CORNER OF GISBORNE	VIS	1280		C/D	P/AT	65	T	<	ADJACENT TO CUTBLOCK
281	22/11/1996	HIGH CLOUD	A	1230	A	WATCHING CREEK	SIG	1370	S	C	P	85	R	<	CUTBLOCK
282	12/12/1996	CLEAR	A	828	A	WATCHING CREEK	VIS	1370	S	C	S	0	F	>	CUTBLOCK
283	12/12/1996	CLEAR	A	825	UNK M	WATCHING CREEK	VIS	1370	W	C	S	0	F	>	CUTBLOCK
284	12/12/1996	CLEAR	A	824	UNK M	WATCHING CREEK	VIS	1370	W	C	S	0	F	>	CUTBLOCK EDGE
285	12/12/1996	CLEAR	A	826	UNK F	WATCHING CREEK	VIS	1370	W	C	S	50	F	>	CUTBLOCK EDGE
286	12/12/1996	CLEAR	A	859	W	LASTCOURSE LAKE	VIS	1220	S	C	P	70	B	<	CUTBLOCK EDGE
287	12/12/1996	CLEAR	A	835	UNK F	PORCUPINE RIDGE	VIS	1615	N	C	S	0	F	>	CUTBLOCK
288	12/12/1996	CLEAR	A	849	AA	S OF SCOT LAKE	VIS	1250	W	C	P	0	F	>	WITH 4 OTHER BULLS
289	12/12/1996	CLEAR	A	849	YRL M	S OF SCOT LAKE	VIS	1250	W	C	P	0	F	>	WITH 'AA'
290	12/12/1996	CLEAR	A	849	YRL M	S OF SCOT LAKE	VIS	1250	W	C	P	0	F	>	WITH 'AA'
291	12/12/1996	CLEAR	A	849	UNK M	S OF SCOT LAKE	VIS	1250	W	C	P	0	F	>	WITH 'AA'
292	12/12/1996	CLEAR	A	849	UNK M	S OF SCOT LAKE	VIS	1250	W	C	P	0	F	>	WITH 'AA'
293	12/12/1996	CLEAR	A	842	UNK M	UPPER DMC	VIS	1220	W	C	PP	0	F	<	CUTBLOCK
294	12/12/1996	CLEAR	A	844	UNK M	S OF TULERIC LAKE	VIS	1280	W	C	P	0	F	<	ROAD
295	12/12/1996	CLEAR	A	844	UNK M	S OF TULERIC LAKE	VIS	1280	W	C	P	0	F	<	ROAD
296	12/12/1996	CLEAR	A	846	UNK F	TULERIC LAKE	VIS	1280	W	C	P	0	F	>	CUTBLOCK
297	12/12/1996	CLEAR	A	848	UNK M	JOE ROSS CREEK	VIS	1280	W	C	P	0	F	>	CUTBLOCK
298	12/12/1996	CLEAR	A	848	UNK M	JOE ROSS CREEK	VIS	1280	W	C	P	0	F	>	CUTBLOCK
299	12/12/1996	CLEAR	A	856	YRL M	JOE ROSS CREEK	VIS	1280	W	C	P	0	F	>	CUTBLOCK
300	12/12/1996	CLEAR	A	856	YRL M	JOE ROSS CREEK	VIS	1280	W	C	P	0	F	>	CUTBLOCK
301	12/12/1996	CLEAR	A	909	K	S BONAPARTE	VIS	1400		C	P/S	80	B	<	CORRIDOR BETWEEN 2 MEADOWS
302	12/12/1996	CLEAR	A	915	S	UPPER DMC	VIS	1250	N	C/D	P/AT	0	T	<	OPENING EDGE WITH CALF
303	12/12/1996	CLEAR	A	924	Q	S X-J	VIS	1160	N	C/D	AT/P	25	T	<	
304	12/12/1996	CLEAR	A	925	UNK F	S X-J	VIS	1160	N	C/D	AT/P	25	B	<	
305	12/12/1996	CLEAR	A	925	UNK F	S X-J	VIS	1160	N	C/D	AT/P	25	T	<	
306	12/12/1996	CLEAR	A	925	UNK M	S X-J	VIS	1160	N	C/D	AT/P	25	F	<	
307	12/12/1996	CLEAR	A	930	T	W OF LILY LAKE	VIS	1280	S	C/D	AT/P	0	B	<	
308	12/12/1996	CLEAR	A	935	UNK F	LILY LAKE	VIS	1280	S	C/D	AT/P	0	B	<	
309	12/12/1996	CLEAR	A	935	UNK F	LILY LAKE	VIS	1280	S	C/D	AT/P	0	B	<	
310	12/12/1996	CLEAR	A	945	DD	UPPER CRISS	VIS	1555		M	S/SEDGE	10	B	<	
311	12/12/1996	CLEAR	A	937	UNK F	E OF LILY LAKE	VIS	1310	W	M	S	0	B	<	EDGE OF TIMBER
312	12/12/1996	CLEAR	A	951	I	E OF KULTOX LAKE	VIS	1190		M	S/SEDGE	5	B	<	EDGE OF MEADOW
313	12/12/1996	CLEAR	A	951	UNK F	E OF KULTOX LAKE	VIS	1190		M	S/SEDGE	5	B	<	EDGE OF MEADOW
314	12/12/1996	CLEAR	A	1000	GG	NE OF JULES LAKE	VIS	1310		C	P	50	F	<	WITH ANOTHER COW
315	12/12/1996	CLEAR	A	1000	UNK F	NE OF JULES LAKE	VIS	1310		C	P	50	F	<	WITH 'GG'
316	12/12/1996	CLEAR	A	1030	F	SW OF GISBORNE	VIS	1250		C/D	AT/P	10	B	<	CUTBLOCK
317	12/12/1996	CLEAR	A	1025	EE	CRISS SE OF FINGER	VIS	1250		C/D	P/AT	30	T	<	
318	13/01/1997	CLEAR	A	1249	AA	JOE ROSS CREEK	VIS	1160	N	C/D	AT/P	10	T	<	WITH COW
319	13/01/1997	CLEAR	A	1249	UNK F	JOE ROSS CREEK	VIS	1160		C/D	AT/P	10	T	<	WITH 'AA'
320	13/01/1997	CLEAR	A	1254	W	SW OF SCOT LAKE	VIS	1220		M	S/SEDGE	5	F	<	
321	13/01/1997	CLEAR	A	1304	K	S OF HAMMER LAKE	VIS	1310	W	C	P	80	B	>	
322	13/01/1997	CLEAR	A	1312	DD	E OF LILY LAKE	VIS	1310		M	S/SEDGE	0	F	>	WITH 2 OTHER COWS
323	13/01/1997	CLEAR	A	1312	UNK F	E OF LILY LAKE	VIS	1310		M	S/SEDGE	0	F	>	WITH 'DD'
324	13/01/1997	CLEAR	A	1312	UNK F	E OF LILY LAKE	VIS	1310		M	S/SEDGE	0	F	>	WITH 'DD'
325	13/01/1997	CLEAR	A	1316	T	DMC E OF LOOP	VIS	1160		M	W	5	F	<	
326	13/01/1997	CLEAR	A	1316	UNK F	DMC E OF LOOP	VIS	1160		M	W	5	F	<	JUST WEST OF 'T'
327	13/01/1997	CLEAR	A	1316	UNK C	DMC E OF LOOP	VIS	1160		M	W	5	F	<	JUST WEST OF 'T'
328	13/01/1997	CLEAR	A	1321	Q	S X-J	VIS	1160		M	P/W	50	B	<	WITH ANOTHER COW AT EDGE OF BIG MEADOW
329	13/01/1997	CLEAR	A	1321	UNK F	S X-J	VIS	1160		M	P/W	50	F	<	WITH 'Q'
330	13/01/1997	CLEAR	A	1337	GG	SE OF KULTOX LAKE	VIS	1160		C/D	P/AT	65	F	<	JUST N OF ROAD
331	13/01/1997	CLEAR	A	1345	EE	CRISS CREEK N	VIS	1160		C/D	P/AT	65	F	<	W OF HOUSE IN CLUMP OF PINE
332	13/01/1997	CLEAR	A	1356	F	SW OF GISBORNE	VIS	1280	W	C/D	P/AT	90	F	<	ANTLERS SHED
333	13/01/1997	CLEAR	A	1417	I	E OF KULTOX LAKE	VIS	1160		M	S/W	30	F	<	ANOTHER COW JUST EAST
334	13/01/1997	CLEAR	A	1417	UNK F	E OF KULTOX LAKE	VIS	1160		M	S/W	30	F	<	JUST EAST OF 'I'
335	13/01/1997	CLEAR	A	1437	S	N OF SEMLIN LAKE	SIG	1160	W	C/D	P/AT	75	F	<	
336	13/01/1997	CLEAR	A	1500	UNK F	N OF LILY LAKE	VIS	1310		C	P	0	F	<	
337	13/01/1997	CLEAR	A	1514	R	CRISS CREEK N	VIS	1035	S	C/D	P/AT	85	B	<	
338	13/01/1997	CLEAR	A	1522	A	E OF RED LAKE	VIS	1310	N	C	P	10	B	<	ANTLERS SHED
339	13/01/1997	CLEAR	A	1520	UNK M	E OF RED LAKE	VIS	1280		C	P	10	T	<	JUST SOUTHEAST OF 'A'
340	07/02/1997	OVERCAST	A	1030	A	E OF RED LAKE	VIS	1125	S	C	P	5	T		
341	07/02/1997	OVERCAST	A	1030	F	FROG LAKE	VIS	1280				90			MORTALITY - NATURAL
342	07/02/1997	OVERCAST	A	1207	EE	CRISS CREEK S	VIS	1125		W	W/AT/F	30	T		WITH UKNOWN ADULT
343	07/02/1997	OVERCAST	A	1207	UNK	CRISS CREEK S	VIS	1125		W	W/AT/F	30	T		
344	07/02/1997	OVERCAST	A	1222	C	W OF HELLER BUTTE	VIS	1250	N	C	P/F	50	B		FREQ SHIFT .196
345	07/02/1997	OVERCAST	A	1231	I	CRISS CREEK N	VIS	1250		C	P/F				

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
346	07/02/1997	OVERCAST	A	1231	GG	CRISS S PLATEAU	SIG	1280							
347	07/02/1997	OVERCAST	A	1231	U	S X-J	SIG	1125							FREQ SHIFT .735
348	07/02/1997	OVERCAST	A	1248	DD	E X-J	VIS	1160		W	W	0	B		
349	07/02/1997	OVERCAST	A	1248	Q	S X-J	SIG	1125							
350	07/02/1997	OVERCAST	A	1248	T	LILY LAKE	SIG	1280							
351	07/02/1997	OVERCAST	A	1248	S	N X-J	SIG	1160							
352	07/02/1997	OVERCAST	A	1248	W	UREN LAKE	SIG	1190							
353	19/02/1997	HIGH OVERCAST	A	833	R	S OF JULES LAKE ON SHORE	VIS	1250	E	C	F	5	F		STILL LIMPING
354	19/02/1997	HIGH OVERCAST	A	833	UNK	E OF JULES LAKE	VIS	1250		C	F	5	F		
355	19/02/1997	HIGH OVERCAST	A	833	UNK	E OF JULES LAKE	VIS	1250		C	F	60	F		
356	19/02/1997	HIGH OVERCAST	A	833	UNK M	E OF JULES LAKE	VIS	1250		C	F	0	T		ON LAKE - UPSET!
357	19/02/1997	HIGH OVERCAST	A	842	EE	HELLER CREEK	VIS	1220		C/D	P/F/AT	50	F		
358	19/02/1997	HIGH OVERCAST	A	842	II	HELLER CREEK	VIS	1220		C	P	50	T		
359	19/02/1997	HIGH OVERCAST	A	847	UNK F	CRISS W OF FINGER	VIS	1125		C	P/F	65	F		
360	19/02/1997	HIGH OVERCAST	A	847	UNK C	CRISS W OF FINGER	VIS	1125		C	P/F	65	F		
361	19/02/1997	HIGH OVERCAST	A	910	GG	CRISS S PLATEAU	VIS	1220		C/D	P/AT	40	F		
362	19/02/1997	HIGH OVERCAST	A	920	S	AVERY HILL	VIS	1250	E	C/D	P/AT	65	B		
363	19/02/1997	HIGH OVERCAST	A	924	DD	E OF CASA GRANDE	VIS	1125		C/D	P/AT	75	F		
364	19/02/1997	HIGH OVERCAST	A	936	AA	S JOE ROSS CREEK	VIS	1125	S	C	P/S	65	F		
365	19/02/1997	HIGH OVERCAST	A	936	UNK F	S JOE ROSS CREEK	VIS	1125	S	C	S	65	F		
366	19/02/1997	HIGH OVERCAST	A	948	K	S OF SPECTACLE LAKE	VIS	1310	W	C	P	75	F		
367	19/02/1997	HIGH OVERCAST	A	955	W	DMC E OF LOOP	VIS	1160		C	P		F		
368	19/02/1997	HIGH OVERCAST	A	1000	U	SE OF DUCK LAKE	VIS	1160		C/D	P/AT	50	F		
369	19/02/1997	HIGH OVERCAST	A	1009	Q	MASSEY HILL	VIS	1220	S	C/D	AT/P	40	F		
370	19/02/1997	HIGH OVERCAST	A	1009	UNK F	MASSEY HILL	VIS	1220	S	C/D	AT/P	40	F		
371	19/02/1997	HIGH OVERCAST	A	1009	UNK F	MASSEY HILL	VIS	1220	S	C/D	AT/P	40	F		
372	19/02/1997	HIGH OVERCAST	A	1016	T	S OF JERRY HILL	VIS	1280		M	W/S	5	F		
373	13/03/1997	CLEAR	A	1235	A	RED LAKE	VIS	1220	S	C	F	20	B		
374	13/03/1997	CLEAR	A	1244	R	JULES LAKE	VIS	1250	E	C	P	10	B		
375	13/03/1997	CLEAR	A	1247	EE	CRISS CREEK	VIS	1100		C	F	10	T		
376	13/03/1997	CLEAR	A	1253	II	CRISS CREEK	VIS	1100	N	C/D	F/AT	20	T		
377	13/03/1997	CLEAR	A	1302	C	CRISS W OF HELLER BUTTE	VIS	1220		C/D	F/AT	75	T		
378	13/03/1997	CLEAR	A	1308	GG	TSINTSUNKO CREEK	VIS	1280		C/D	P/AT	65	T		
379	13/03/1997	CLEAR	A	1320	DD	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
380	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
381	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
382	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
383	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
384	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
385	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
386	13/03/1997	CLEAR	A	1320	UNK	N OF FATOX LAKE	VIS	1125	E	C/D	P/AT	60	T		
387	13/03/1997	CLEAR	A	1326	U	W OF FATOX LAKE	VIS	1125		C/D	P/AT	60	T		
388	13/03/1997	CLEAR	A	1326	UNK	W OF FATOX LAKE	VIS	1125		C/D	P/AT	60	T		
389	13/03/1997	CLEAR	A	1330	HH	E OF DUCK LAKE	VIS	1160	N	C/D	P/AT	55	T		
390	13/03/1997	CLEAR	A	1336	S	N OF SEMLIN LAKE	VIS	1160	W	C/D	AT/P	20	B		
391	13/03/1997	CLEAR	A	1400	AA	JOE ROSS CREEK	VIS	1220	N	C/D	P/AT	35	T		
392	13/03/1997	CLEAR	A	1400	UNK F	JOE ROSS CREEK	VIS	1220	N	C/D	P/AT	35	T		
393	13/03/1997	CLEAR	A	1408	K	E OF BABE LAKE	VIS	1370	N	C	P/S	90	T		
394	13/03/1997	CLEAR	A	1414	W	N OF LASTCOURSE	VIS	1250		C	P	50	F		
395	13/03/1997	CLEAR	A	1414	UNK F	N OF LASTCOURSE	VIS	1250		C	P	50	F		
396	13/03/1997	CLEAR	A	1422	T	TERNAN LAKE	VIS	1250		W	W	0	F		
397	13/03/1997	CLEAR	A	1427	Q	X-J	VIS	1125		C/D	P/AT	15	B		
398	13/03/1997	CLEAR	A	1427	UNK F	X-J	VIS	1125		C/D	P/AT	15	B		
399	07/04/1997	CLEAR	A	849	A	RED LAKE	SIG	1220	S	C	F/P	40			
400	07/04/1997	CLEAR	A	902	EE	HELLER CREEK	VIS	1100		C/D	AT/F	5	T		
401	07/04/1997	CLEAR	A	908	II	HELLER CREEK	VIS	1100	N	C/D	P/AT	60	T		
402	07/04/1997	CLEAR	A	917	R	W OF JULES LAKE	VIS	1220	W	C	P	85	B		BEDDED UNDER TREE
403	07/04/1997	CLEAR	A	929	GG	SE OF KULTOX LAKE	SIG	1310		C	P/S	80	T		
404	07/04/1997	CLEAR	A	946	C	CRISS W OF HELLER BUTTE	VIS	1310	N	C	P/S	95	B		FLEW BY <10x - NO MOVEMENT (FINALLY SIGHTED TUCKED UNDER A TRE
405	07/04/1997	CLEAR	A	1010	I	S OF KULTOX	SIG	1220							INTERFERENCE ON FREQ.
406	07/04/1997	CLEAR	A	1017	DD	E X-J	SIG	1160		C/D	P/AT	60			
407	07/04/1997	CLEAR	A	1024	U	S OF FATOX LAKE	SIG	1160		C/D	P/AT	40			
408	07/04/1997	CLEAR	A	1027	Q	S X-J	VIS	1160		C/D	P/AT	50	T		
409	07/04/1997	CLEAR	A	1027	UNK C	S X-J	VIS	1160		C/D	P/AT	50	T		YEARLING CALF OF Q
410	07/04/1997	CLEAR	A	1034	HH	S OF UREN LAKE	VIS	1190		C/D	AT/P	50	B		
411	07/04/1997	CLEAR	A	1047	AA	UREN LAKE	VIS	1190		C/D	P/AT	65	T		
412	07/04/1997	CLEAR	A	1054	K	SE OF LASTCOURSE	VIS	1370		C	P/S	75	B		TUCKED UNDER PINE
413	07/04/1997	CLEAR	A	1102	W	N OF BOG LAKE	SIG	1220		C/D	P/AT	75			
414	07/04/1997	CLEAR	A	1108	S	N OF SEMLIN LAKE	SIG	1160		C/D		40			

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
415	06/05/1997	CLEAR	A	851	A	RED LAKE	VIS	1250	N	C	P	70	B		
416	06/05/1997	CLEAR	A	902	EE	HELLER CREEK	SIG	1400	W	C/D	P/AT	90	F		NO CALF
417	06/05/1997	CLEAR	A	915	R	S OF KULTOX	SIG	1190	S	C/D	F/P/AT	90			CUTBLOCK EDGE
418	06/05/1997	CLEAR	A	924	C	CRISS KNOB	VIS	1250	N	C/D	P/AT	50	F		
419	06/05/1997	CLEAR	A	930	GG	MOW CREEK	VIS	1465	W	C	P	60	T		NO CALF
420	06/05/1997	CLEAR	A	944	DD	UPPER DMC	VIS	1310	W	C	P/F	60	T		NO CALF
421	06/05/1997	CLEAR	A	954	S	TERNAN LAKE	VIS	1250	S	C/D	P/AT	30	T		WITH YEARLING CALF
422	06/05/1997	CLEAR	A	954	UNK C	TERNAN LAKE	VIS	1250	S	C/D	P/AT	30	T		YEARLING CALF OF 'S'
423	06/05/1997	CLEAR	A	1002	Q	DMC S OF LOOP	VIS	1160	N	C/D	P/AT	40	T		NO CALF
424	06/05/1997	CLEAR	A	1025	U	E OF DUCK LAKE	VIS	1125	N	C/D	P/AT				
425	06/05/1997	CLEAR	A	1045	AA	JOE ROSS CREEK	VIS	1190	N	M	S/SEDGE	30	F		
426	06/05/1997	CLEAR	A	1040	UNK F	JOE ROSS CREEK	VIS	1190	S	C	P	5	B		IN SMALL OPENING
427	06/05/1997	CLEAR	A	1052	W	N SHORE OF LASTCOURSE	VIS	1220	S	C	S	30	F		NO CALF
428	06/05/1997	CLEAR	A	1106	K	E JOE ROSS - BALDY AREA	VIS	1280	N	C	P	50	F		
429	06/05/1997	CLEAR	A	1125	II	E OF DUCK LAKE	VIS	1125		C/D	P/AT	50	T		
430	06/05/1997	CLEAR	A	1120	UNK	E OF DUCK LAKE	VIS	1125		C/D	P/AT	50	T		
431	06/05/1997	CLEAR	A	1120	UNK F	E OF DUCK LAKE	VIS	1125		C/D	P/AT	10	B		NO CALF
432	06/05/1997	CLEAR	A	1225	HH	N OF UREN	VIS	1220		C/D	P/AT	50	T		
433	06/05/1997	CLEAR	A	1235	T	S OF JERRY HILL/MT. SWIMM	VIS	1280		C/D	P/AT	50	T		NO CALF
434	21/05/1997	RAIN/SNOW	A	1400	A	N OF RED LAKE	VIS	1127		C/D	S/P/AT	80	F		
435	21/05/1997	RAIN/SNOW	A	1410	EE	CRISS CREEK	VIS	1100		C/D	P/F/AT	20	T		
436	21/05/1997	RAIN/SNOW	A	1417	C	UPPER CRISS CREEK	VIS	1220		C	P	70	F		
437	21/05/1997	RAIN/SNOW	A	1428	GG	UPPER CRISS CREEK	VIS	1220	N	C/D	P/AT	75	T		WITH YEARLING
438	21/05/1997	RAIN/SNOW	A	1428	UNK YRL	UPPER CRISS CREEK	VIS	1190		C/D	P/AT	75	T		WITH 'GG'
439	21/05/1997	RAIN/SNOW	A	1440	I	UPPER CRISS CREEK	VIS	1160		M	S/SEDGE	15	T		WITH 2 ADULTS
440	21/05/1997	RAIN/SNOW	A	1440	UNK	UPPER CRISS CREEK	VIS	1160		M	S/SEDGE	15	T		WITH 'I'
441	21/05/1997	RAIN/SNOW	A	1440	UNK	UPPER CRISS CREEK	VIS	1160		M	S/SEDGE	15	T		WITH 'I'
442	21/05/1997	RAIN/SNOW	A	1450	U	E OF FATOX LAKE	VIS	1160		C/D	P/AT	50	F		
443	21/05/1997	RAIN/SNOW	A	1502	HH	NE OF X-J	VIS	1160	S	C/D	P/AT	50	T		
444	21/05/1997	RAIN/SNOW	A	1456	UNK	NE OF X-J	VIS	1160	S	C/D	P/AT	50	T		COLLARED - NO SIGNAL
445	21/05/1997	RAIN/SNOW	A	1514	S	DMC N OF LOOP	VIS	1160	S	C/D	P/AT	50	F		WITH 1 ADULT
446	21/05/1997	RAIN/SNOW	A	1514	UNK	DMC N OF LOOP	VIS	1160		C/D	P/AT	50	F		WITH 'S'
447	21/05/1997	RAIN/SNOW	A	1520	Q	UPPER DMC	VIS	1160		W	W/SEDGE	5	F		NEW CALF
448	21/05/1997	RAIN/SNOW	A	1520	UNK C	UPPER DMC	VIS	1160		W	W/SEDGE	5	F		NEW CALF OF 'Q'
449	21/05/1997	RAIN/SNOW	A	1533	AA	SE OF LASTCOURSE	VIS	1160		M	SEDGE	0	F		VERY LIGHT COAT ON BACK
450	21/05/1997	RAIN/SNOW	A	1532	UNK YRL	SE OF LASTCOURSE	VIS	1160		M	SEDGE	0	F		
451	21/05/1997	RAIN/SNOW	A	1530	UNK F	SE OF LASTCOURSE	VIS	1160		M	SEDGE	0	F		
452	21/05/1997	RAIN/SNOW	A	1530	UNK F	SE OF LASTCOURSE	VIS	1160		M	SEDGE	0	F		PREGNANT
453	21/05/1997	RAIN/SNOW	A	1600	K	JOE ROSS CREEK	VIS	1220	N	C/D	AT/P	30	T		
454	21/05/1997	RAIN/SNOW	A	1613	T	SE OF X-J/JERRY HILL	VIS	1190	N	C/D	AT/P	65	T		PREGNANT
455	21/05/1997	RAIN/SNOW	A	1626	DD	W OF DOUGHNUT	VIS	1371	N	C	P	70	T		PREGNANT
456	29/05/1997	OVERCAST	A	920	A	NE OF RED LAKE	VIS	1127	S	C	F/S	60	B		
457	29/05/1997	OVERCAST	A	930	EE	CRISS N OF FINGER	VIS	1100	W	C/D	F/AT	60	T		PREGNANT
458	29/05/1997	OVERCAST	A	947	C	SE OF KULTOX LAKE	SIG	1220	N	C/D	F/AT	60	T		
459	29/05/1997	OVERCAST	A	952	I	NE OF KULTOX LAKE	VIS	1190		C/D	F/AT	60	T		PREGNANT
460	29/05/1997	OVERCAST	A	1002	S	UPPER DMC	VIS	1160	S	C/D	P/AT	70	T		PREGNANT
461	29/05/1997	OVERCAST	A	1008	Q	UPPER DMC ON RIVER	VIS	1160		W	W/SEDGE	10	F		WITH CALF
462	29/05/1997	OVERCAST	A	1008	UNK C		VIS	1160		W	W/SEDGE	10	F		CALF OF 'Q'
463	29/05/1997	OVERCAST	A	1017	DD	W OF DOUGHNUT LAKE	VIS	1371		M	S/SEDGE	0	F		PREGNANT
464	29/05/1997	OVERCAST	A	1029	HH	UREN LAKE E SHORE	VIS	1190	W	C/D	AT/S	70	T		
465	29/05/1997	OVERCAST	A	1059	U	S X-J	VIS	1160		C/D	P/AT	10	F		SHED OUT
466	29/05/1997	OVERCAST	A	1107	II	SW OF FATOX LAKE	VIS	1160		C	S	70	F		DRINKING/FORAGING IN WET AREA
467	29/05/1997	OVERCAST	A	1115	AA	N JOE ROSS CREEK	VIS	1220		C	P	40	T		
468	29/05/1997	OVERCAST	A	1113	UNK F	N JOE ROSS CREEK	VIS	1220		M	SEDGE	0	F		
469	29/05/1997	OVERCAST	A	1113	UNK F	N JOE ROSS CREEK	VIS	1220		M	SEDGE	0	F		
470	29/05/1997	OVERCAST	A	1123	W	E OF LASTCOURSE	VIS	1250		M	S/SEDGE	5	F		WITH CALF APPROX. 1 WEEK OLD
471	29/05/1997	OVERCAST	A	1123	UNK C	E OF LASTCOURSE	VIS	1250		M	S/SEDGE	5	F		CALF OF 'W'
472	29/05/1997	OVERCAST	A	1120	UNK F	E OF LASTCOURSE	VIS	1250		M	SEDGE	0	F		
473	29/05/1997	OVERCAST	A	1130	K	S OF SPECTACLE LAKE	VIS	1310	N	C	P	50	F		SHED OUT
474	29/05/1997	OVERCAST	A	1144	GG	SE OF KULTOX LAKE	VIS	1371	N	C	P	50	F		PREGNANT
475	29/05/1997	OVERCAST	A	1157	R	TSINTSUNKO CR.	VIS	1400		W	W/SEDGE	10	F		LIMP STILL PRONOUNCED - WITH CALF?
476	29/05/1997	OVERCAST	A	1155	UNK F	TSINTSUNKO CR.	VIS	1400		W	W/SEDGE	10	F		VERY UPSET - PROTECTING CALF?
477	29/05/1997	OVERCAST	A	1155	UNK F	TSINTSUNKO CR.	VIS	1400		W	W/SEDGE	10	F		
478	29/05/1997	OVERCAST	A	1212	T	NW OF LILY LAKE	VIS	1280		M	S/SEDGE	40	F		WITH CALF (2-3 DAYS OLD)
479	29/05/1997	OVERCAST	A	1212	UNK C	NW OF LILY LAKE	VIS	1280		M	S/SEDGE	40	F		CALF OF 'T'
480	05/06/1997	HIGH CLOUD	A	851	A	NE OF RED LAKE	VIS	1130		M	SEDGE	0	F		FENCED POND
481	05/06/1997	HIGH CLOUD	A	900	EE	N OF GISBORNE	VIS	1300		M	S/SEDGE	50	F		EDGE OF POND; PREGNANT?
482	05/06/1997	HIGH CLOUD	A	911	GG	MOW CR.	VIS	1370		C	F	65	T		PREGNANT
483	05/06/1997	HIGH CLOUD	A	920	C	TSINTSUNKO CR.	VIS	1250	S	C/D	AT/P	50	F		

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
484	05/06/1997	HIGH CLOUD	A	914	UNK F	NE OF KULTOX LAKE	VIS	1190		M	S/SEDGE	0	F		
485	05/06/1997	HIGH CLOUD	A	935	R	W OF TSINTSUNKO LAKE	VIS	1585		M	S/SEDGE	60	F		WITH CALF; LEAVE STRIP BETWEEN CUTBLOCK AND SMALL SWAMP
486	05/06/1997	HIGH CLOUD	A	935	UNK C	W OF TSINTSUNKO LAKE	VIS	1585		M	S/SEDGE	60	F		CALF OF 'R'
487	05/06/1997	HIGH CLOUD	A	948	DD	W OF DOUGHNUT	VIS	1400	E	C/D	S/AT	75	T		RUNNING - DID NOT SEE CALF
488	05/06/1997	HIGH CLOUD	A	955	S	UPPER DMC N OF RIVER	VIS	1160	S	C/D	P/AT	75	F		WITH ANOTHER COW; NO CALF
489	05/06/1997	HIGH CLOUD	A	955	UNK F	UPPER DMC N OF RIVER	VIS	1160		C/D	P/AT	75	F		WITH 'S'
490	05/06/1997	HIGH CLOUD	A	1000	Q	UPPER DMC ON RIVER	VIS	1160		W	W/SEDGE	50	F		WITH CALF
491	05/06/1997	HIGH CLOUD	A	1000	UNK C	UPPER DMC ON RIVER	VIS	1160		W	W/SEDGE	50	F		CALF OF 'Q'
492	05/06/1997	HIGH CLOUD	A	1017	II	E OF X-J ON RIVER	VIS	1160		C/D	P/AT	50	T		
493	05/06/1997	HIGH CLOUD	A	1025	U	NE OF DUCK LAKE	VIS	1160	N	C/D	AT/F	30	F		
494	05/06/1997	HIGH CLOUD	A	1030	HH	S JOE ROSS CREEK	VIS	1160	W	M	S/SEDGE	10	F		
495	05/06/1997	HIGH CLOUD	A	1033	W	E OF LASTCOURSE	VIS	1250		M	S/SEDGE	0	F		WITH CALF
496	05/06/1997	HIGH CLOUD	A	1033	UNK C	E OF LASTCOURSE	VIS	1250		M	S/SEDGE	0	F		CALF OF 'W'
497	05/06/1997	HIGH CLOUD	A	1040	AA	JOE ROSS CREEK	VIS	1220		C	P	50	T		PASSED THROUGH SWAMP
498	05/06/1997	HIGH CLOUD	A	1050	K	S BONAPARTE	SIG	1310	N	C/D	P/AT	60			
499	05/06/1997	HIGH CLOUD	A	1107	T	N OF LILY LAKE	VIS	1280		C	P	70	T		WITH CALF AROUND SMALL SWAMPS
500	05/06/1997	HIGH CLOUD	A	1107	UNK C	N OF LILY LAKE	VIS	1280		C	P	70	T		CALF OF 'T'
501	05/06/1997	HIGH CLOUD	A	1116	I	SE OF BEAVERHUT	VIS	1525	N	C	P/S	70	T		NO CALF; PREGNANT?
502	11/06/1997	HIGH OVERCAST	A	903	A	NE OF RED LAKE	VIS	1127	N	C/D	F/AT	10	F		
503	11/06/1997	HIGH OVERCAST	A	914	EE	CRISS E OF FINGER	VIS	1160	S	C/D	F/AT	80	F		DID NOT SEE CALF; IN THICK COVER
504	11/06/1997	HIGH OVERCAST	A	926	GG	MOW CR.	VIS	1554	N	C	S	75	F		NO CALF
505	11/06/1997	HIGH OVERCAST	A	932	R	E OF BEAVERHUT	VIS	1615		M	S/SEDGE	0	F		WITH CALF
506	11/06/1997	HIGH OVERCAST	A	945	I	SE OF BEAVERHUT MOW CR.	VIS	1676	N	C	S/P	75	F		NO CALF
507	11/06/1997	HIGH OVERCAST	A	955	C	E OF BEAVERHUT	VIS	1554		C	S/P	70	B		ON EDGE OF MEADOW
508	11/06/1997	HIGH OVERCAST	A	1002	DD	S CRISS PLATEAU	VIS	1524	N	C	S/P	30	B		NO CALF
509	11/06/1997	HIGH OVERCAST	A	1010	Q	UPPER DMC	VIS	1160		M	S/SEDGE	5	F		WITH CALF
510	11/06/1997	HIGH OVERCAST	A	1024	II	NW OF LILY LAKE	SIG	1280	N	C/D	P/AT	50			
511	11/06/1997	HIGH OVERCAST	A	1015	UNK	LILY W MEADOW	VIS	1280		M	S/SEDGE	0	F		
512	11/06/1997	HIGH OVERCAST	A	1015	UNK F	LILY W MEADOW	VIS	1280		M	S/SEDGE	5	F		WITH CALF
513	11/06/1997	HIGH OVERCAST	A	1035	T	NE OF LILY LAKE	VIS	1280	N	C	P	25	F		WITH CALF
514	11/06/1997	HIGH OVERCAST	A	1100	HH	SW OF LASTCOURSE	VIS	1220		C	P	40	T		ROAD EDGE
515	11/06/1997	HIGH OVERCAST	A	1102	UNK	LARGE MEADOW N OF JOE ROSS	VIS	1250		M	S/SEDGE	0	F		
516	11/06/1997	HIGH OVERCAST	A	1114	W	E OF LASTCOURSE	VIS	1250		M	S/SEDGE	0	F		WITH CALF
517	19/06/1997	CLOUD	A	1053	A	NE OF RED LAKE	VIS	1127		C	F	10	F		
518	19/06/1997	CLOUD	A	1104	EE	S CRISS - HELLER CR.	VIS	1100	N	C/D	AT/F/P	80	F		NO CALF?
519	19/06/1997	CLOUD	A	1125	DD	CRISS KNOB	VIS	1220	W	M	AT/SEDGE	5	F		NO CALF
520	19/06/1997	CLOUD	A	1130	R	TSINTSUNKO CR.	VIS	1585		M	S/SEDGE	0	F		WITH CALF
521	19/06/1997	CLOUD	A	1142	UNK F	TSINTSUNKO CR.	VIS	1615		C	S/P	60	T		NO CALF
522	19/06/1997	CLOUD	A	1143	I	TSINTSUNKO CR.	VIS	1615		C	S/P	60	T		NO CALF
523	19/06/1997	CLOUD	A	1153	GG	CRISS S PLATEAU	VIS	1280	N	C	P	40	T		NO CALF
524	19/06/1997	CLOUD	A	1158	C	CRISS S PLATEAU	VIS	1220	N	C	P	40	F		FEEDING ON SHRUBBERY
525	19/06/1997	CLOUD	A	1205	S	DMC NW OF LOOP	VIS	1220	S	C/D	AT/P	30	F		NO CALF
526	19/06/1997	CLOUD	A	1211	Q	DMC W OF LOOP ON RIVER	VIS	1160		W	W	40	F		WITH CALF
527	19/06/1997	CLOUD	A	1300	AA	SE OF UREN	VIS	1220	S	C	P	35	F		6 INCH ANTLER/STILL LIGHT COAT
528	19/06/1997	CLOUD	A	1306	II	E OF DUCK LAKE	VIS	1160	W	M	AQUATICS	10	F		
529	19/06/1997	CLOUD	A	1316	HH	E OF UREN	VIS	1220	E	C/D	P/AT/F	40	F		
530	19/06/1997	CLOUD	A	1311	UNK M	JOE ROSS	VIS	1190	N	C/D	P/AT	40	T		
531	19/06/1997	CLOUD	A	1319	UNK	JOE ROSS	VIS	1190		M	S/SEDGE	0	F		
532	19/06/1997	CLOUD	A	1320	UNK F	JOE ROSS	VIS	1190		M	S/SEDGE	0	F		WITH CALF
533	19/06/1997	CLOUD	A	1322	UNK F	MEADOW E OF LASTCOURSE	VIS	1250		M	S/SEDGE	10	F		WITH CALF
534	19/06/1997	CLOUD	A	1323	W	S OF SCOTT LAKE	VIS	1220		M	S/SEDGE	20	F		WITH CALF; MEADOW EDGE
535	19/06/1997	CLOUD	A	1326	UNK F	S OF SCOTT LAKE	VIS	1220		M	AQUATICS	0	F		
536	19/06/1997	CLOUD	A	1335	K	JOE ROSS	SIG	1250	N	C/D	P/AT	75			
537	19/06/1997	CLOUD	A	1349	U	NE EDGE OF LILY CUTBLOCK	VIS	1310		C	S/P	70	F		NICE RACK
538	19/06/1997	CLOUD	A	1357	T	LARGE MEADOW N OF 'SHOVEL'	VIS	1280		M	S/SEDGE	5	F		WITH CALF
539	25/06/1997	HIGH CLOUD	A	1328	A	NE OF RED LAKE	SIG	1100	N	C	P/F	70	F		
540	25/06/1997	HIGH CLOUD	A	1335	EE	N OF GISBORNE	VIS	1310	N	C	P	40	B		NO CALF
541	25/06/1997	HIGH CLOUD	A	1351	GG	CRISS S PLATEAU	VIS	1160		C	S/P	40	T		NO CALF
542	25/06/1997	HIGH CLOUD	A	1354	R	TSINTSUNKO CR.	VIS	1615		M	S/SEDGE	0	F		WITH CALF
543	25/06/1997	HIGH CLOUD	A	1415	I	TSINTSUNKO CR.	VIS	1615		C	S	60	T		
544	25/06/1997	HIGH CLOUD	A	1405	UNK F	MEADOW W OF TSINTSUNKO LK.	VIS	1585		M	S/SEDGE	0	F		WITH CALF
545	25/06/1997	HIGH CLOUD	A	1426	DD	CRISS S PLATEAU	VIS	1432		C/D	P/AT	65	F		NO CALF
546	25/06/1997	HIGH CLOUD	A	1433	C	CRISS S PLATEAU	VIS	1432	N	C	P	20	F		
547	25/06/1997	HIGH CLOUD	A	1443	S	UPPER DMC	VIS	1220		W	W	10	F		NO CALF
548	25/06/1997	HIGH CLOUD	A	1445	UNK F	E OF X-J ON RIVER	VIS	1160		W	W	20	F		WITH CALF ON RIVER
549	25/06/1997	HIGH CLOUD	A	1508	Q	E OF X-J ON RIVER	VIS	1160		W	W	0	F		WITH CALF
550	25/06/1997	HIGH CLOUD	A	1510	T	S OF MT. SWIMM	VIS	1190	N	M	S/SEDGE	0	F		WITH CALF
551	25/06/1997	HIGH CLOUD	A	1516	U	E OF DUCK LAKE	VIS	1160	N	C/D	AT/P	20	F		
552	25/06/1997	HIGH CLOUD	A	1520	II	W OF X-J	VIS	1190	E	C/D	AT/P	40	T		

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
553	25/06/1997	HIGH CLOUD	A	1524	HH	JOE ROSS	VIS	1190	S	C	P	10	T		CUTBLOCK REGEN
554	25/06/1997	HIGH CLOUD	A	1532	AA	SE OF LASTCOURSE	VIS	1250	N	C	P	50	T		
555	25/06/1997	HIGH CLOUD	A	1542	W	W OF LASTCOURSE	VIS	1220		C	P	65	F		WITH CALF
556	25/06/1997	HIGH CLOUD	A	1602	K	UPPER DMC W OF ELBOW LK.	VIS	1371	S	C	P/S	80	T		
557	03/07/1997	HIGH CLOUD	A	1346	A	NE RED LAKE	VIS	1100	N	C	F	50	B		SLEEK COAT
558	03/07/1997	HIGH CLOUD	A	1359	EE	CRISS - W OF FINGER	VIS	1065	N	C/D	F/AT	80	F		
559	03/07/1997	HIGH CLOUD	A	1408	GG	MOW CR.	VIS	1495	N	C	P	40	F		
560	03/07/1997	HIGH CLOUD	A	1416	I	TSINTSUNKO CR.	VIS	1615		C	S	50	F		
561	03/07/1997	HIGH CLOUD	A	1420	R	JUST W OF TSINTSUNKO LAKE	VIS	1615		M	S/SEDGE	0	F		WITH CALF
562	03/07/1997	HIGH CLOUD	A	1435	C	CRISS S PLATEAU	VIS	1370	N	C	P	35	F		
563	03/07/1997	HIGH CLOUD	A	1445	DD	CRISS S PLATEAU	VIS	1370		WATER	AQUATICS	0	F		NO CALF
564	03/07/1997	HIGH CLOUD	A	1450	S	UPPER DMC	VIS	1125		W	W	75	F		NEW CALF
565	03/07/1997	HIGH CLOUD	A	1502	Q	S X-J	VIS	1160	N	C/D	P/AT	35	F		WITH CALF; HEALTHY
566	03/07/1997	HIGH CLOUD	A	1525	II	E OF DUCK LAKE	VIS	1125	N	C/D	P/AT	30	T		
567	03/07/1997	HIGH CLOUD	A	1534	HH	JOE ROSS CREEK	VIS	1160	N	C/D	P/AT	50	T		
568	03/07/1997	HIGH CLOUD	A	1542	AA	SE OF LASTCOURSE	VIS	1250		C/D	P/AT	70	F		
569	03/07/1997	HIGH CLOUD	A	1547	W	JUST W OF LASTCOURSE LAKE	VIS	1190		M	S/AT/SEDGE	10	F		WITH CALF; 100M OFF ROAD
570	03/07/1997	HIGH CLOUD	A	1559	K	UPPER JOE ROSS - N OF TULERIC	VIS	1310		C	P	40	F		
571	03/07/1997	HIGH CLOUD	A	1605	T	SHOVEL' MEADOW	VIS	1250		M	S/SEDGE	10	F		WITH CALF
572	03/07/1997	HIGH CLOUD	A	1626	U	N OF WILLOWGROUSE	VIS	1465		C	P	25	F		
573	03/07/1997	HIGH CLOUD	A	1630	UNK	SW OF SHELLY LAKE	VIS	1585		M	S/SEDGE	0	F		WITH CALF
574	16/07/1997	HIGH CLOUD	A	1338	A	NE OF RED LAKE	VIS	1100		C	F	70	F		NICE RACK
575	16/07/1997	HIGH CLOUD	A	1421	EE	HELLER CREEK	VIS	1250	E	H2O	AQUATICS	20	F		EDGE OF SWAMP
576	16/07/1997	HIGH CLOUD	A	1430	GG	MOW CREEK	SIG	1495	N	C	S/P	80	F		
577	16/07/1997	HIGH CLOUD	A	1439	I	JUST W OF TSINTSUNKO LAKE	VIS	1615		C	S/F	80	F		NO CALF
578	16/07/1997	HIGH CLOUD	A	1446	R	JUST W OF TSINTSUNKO LAKE	SIG	1615		C	S/F	85	F		
579	16/07/1997	HIGH CLOUD	A	1458	C	NW OF BEAVERHUT LAKE	SIG	1465		C	P/F	65	F		IN SHRUBS
580	16/07/1997	HIGH CLOUD	A	1501	DD	CRISS S PLATEAU S OF KNOB	VIS	1370	N	C	P	45	F		IN SHRUBS
581	16/07/1997	HIGH CLOUD	A	1524	Q	DMC N OF LOOP	VIS	1220	S	C/D	P/AT	30	F		WITH CALF/EATING SHRUBS
582	16/07/1997	HIGH CLOUD	A	1531	II	X-J	VIS	1125		W	W	20	F		RACK COMING ALONG
583	16/07/1997	HIGH CLOUD	A	1531	S	DMC ON RIVER E OF X-J	VIS	1125		W	W	20	F		CALF GONE/FORAGING ON WILLOW
584	16/07/1997	HIGH CLOUD	A	1548	HH	S OF LASTCOURSE	VIS	1190	S	C	P	35	T		
585	16/07/1997	HIGH CLOUD	A	1556	W	SE OF LASTCOURSE	VIS	1190		C	P	60	F		CALF TURNED DARKER BROWN/EDGE OF CUTBLOCK
586	16/07/1997	HIGH CLOUD	A	1605	AA	SE OF LASTCOURSE	VIS	1250	W	C/D	P/AT	30	T		
587	16/07/1997	HIGH CLOUD	A	1618	U	S OF WILLOWGROUSE	VIS	1465	N	C	P	40	F		
588	16/07/1997	HIGH CLOUD	A	1627	T	UPPER DEADMAN	VIS	1250	N	C/D	P/AT	50	T		WITH CALF
589	24/07/1997	CLOUD	A	1245	A	WATCHING CREEK	VIS	1493	SE	C	P	10	B		CUTBLOCK REGENERATION; BEDDED IN GROUPING OF DECIDUOUS SHRUB
590	24/07/1997	CLOUD	A	959	EE	CRISS - S OF FINGER	VIS	1220	NE	C/D	F/AT	80	T		
591	24/07/1997	CLOUD	A	1011	GG	PORCUPINE - MOW CREEK	VIS	1706	NE	C	S/F	70	F		NO CALF
592	24/07/1997	CLOUD	A	1020	C	NW OF TSINTSUNKO LAKE	VIS	1798		C	S/P	40	F		
593	24/07/1997	CLOUD	A	1030	I	SW OF TSINTSUNKO LAKE	VIS	1828	N	C	S/P	35	F		
594	24/07/1997	CLOUD	A	1033	R	SW OF TSINTSUNKO LAKE	VIS	1737		M	S/SEDGE	0	F		WITH CALF
595	24/07/1997	CLOUD	A	1050	DD	CRISS S PLATEAU SE OF KNOB	VIS	1432	NE	C	P/F	20	F		
596	24/07/1997	CLOUD	A	1055	T	UPPER DMC - S SIDE OF RIVER	VIS	1188		M	S/SEDGE	5	F		WITH CALF
597	24/07/1997	CLOUD	A	1100	S	UPPER DMC - S SIDE OF RIVER	VIS	1160		M	S/SEDGE	5	F		WITH CALF
598	24/07/1997	CLOUD	A	1105	UNK F	SE OF DUCK LAKE	VIS	1125	N	C/D	AT/P	15	F		WITH CALF
599	24/07/1997	CLOUD	A	1111	U	E OF DUCK LAKE	VIS	1125	N	C/D	AT/F	15	F		
600	24/07/1997	CLOUD	A	1136	II	JUST S OF LILY LAKE	VIS	1310	S	C	P/F	15	F		
601	24/07/1997	CLOUD	A	1147	Q	E OF DUCK LAKE	VIS	1125		C/D	AT/P	50	F		WITH CALF
602	24/07/1997	CLOUD	A	1200	HH	SE OF LASTCOURSE	VIS	1280	SW	C	P	50	T		
603	24/07/1997	CLOUD	A	1148	UNK M	JOE ROSS CREEK S	VIS	1250	W	C	P	0	T		CUTBLOCK REGENERATION
604	24/07/1997	CLOUD	A	1211	W	JUST S OF SCOT LAKE	VIS	1220	W	C	P	50	B		WITH CALF; BEDDED DOWN, CALF STANDING
605	24/07/1997	CLOUD	A	1220	K	S OF BONAPARTE	VIS	1310	N	C	P	50	F		
606	24/07/1997	CLOUD	A	1231	AA	SE OF LASTCOURSE	VIS	1250	N	C	P	50	F		
607	31/07/1997	CLEAR	A	936	A	WATCHING CREEK	VIS	1463	S	C/D	F/SHRUB	65	B		REGEN
608	31/07/1997	CLEAR	A	942	R	PORCUPINE - MOW CREEK	VIS	1767		M	S/SEDGE	0	F		DID NOT SEE CALF
609	31/07/1997	CLEAR	A	953	I	W PORCUPINE	VIS	1798		C	F/S	50	F		REGEN
610	31/07/1997	CLEAR	A	1000	C	NW OF TSINTSUNKO LAKE	SIG	1615	W	C	F/S	70	F		
611	31/07/1997	CLEAR	A	955	UNK M	NW OF TSINTSUNKO LAKE	VIS	1615	E	C	F/S	0	F		CUTBLOCK
612	31/07/1997	CLEAR	A	1307	GG	W PORCUPINE	SIG	1645	N	C	F/S	60	F		MEADOW EDGE
613	31/07/1997	CLEAR	A	1016	EE	CRISS E OF FINGER	VIS	1158	NW	C	F/P	50	B		REGEN
614	31/07/1997	CLEAR	A	1026	Q	S X-J W OF FATOX	VIS	1158	NW	C/D	P/AT	30	F		WITH CALF; PLUNGED INTO LAKE
615	31/07/1997	CLEAR	A	1018	UNK M	W OF LILY LAKE	VIS	1280		M	S/SEDGE	5	F		
616	31/07/1997	CLEAR	A	1030	II	JERRY HILL SE	VIS	1188	N	C/D	AT/P	20	T		
617	31/07/1997	CLEAR	A	1043	HH	JOE ROSS CR. N	VIS	1188	S	C	P	25	T		
618	31/07/1997	CLEAR	A	1048	AA	SE OF LASTCOURSE	VIS	1188	N	C	P	30	T		
619	31/07/1997	CLEAR	A	1053	W	S OF LASTCOURSE	VIS	1188	N	C	P	40	B		WITH CALF
620	31/07/1997	CLEAR	A	1103	K	E OF ISLAND	VIS	1432	S	M	SEDGE	0	F		
621	31/07/1997	CLEAR	A	1112	S	UPPER DMC	VIS	1158		W	W	10	F		WITH CALF

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
622	31/07/1997	CLEAR	A	1200	T	UPPER DMC	VIS	1249	NW	C	P	30	F		.334; DID NOT SEE CALF
623	31/07/1997	CLEAR	A	1244	U	SHOVEL' MEADOW	VIS	1249		W	W	15	F		
624	31/07/1997	CLEAR	A	1316	DD	CRISS KNOB	VIS	1371		WATER	P/SEDGE	5	F		FINE TUNE TO .5257
625	28/08/1997	HIGH CLOUD	A	1258	A	WATCHING CREEK	VIS	1463	S	C	S	80	F		LOSING VELVET
626	28/08/1997	HIGH CLOUD	A	1315	R	UPPER CRISS	SIG	1432	N	C	P	40	B		NO SIGHTING; DID NOT SEE CALF
627	28/08/1997	HIGH CLOUD	A	1333	DD	CRISS S PLATEAU	VIS	1463	N	C	P	35	T		
628	28/08/1997	HIGH CLOUD	A	1340	EE	CRISS E OF FINGER	VIS	1249	N	C	P	25	B		
629	28/08/1997	HIGH CLOUD	A	1352	U	NW OF 'SHOVEL' MEADOW	VIS	1249		C	P/S	20	F		THICK SPRUCE
630	28/08/1997	HIGH CLOUD	A	1359	Q	S X-J	VIS	1158		D	AT	15	F		DID NOT SEE CALF
631	28/08/1997	HIGH CLOUD	A	1402	II	E X-J	VIS	1158		C/D	P/AT	5	F		
632	28/08/1997	HIGH CLOUD	A	1409	UNK F	JOE ROSS CREEK N	VIS	1188	N	C	P	0	F		CUTBLOCK
633	28/08/1997	HIGH CLOUD	A	1411	HH	JOE ROSS CREEK N	VIS	1188	N	C	P	30	T		
634	28/08/1997	HIGH CLOUD	A	1418	AA	JOE ROSS CREEK N	VIS	1188	N	C	P	25	F		WITH ANOTHER YOUNG BULL
635	28/08/1997	HIGH CLOUD	A	1425	W	S OF LASTCOURSE	VIS	1188		C	P	35	B		WITH CALF
636	28/08/1997	HIGH CLOUD	A	1436	K	S BONAPARTE	VIS	1310	N	C/D	P/SHRUB	15	F		
637	28/08/1997	HIGH CLOUD	A	1451	S	UPPER DMC	VIS	1188		C/D	P/AT	30	F		WITH CALF? (BEHAVIOR INDICATES); YEARLING COW ABOUT
638	28/08/1997	HIGH CLOUD	A	1456	UNK F	UPPER DMC	VIS	1188		C	P	30	F		YEARLING COW
639	28/08/1997	HIGH CLOUD	A	1507	T	UPPER DMC	VIS	1188	N	C	P	10	F		EDGE OF SMALL SWAMP; DID NOT SEE CALF
640	28/08/1997	HIGH CLOUD	A	1522	GG	S OF TSINTSUNKO CREEK	VIS	1767	N	C	S	40	T		
641	28/08/1997	HIGH CLOUD	A	1529	I	S OF TSINTSUNKO CREEK	VIS	1767	N	C	S	40	T		
642	28/08/1997	HIGH CLOUD	A	1534	UNK	PORCUPINE RIDGE	VIS	1554		M	SEDGE	0	F		
643	25/09/1997	HIGH CLOUD	A	910	GG	S OF BEAVERHUT - NW OF CARLO	VIS	1520		C	S/F	60	T		
644	25/09/1997	HIGH CLOUD	A	923	I	TSINTSUNKO CR.	VIS	1554		C	P/F	70	T		
645	25/09/1997	HIGH CLOUD	A	929	DD	TSINTSUNKO CR.	VIS	1463		C	P	60	F		30 M TO WILLOW ON CREEK
646	25/09/1997	HIGH CLOUD	A	932	R	TSINTSUNKO CR.	VIS	1386		C	P	60	F		100 M TO MEADOW; WITH CALF?
647	25/09/1997	HIGH CLOUD	A	950	K	S OF BONAPARTE	VIS	1371	N	C/D	P/AT	30	T		30 M TO SWAMP
648	25/09/1997	HIGH CLOUD	A	1002	W	JUST W OF LASTCOURSE LAKE	VIS	1220	N	C	P	50	F		50 M TO LAKE; WITH CALF
649	25/09/1997	HIGH CLOUD	A	1013	AA	N JOE ROSS CREEK	VIS	1220		C	P	35	T		
650	25/09/1997	HIGH CLOUD	A	1019	HH	W SIDE OF UREN LAKE	VIS	1188	N	C/D	AT/P	35	F		WITH COW
651	25/09/1997	HIGH CLOUD	A	1112	II	S X-J	SIG	1127	N	C/D	P/AT	30	T		
652	25/09/1997	HIGH CLOUD	A	1023	UNK F	W SIDE OF X-J MEADOW	VIS	1127		W	W	2	F		
653	25/09/1997	HIGH CLOUD	A	1045	S	N UPPER DMC	VIS	1250		C/D	P/AT	90	F		WITH BULL (3-4 YR.); REGEN Fd
654	25/09/1997	HIGH CLOUD	A	1055	T	UPPER DMC S	VIS	1250		C	P	20	F		WITH BULL (5 YR.)
655	25/09/1997	HIGH CLOUD	A	1100	Q	W SIDE OF FATOX	VIS	1127		C/D	P/AT	20	F		WITH BULL (3-4 YR.)
656	25/09/1997	HIGH CLOUD	A	1128	U	N CRISS	VIS	1280		C	P/F	65	F		WITH COW
657	25/09/1997	HIGH CLOUD	A	1135	EE	W OF FINGER	VIS	1127		C/D	P/AT	40	F		WITH BULL (3-4 YR.)
658	23/10/1997	OVERCAST	A	1233	UNK	POND S CRISS	VIS	1463		M	SEDGE/AT	5	F		BULL/2 COWS
659	23/10/1997	OVERCAST	A	1240	EE	E OF FINGER	VIS	1097		C/D	P/AT	2	F		PRIVATE LOGGING CUTBLOCK
660	23/10/1997	OVERCAST	A	1253	U	S OF JERRY HILL	VIS	1249		C/D	P/S/AT	75	F		
661	23/10/1997	OVERCAST	A	1305	AA	S JOE ROSS	VIS	1249		C/D	P/AT	50	F		
662	23/10/1997	OVERCAST	A	1304	UNK F	S JOE ROSS	VIS	1249		C/D	P/AT	10	F		STRIPPING BARK
663	23/10/1997	OVERCAST	A	1313	W	E OF LASTCOURSE	VIS	1188		C	P/S	80	F		WITH CALF
664	23/10/1997	OVERCAST	A	1320	K	S BONAPARTE	VIS	1341		C	P	80	F		
665	23/10/1997	OVERCAST	A	1332	HH	S OF UREN LAKE	VIS	1160		C	P	70	F		
666	23/10/1997	OVERCAST	A	1337	T	UPPER DMC S OF RIVER	VIS	1341		C	P	70	T		NO CALF
667	23/10/1997	OVERCAST	A	1335	UNK F	UPPER DMC S OF RIVER	VIS	1341		C/D	P/AT	50	B		WITH CALF
668	23/10/1997	OVERCAST	A	1340	Q	UPPER DMC S OF RIVER	VIS	1341		C/D	P/AT	10	T		NO CALF
669	23/10/1997	OVERCAST	A	1348	DD	W OF DOUGHNUT	VIS	1310		C/D	P/AT	70	T		WITH ANOTHER COW/2 BULLS
670	19/11/1997	HIGH OVERCAST	A	1231	A	WATCHING CREEK	VIS	1493	S	C	F	50	F	<	EDGE OF CUTBLOCK
671	19/11/1997	HIGH OVERCAST	A	1235	UNK	PORCUPINE RIDGE	VIS	1615	N	C	S	20	T	<	2 BULLS; 1 YOUNG, 1 OLDER
672	19/11/1997	HIGH OVERCAST	A	1239	I	PORCUPINE RIDGE	VIS	1615		C	S	30	T	<	
673	19/11/1997	HIGH OVERCAST	A	1246	DD	NW OF TSINTSUNKO LAKE	VIS	1463		M	S/SEDGE	15	T	<	
674	19/11/1997	HIGH OVERCAST	A	1252	K	S BONAPARTE	VIS	1463	N	C	P	30	F	<	2 COWS WITH 'K'; IN AREA - 5 OTHER COWS AND 1 YOUNG BULL
675	19/11/1997	HIGH OVERCAST	A	1305	W	N OF SCOT LAKE	VIS	1280	S	C	P	20	B	<	WITH CALF
676	19/11/1997	HIGH OVERCAST	A	1307	UNK	E OF LASTCOURSE	VIS	1249		M	S/SEDGE	2	F	<	BULL AND COW
677	19/11/1997	HIGH OVERCAST	A	1308	UNK	E OF LASTCOURSE	VIS	1249		M	S/SEDGE	2	F	<	3 BULLS
678	19/11/1997	HIGH OVERCAST	A	1311	HH	E OF LASTCOURSE	VIS	1249		C	P	50	T	<	
679	19/11/1997	HIGH OVERCAST	A	1315	UNK F	N OF DEADMAN	VIS	1188	S	C/D	AT/P	10	F	<	
680	19/11/1997	HIGH OVERCAST	A	1320	T	DMC S OF LOOP	VIS	1188	N	C/D	S/AT	5	F	<	WITH ANOTHER COW
681	19/11/1997	HIGH OVERCAST	A	1330	GG	SHOVEL' LAKE AREA	VIS	1280		M	S/SEDGE	0	F	<	WITH ANOTHER COW
682	19/11/1997	HIGH OVERCAST	A		EE	LOWER CRISS	VIS	1097		C	P	2	X	<	MORTALITY - COLLAR RETRIEVED (TOOTH AGE - 3)
683	17/12/1997	HIGH SCATTERED CLOUD	A	955	UNK	PORCUPINE RIDGE	VIS	1615	N	M	S/SEDGE	0	B	<	COW WITH M CALF
684	17/12/1997	HIGH SCATTERED CLOUD	A	957	GG	ORCUPINE RIDGE W OF TSINTSUNK	VIS	1463	N	C	P/S	5	F	<	WITH COW & BULL; CUTBLOCK
685	17/12/1997	HIGH SCATTERED CLOUD	A	1000	DD	SE OF BEAVERHUT LAKE	VIS	1520	N	M	S/SEDGE	5	B	<	
686	17/12/1997	HIGH SCATTERED CLOUD	A	1009	UNK F	TSINTSUNKO CR.	VIS	1463	N	C	P		F	<	
687	17/12/1997	HIGH SCATTERED CLOUD	A	1016	I	SW OF TSINTSUNKO	VIS	1463	N	C	S	70	F	<	WITH 2 OTHERS (COW AND YRL?); EDGE OF CUTBLOCK
688	17/12/1997	HIGH SCATTERED CLOUD	A	1025	R	ORCUPINE RIDGE W OF TSINTSUNK	VIS	1463	N	C	S	75	B	<	NO CALF
689	17/12/1997	HIGH SCATTERED CLOUD	A	1029	UNK F	W OF TSINTSUNKO	VIS	1463	N	M	S/SEDGE	0	B	<	COW WITH CALF
690	17/12/1997	HIGH SCATTERED CLOUD	A	1030	K	BONAPARTE	SIG	1463		C	P			<	

Loc #	Date	Weather	Survey type	Time	Moose I.D.	Map Location	Loc type	Elevation (m)	Aspect	Habitat type	Veg types	Canopy cover	Activity	Snow/sink depth	Comments
691	17/12/1997	HIGH SCATTERED CLOUD	A	1046	W	S OF SCOT LAKE	VIS	1280	S	C	P	40	F	<	COW WITH CALF & 2 BULLS
692	17/12/1997	HIGH SCATTERED CLOUD	A	1100	UNK F	NW OF LASTCOURSE	VIS	1188	N	M	S/SEDGE	2	F	<	
693	17/12/1997	HIGH SCATTERED CLOUD	A	1105	HH	E OF LASTCOURSE	VIS	1249	S	C	P	45	T	<	SHED ANTLERS
694	17/12/1997	HIGH SCATTERED CLOUD	A	1113	AA	E JOE ROSS	VIS	1249	W	C	P/S	50	F	<	WITH 2 OTHERS (COW & ?); CUTBLOCK EDGE
695	17/12/1997	HIGH SCATTERED CLOUD	A	1122	Q	N DEADMAN	VIS	1188		C/D	P/AT	10	F	<	NO CALF
696	17/12/1997	HIGH SCATTERED CLOUD	A	1120	UNK F	N DEADMAN	VIS	1188		M	S/SEDGE	0	F	<	
697	17/12/1997	HIGH SCATTERED CLOUD	A	1120	UNK F	N DEADMAN	VIS	1188		C/D	AT/P	10	F	<	
698	17/12/1997	HIGH SCATTERED CLOUD	A	1126	S	N DEADMAN	VIS	1188	S	C/D	P/AT	25	F	<	NO CALF
699	17/12/1997	HIGH SCATTERED CLOUD	A	1135	T	NW OF LILY LAKE	VIS	1280		C	P		F	<	
700	17/12/1997	HIGH SCATTERED CLOUD	A	1335	A	WATCHING CREEK	VIS	1493	S	C	P REGEN	0	F	<	
701	17/12/1997	HIGH SCATTERED CLOUD	A	1336	UNK F	WATCHING CREEK	VIS	1493	S	C	P REGEN	0	F	<	COW WITH CALF
702	13/01/1998	HIGH OVERCAST	A	1300	UNK	PORCUPINE RIDGE	VIS			C	S REGEN	0	F	<	2 ANIMALS IN CUTBLOCK
703	13/01/1998	HIGH OVERCAST	A	1308	UNK	S OF MOOSE LAKE	VIS			C	S REGEN	0	F	<	CUTBLOCK
704	13/01/1998	HIGH OVERCAST	A	1317	UNK	S BONAPARTE	VIS			M	S/SEDGE	0	B	<	2 ANIMALS
705	13/01/1998	HIGH OVERCAST	A	1321	K	S BONAPARTE	VIS			C	S	80	B	<	SHED ANTLERS
706	13/01/1998	HIGH OVERCAST	A	1326	W	S OF LASTCOURSE	VIS			C	P	5	F	<	WITH CALF IN CUTBLOCK
707	13/01/1998	HIGH OVERCAST	A	1328	UNK	N JOE ROSS CREEK	VIS			C	P	5	F	<	CUTBLOCK
708	13/01/1998	HIGH OVERCAST	A	1334	HH	NE OF UREN LAKE	VIS		S	C/D	P/AT	20	T	<	
709	13/01/1998	HIGH OVERCAST	A	1335	UNK	NE OF UREN LAKE	VIS			C/D	P/AT	20	T	<	2 ANIMALS
710	13/01/1998	HIGH OVERCAST	A	1341	AA	UPPER DMC	VIS			C	P REGEN	0	B	<	3 ANIMALS IN CUTBLOCK - AA SMALL ANTLERS; OTHER WITH 1 SPIKE ON LEFT SIDE; 1 COLLAR NOT FUNCTIONING (UNSURE OF M OR F; LIKELY M)
711	13/01/1998	HIGH OVERCAST	A	1342	UNK	UPPER DMC ON RIVER	VIS			W	W	0	F	<	2 YEARLINGS
712	13/01/1998	HIGH OVERCAST	A	1343	S	UPPER DMC N	VIS			C/D	P/AT	25	F	<	2 COWS
713	13/01/1998	HIGH OVERCAST	A	1352	Q	S X-J	VIS			C/D	P/AT	20	F	<	2 COWS WITH 1 YEARLING CALF
714	13/01/1998	HIGH OVERCAST	A	1350	UNK	X-J WILLOW WEST	VIS			W	W	0	F	<	
715	13/01/1998	HIGH OVERCAST	A	1405	UNK	SHOVEL MEADOW	VIS			M	S/SEDGE	5	B	<	
716	13/01/1998	HIGH OVERCAST	A	1410	UNK	E OF FATOX LAKE	VIS			C/D	P/AT	20	F	<	
717	13/01/1998	HIGH OVERCAST	A	1410	UNK M	E OF FATOX LAKE	VIS			C/D	P/AT	20	F	<	
718	13/01/1998	HIGH OVERCAST	A	1415	T	E OF FATOX LAKE	VIS			C/D	P/AT	50	T	<	
719	13/01/1998	HIGH OVERCAST	A	1418	UNK	N CRISS	VIS			C/D	P/AT	15	B	<	
720	13/01/1998	HIGH OVERCAST	A	1420	R	CRISS CREEK W OF KULTOX	VIS			M	S/SEDGE	20	F	<	MEADOW EDGE
721	13/01/1998	HIGH OVERCAST	A	1424	GG	CRISS VALLEY FLOOR	VIS			M	S/SEDGE	20	F	<	MEADOW EDGE
722	13/01/1998	HIGH OVERCAST	A	1425	UNK	CRISS VALLEY FLOOR	VIS			C	P	20	F	<	2 COWS & 1 BULL
723	13/01/1998	HIGH OVERCAST	A	1430	I	UPPER CRISS S	VIS			C	P	50	F	<	4 COWS & 1 YEARLING
724	13/01/1998	HIGH OVERCAST	A	1432	DD	UPPER CRISS N	VIS			C	P	50	F	<	3 COWS
725	13/01/1998	HIGH OVERCAST	A	1511	A	WATCHING CREEK	VIS			C	P REGEN	0	F	<	CUTBLOCK; COW JUST S OF 'A'

APPENDIX 3. PREFER Preference Assessment Software – Habitat use/availability analysis

PREFER calculation results for input file: moose.pdt

Average difference in ranks for components:

Component	Tbar	Rank
Mixed	-1.411765	1
Willow	-0.264706	2
Meadow	0.176471	3
Conifer	0.676471	4
Aquatic	0.823529	5

Test of ho: all components are equally preferred:

F (4, 13) = 6.63278

Critical value for the Waller-Duncan procedure with K = 100 is:

W = 2.18 (alpha approximating .05)

I	K		Variance Covariance	Difference in Mean Rank	Absolute Standard Difference	Sigma Inverse
Conifer	Conifer		1.12316	0.00000	0.00000	2.14087
Mixed	Conifer	SIG	-0.46967	-2.08824	4.20383	1.32423
Mixed	Mixed		2.13235	0.00000	0.00000	1.63286
Meadow	Conifer		0.06066	-0.50000	1.44648	1.46530
Meadow	Mixed	SIG	-0.57904	1.58824	3.15068	1.63673
Meadow	Meadow		1.02941	0.00000	0.00000	2.82416
Willow	Conifer		-0.49724	-0.94118	2.05704	1.75263
Willow	Mixed	SIG	-0.55331	1.14706	2.18615	1.64851
Willow	Meadow		-0.49724	-0.44118	0.97719	2.10836
Willow	Willow		1.44118	0.00000	0.00000	2.65893
Aquatic	Conifer		-0.21691	0.14706	0.40774	0.00000
Aquatic	Mixed	SIG	-0.53033	2.23529	4.69866	0.00000
Aquatic	Meadow		-0.01379	0.64706	2.03936	0.00000
Aquatic	Willow	SIG	0.10662	1.08824	3.27037	0.00000
Aquatic	Aquatic		0.65441	0.00000	0.00000	0.00000

APPENDIX 4. Home Range Estimates (Calhome – 100% MCP)

				Home range size (km^2)				
Animal	*Sex*	*Approx.*	*Migratory*	*Annual*	*Winter*	*Summer*	*Spring*	*Autumn*
I.D.		*Age*	*status*					
A	M	10	Migratory	139.8	32.8	31.3	96.9	n/a
C	M	15	Migratory	61.8	5.7	16.6	29.3	n/a
AA	M	4	Resident	60.5	32.3	9.3	7.4	28.3
HH	M	9	Resident	13.8	n/a	n/a	7.2	n/a
II	M	9	?	49.6	n/a	n/a	30.5	n/a
K	M	11	Migratory	48.0	5.3	n/a	33.5	3.8
U	M	9	Migratory	111.5	n/a	35.6	2.0	n/a
D	M	8	?	54.4	n/a	n/a	n/a	n/a
			Mean	**67.4**	**19.0**	**23.2**	**29.5**	**16.1**
			Mean (migratory)	**90.3**	**14.6**	**27.8**	**40.4**	**n/a**
			Mean (resident)	**37.15**	**n/a**	**n/a**	**7.3**	**n/a**
X	F	9	?	10.7	n/a	n/a	n/a	n/a
Z	F	3	?	15.8	n/a	n/a	n/a	n/a
O	F	16	?	31.9	n/a	n/a	n/a	n/a
DD	F	7	Migratory	154.5	47.9	30.8	67.8	6.3
EE	F	2	Resident	26.6	1.5	5.4	16.0	n/a
GG	F	Adult	Migratory	151.3	18.0	1.8	16.0	n/a
I	F	12	Migratory	48.2	22.8	n/a	16.9	n/a
Q	F	13	Resident	10.9	3.6	n/a	1.9	n/a
R	F	13	Migratory	235.1	125.8	9.1	85.1	n/a
S	F	12	Resident	56.1	18.5	2.9	4.0	n/a
T	F	7	Resident	19.6	8.2	1.4	13.7	n/a
W	F	8	Migratory	109.8	19.5	n/a	25.9	n/a
			Mean	**72.5**	**29.5**	**8.6**	**27.5**	**n/a**
			Mean (migratory)	**139.8**	**46.8**	**13.9**	**42.3**	**n/a**
			Mean (resident)	**28.3**	**7.95**	**3.2**	**8.9**	**n/a**

Cairns, A.L. and E.S. Telfer. 1980. Habitat use by 4 sympatric ungulates in boreal mixedwood forest. Journal of Wildlife Management. 44(4): 849-857.

Abstract: Habitat use by moose (*Alces alces*), wapiti (*Cervus canadensis*), white-tailed deer (*Odocoileus virginianus*), and bison (*Bison bison*) during 1972-73 was investigated in a fenced national park. Ungulates differed in use of habitat types in terms of time spent and kinds of winter activity. Bison and wapiti strongly selected upland grassland at all seasons. Moose preferred shrubland, and sedge meadow was a close second during spring and summer. Deer preferred shrub meadow in spring, summer, and, to a lesser extent, winter, when dense aspen (*Populus tremuloides*) forest was selected equally. Habitats selected for activity were not always those in which the most time was spent. Between 1948 and 1972, proportions of habitat types on the park showed a 10% decrease in shrub meadow; minor increases occurred in water area due to beavers (*Castor canadensis*) and in several terrestrial habitats.

Cederlund, Göran and Henryk Okarma. 1988. Home range and habitat use of adult female moose. Journal of Wildlife Management. 52 (2) 336-343.

Abstract: We estimated home range size and habitat use of adult female moose (*Alces alces*) in Grimsö, Sweden. Fourteen adult moose (3-8 years old) were radiomarked and located from February 1982 through November 1985. Seasonal and annual home range sizes and habitat preferences were determined. Season home range size varied. Summer home ranges were almost 2x larger an winter ranges (9.1 vs. 4.9 km^2). summer ranges constituted >70% of annual home range. Home ranges overlapped a mean of >10% between all seasons. Annual home range averaged 12.6 km^2 and contained ≤2 core areas. Core areas represented a mean of 85% of all locations but only 50% of the total area. All annual home ranges overlapped with ≥1 home range of other females. Females preferred clearcuts and young and medium-aged forests. Mature stands and bogs were avoided by female moose.

Cederlund,G., R. Bergström and F. Sandegren. 1989. Winter activity patterns of females in two moose populations. Canadian Journal of Zoology 67: 1516-1522.

Data on activity patterns of nine radio-tagged female moose (*Alces alces*) in an area with a high level of nutrition (Grimsö) and seven radio-tagged female moose in an area with a low level of nutrition (Furudal) are presented. The study was done during January-May in 1982-1986 at Grimsö and in 1986 at Furudal, comprising 6063 and 4136 h of recording, respectively. The character of the radio signals allowed separation of active (any kind of body motion, mainly movements) and inactive (a motionless state, mainly in lying position) bouts. The 24-h activity pattern was similar between the two areas during all winter months. Active bouts showed a polyphasic pattern with prominent peaks around sunrise and sunset. The average active time per 24-h interval varied (30-50%) through the winter months, and increased rapidly in April and May. The average length of active bouts was similar in both areas during midwinter (60-70 min) but developed more rapidly in April and may among moose at Grimsö. The moose at Furudal rested for longer periods than those at Grimsö, and in both areas bouts became shorter towards spring (around 120 min). The moose at Grimsö kept the number of bouts per 24-h interval almost unchanged throughout winter (11.0-11.9), while the number consistently increased at Furudal (9.9-12.7 bouts per 24-h interval). Differences in activity pattern are discussed in relation to food availability and overbrowsing.

Danell, Kjell, Lars Edenius and Per Lundberg. 1991. Herbivory and tree stand composition: Moose patch use in winter. 1991. Ecology. 72(4): 1350-1357.

Abstract: Foraging decisions by large herbivores in a heterogeneous environment with several available plant species are a scale problem. If, for example, the foraging decisions primarily occur at the stand level, then stands of trees might be regarded as patches within a habitat of several stands over which intake rate is to be maximized. The food consumption within a stand should be in proportion to the availability of different food types. If, on the other hand, food selection occurs at the tree level within a stand, then the individual trees are regarded as "patches"; total stand exploitation should then be the result of foraging decisions made within the stand. We tested these two hypotheses in the field experiments in winter with free-ranging moose (*Alces alces*) having access to artificial stands of trees. In these stands Scots pine (*Pinus sylvestris*) was mixed with either aspen (*Populus tremula*) or alder (*Alnus incana*). In experiment A, where the total available pine biomass per stand was much greater than any of the additional species, total stand consumption did not differ between stand types. In experiment B, where pine biomass did not dominate to the same extent, pine+aspen stands were more heavily used than pine+pine and pine+alder

stands. The within-stand consumption of different species appeared to be nonrandom, i.e., the tree biomass was not consume in proportion to availability. The mean pine biomass consumption per tree did not differ between stand types in either experiment. We conclude that the food selection appears to occur primarily at the tree level within stands. The level of decision might also be important for the performance of the plant species exploited. The results from this study question the general validity of recent hypotheses regarding "associational protection" in plant communities. We suggest that the optimal patch us approach taken in this study might give better insight in these kinds of plant-animal interaction problems.

Gillingham, M.P. and D.R. Klein. 1992. Late-winter activity patterns of moose (*Alces alces gigas*) in western Alaska. Canadian Journal of Zoology 70: 293-299.

Activity patterns of free-ranging moose (*Alces alces gigas*) on the central Seward Peninsula were polyphasic but not highly synchronized among individuals from March through May 1987. Female-calf pairs, however, showed nearly identical activity patterns (92.6% of 2353 five-minute scans). Based on data collected between 06:00 and 24:00, we estimate that moose exhibit ~5 or 6 active bouts per 24-h period. Our direct observations of moose (980 moose-h) showed that moose were active 57.2% of the time from 06:00 to 24:00. Inactive bouts lasted ~2.5 times longer than active bouts. Calves tended to lie for longer ($x\pm$ SE = 165.7 ± 24.4 min) than adult females (143.1 ± 15.5 min) or males (109.0 ± 17.9 min). Time budgets for moose in late winter were intermediate between values reported in previous studies for moose in midwinter and late spring. Our data showed that moose spend much more time walking (8%) than previously reported. We think this reflects their use of snow-packed river and gravel bars as movement and feeding corridors. Direct observations of moose showed that many active and inactive bouts were less than 10 min in duration; these bouts are not detected by most telemetric systems. We also present evidence that without predation in winter, ambient conditions (e.g., operative temperature) may cause synchrony in the activity patterns of individual moose in northwestern Alaska.

Histol, T. and O. Hjeljord. 1983. Winter feeding strategies of migrating and nonmigrating moose. Canadian Journal of Zoology. 71: 141-1428.

Abstract: We recorded forage and habitat use by radio-collared moose, *Alces alces* (L.), in southeastern Norway. Migrating and resident moose preferred different habitats during winter. Migrating animals used habitats of lower site quality than did resident animals. Migrating animals also used Scots pine (*Pinus silvestris* L.) forests more often and had a higher proportion of pine and common birch (*Betula pubescens* L.) in their diet than did resident animals. Increased browsing pressure from both migrating and resident animals was evident at the end of the winter from an increase in twig diameter at the point of browsing, breakage of stems, heavy browsing of common birch, and more extensive searching for forage. Rebrowsing of previously browsed trees by resident moose and, to a lesser extent, by migrants was recorded during March. Snow depths were similar on the winter ranges of resident and migrating moose.

Loranger, Andre J., Theodore N. Bailey and William W. Larned. 1991. Effects of forest succession after fire in moose wintering habitats on the Kenai Peninsula, Alaska. Alces Vol. 27 (1991): 100-109.

Abstract: Estimates of moose (*Alces alces*) density during winter in early seral forests created by human-caused wildfires and in older successional forests on the northern Kenai Peninsula were obtained using data from standardized aerial surveys conducted from 1964-1990. Wintering moose densities in the study area were highest within areas burned by wildfires in 1947 and 1969, reaching peaks of 3.6-4.3 moose/km^2. Density estimates for the 1947 burn were available 17-43 years post-fire. The relationship between moose density and forest age in the 1947 burn from 1969-1990 was highly significant ($P<0.01$, $R2=0.68$), and density declined at a rate of approximately 9 percent per year during this period. Highest densities, ranging from 2.0-3.6 moose/km^2, were recorded 17-26 years post-fire (1964-1973). Winter moose density in the 1947 and the area's total moose population then declined abruptly. Favorable habitat created by the 1969 wildfire resulted in a major increase in total population by 1982, although wintering densities in the 1947 burn remained low. Moose density estimates in the 1969 burn following this increase were high and remained relatively constant 13-21 years post-fire (1982-1990), ranging from 3.6-4.4 moose/km^2. In older successional forests, wintering moose density was low throughout the study period, ranging from 0.1-0.8 moose/km^2. Forest succession in the 1969 burn will ultimately result in habitat capable of supporting wintering moose densities similar to those currently found in mid-successional and older forest. We predict the area's moose population will decline in the absence of early seral forests.

McNicol, J. G. and F. F. Gilbert. 1980. Late winter use of upland cutovers by moose. Journal of Wildlife Management. 44(2): 363-371.

Abstract: Moose (*Alces alces*) utilization of 16 upland mixed-species cutovers, 10-15 years old and varying in size from about 49 to 2,830 ha, was examined from mid-January to the end of February in 1974 and 1975. The cutovers were 60-120 km northeast of Thunder Bay, Ontario. The scattered-residual cover type was preferred by moose during both winters over the dense-conifer, open, and open-planted cover types. The scattered-residual type had an average of 52% more browse stems/ha available, greater diversity of browse (46% more browse species with 300 or more stems/ha), and the largest number of preferred browse stems. Residual dense-conifer edge within the cutovers appeared to influence use of cutovers more than border coniferous edge. The size an number of areas used by moose on the cutovers decreased from 1974 to 1975, when mobility of moose was restricted by snow conditions. The number of use areas/ha increased with decreasing size of cutover regardless of hunting pressure or snow conditions on the cutover. The size of areas used on cutovers that were hunted heavily appeared to be correlated negatively with increasing cutover size, in contrast to a positive correlation for cutovers that were lightly hunted or not hunted at all.

McNicol, J.G. and H. R. Timmerman. 1980. Effects of forestry practices on ungulate populations in the boreal mixedwood forest.

Summary: Moose, white-tailed deer and woodland caribou all inhabit the boreal forest but, for a variety of reasons, the moose is the most likely ungulate to be found commonly utilizing boreal mixedwoods. The paper examines how various forestry practices affect the suitability of boreal mixedwoods as moose habitats.

Miquelle, D.G. and V. Van Ballenberghe. 1989. Impact of bark stripping by moose on aspen-spruce communities. Journal of Wildlife Management. 53(3): 577-586.

Abstract: We studied bark stripping by moose (*Alces alces*) in Denali National Park and Preserve (DNPP), Alaska, to determine the proportion of bark in the diet, consider what conditions induce bark stripping, and assess the combined impact of stem breakage and bark stripping in a quaking aspen (*Populus tremuloides*)-white spruce (*Picea glauca*) community. Less than 4% of the diet was composed of aspen and willow (*Salix* spp.) bark. Spring protein content of browse was 3x that of bark. Moose appeared to eat bark when availability of browse was low. Bark stripping was most common among female moose in spring, when movements were restricted by limited mobility of their calves. Over 75% of the aspen and bebb willow (*S. bebbiana*) canopy trees in an aspen-spruce community were debarked by moose. The amount of bark removed and the percentage of the trunk circumference girdled were positively associated with mortality of aspen and balsam poplar (*Populus balsamifera*). In the understory, stem breakage by moose increased the probability of deciduous plant mortality. Moose may be increasing the rate of succession in the aspen-spruce community through deciduous tree mortality due to bark stripping and suppression of understory replacement through stem breakage.

Pierce, D. John and James M. Peek. 1984. Moose habitat use and selection patterns in north-central Idaho. Journal of Wildlife Management. 48(4): 1335-1343.

Abstract: Twelve radio-collared moose (*Alces alces shirasi*) were monitored in north-central Idaho from January 1979 through April 1982. Moose selected vegetative types where forage was abundant in all seasons. Old-growth grand fir (*Abies grandis*)/Pacific yew (*Taxus brevifolia*) stands were critical moose winter habitat. Winter habitat patterns did not differ among years even though snowfall varied dramatically. Even-ages pole timber stands and open areas, including clear-cuts and lakes, were used most by moose during summer. During deep snow periods, preferred moose habitat was characterized by dense cover and abundant forage.

Proulx, G. 1983. Characteristics of moose (*Alces alces*) winter yards on different exposures and slopes in southern Quebec. Canadian Journal of Zoology. 61: 112-118.

Abstract: Forty-two moose (*Alces alces*) wintering yards were located in February 1970 in southern Quebec. The yards were established without preference for a particular exposure, and no significant difference ($p>0.05$) in mean areas existed between yards with southern and northern exposures. However, yards with greater slopes tended to be smaller. The average winter yard slope ($12.9 \pm 8.8\%$) was significantly ($p<0.05$) smaller than that of control blocks ($18.2 \pm 9.6\%$). Fifty percent of the yards were located on slopes ≤10%. The number of winter yards with gentle (0-≤10%), intermediate (>10-≤20%) and steep (>20%) slopes was significantly ($p<0.005$) different from that of control blocks. Independent of

exposure and slope classes, moose winter yards were mosaics of mature and young coniferous, deciduous, and mixed stands.

Renecker, Lyle A. and Robert J. Hudson. 1992. Habitat and forage selection of moose in the aspen-dominated boreal forest, central Alberta. Alces Vol. 28 (1992): 189-201.

Abstract: Forage and habitat selection of tame moose (*Alces alces*) in a 65 ha enclosure were studied for an annual cycle. Although the staple winter foods were woody twigs, moose consumed large amounts of leaf litter and bark under some environmental conditions. Foliage dominated the diet following leaf flush in May. Selectivity of moose for plants high in cell solubles was most pronounced during autumn. Moose used a variety of habitats throughout the year. Although relative use varied with foraging return on an annual basis, habitat choice during late spring and summer became two-fold: to maximize the intake of foods high in cell solubles, and to mitigate thermal imbalances and insect annoyance.

Risenhoover, Kenneth L. 1989. Composition and quality of moose winter diets in interior Alaska. Journal of Wildlife Management. 53(3): 568-577.

Abstract: I studied the botanical composition and nutritional qualities of moose (*Alces alces*) winter diets in subalpine habitats in Denali National Park and Preserve (DNPP), Alaska, during January-April 1983 and 1984. Feltleaf willow (*Salix alaxensis*), diamondleaf willow (*S. planifolia*), littletree willow (*S. arbusculoides*), and grayleaf willow (*S. glauca*) predominated moose diets in all habitats. Willows accounted for >94% of the biomass consumed by radio-collared animals during observed foraging periods. However, diet composition varied markedly between habitats. The chemical composition of individual forage species varied among habitats, and I documented significant differences among species consumed. Mean diet quality varied significantly among habitats. Diet in vitro digestible organic matter (IVDOM) ranged from 32 to 41% among habitats, and dietary crude protein ranged between 6.0 and 7.2%. Diets in all habitats contained concentrations of phosphorus (P), magnesium (Mg), sodium (Na), potassium (K), copper (Cu), and selenium (Se) considered marginal for cattle. Concentrations of total phenols and condensed tannins in forages at DNPP were high compared to other areas of Alaska. Diets of moose foraging in willow riparian-lowland habitats contained higher concentrations of IVDOM and crude protein, and less lignin compared to diets of moose in other habitats. In DNPP, upland and riparian willow communities are important winter habitats.

Sweanor, Patricia Y. and F. Sandegren. 1989. Winter-range philopatry of seasonally migratory moose. Journal of Applied Ecology. 26: 25-33.

Summary: Migratory moose (*Alces alces* (L.)) studied in a population in central Sweden in 1980-86 were philopatric to their winter home-ranges during years and in areas of varying population density, snow conditions and forest browse damage. Distances separating consecutive winter home-ranges of moose (x=3.1 km) did not vary with population density, sex or age but did differ in three subareas that differed in population density, snow depth and forest damage. Winter home-range size was affected by long durations of snow >70 cm deep but not by snow depths of 25 or 40 cm. Winter range size (x=11.5 km^2; S.D. 13.9) did not differ in the three subareas, at different population densities, for different durations of time moose remained on the winter range, for bulls vs. cows of for moose of different ages. Problems of moose management, such as browsing damage in pine plantations, cannot be approached by expecting moose to disperse from high-density wintering areas to low-density areas. In years with long durations of snow >70 cm deep, browsing damage can be expected to be more intense and localized because of reduced home-range sizes.

Tew, R. K. 1970. Seasonal variation in the nutrient content of aspen foliage. Journal of Wildlife Management. 34 (2): 475-478.

Abstract: Chemical composition of aspen (*Populus tremuloide*s) leaves, collected on three sampling dates during the growing season of 1966, varied greatly. Content of calcium, magnesium, sodium, and fat increased as the season progressed, whereas total nitrogen, phosphorus, and potassium content decreased significantly. Browse quality therefore changed with season. Aspen leaves contain most calcium and magnesium late in the season; this would help to maintain desirable soil properties when leaves drop.

Timmerman, H.R. and G. D. Racey. 1989. Moose access routes to an aquatic feeding site. Alces 25: 104-111.

Abstract: The relationship between travel routes of moose to an aquatic feeding site and the characteristics of forests and topography surrounding the site were examined. A total of 79 moose trails in standing timber were identified. We suggest moose establish regular trails to aquatic feeding sites that avoid steep slopes and dense vegetation. Waterbody characteristics and particularly the characteristics of the backshore areas, appear to influence where moose enter to feed. The strategy of retaining forest reserves to provide security near aquatic sites is discussed.

Thompson, Ian D. and Milan F. Vukelich. 1981. Use of logged habitats in winter by moose cows with calves in northeastern Ontario. Canadian Journal of Zoology. 59: 2103-2114.

Abstract: Use of logged areas south of Hearst, Ontario, by moose cows with calves was studied in winter from 1977 to 1979. Cutovers selected average 64 ha in early winter and 16 ha in late winter and were most often in lowland areas. Cuts were generally not used until they were at least 18 years old. At least three residual stands of timber were present including one large stand in upland or mesic habitat averaging 42 ha on early winter areas and 107 ha on late winter sites. Basal area of conifers in these stands was 9 m^2/ha in early winter sites and 13 m^2/ha in late winter sites. Discriminant analysis revealed differences between early winter sites, late winter sites, and locations where the animals were not found based on the size of residual stands, size of cutovers, basal area of small conifers, maximum distance between uncut edges, and average diameter of conifers. Movements between sites were short and substantially reduced as the winter progressed. Moose moved an average of 12 m from cover after the snow reached 65 cm in depth in contrast to in early winter when they usually ranges less than 60 m from cover.