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Winter Moose Surveys of the Omineca, Nation, and Ospika River Drainages, 1999

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December 2000

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

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1.0 INTRODUCTION

Winter range is a primary limiting factor for most ungulate populations in BC. Moose (*Alces alces*) distribution is strongly influenced by winter range conditions, particularly snow depth, forage availability, and the presence of tall, closed canopy conifer stands for shelter (Peek 1997). In mountainous areas animals move down slope as increasing snow depths (e.g., >70-80 cm) restrict mobility and forage availability (Hatler 1989, RIC 1997). Consequently, in the Williston Reservoir watershed, the greatest winter concentrations of moose occur along the major rivers and their adjacent low-elevation, warm aspect hillsides in the Parsnip and Finlay River drainages, and in isolated pockets on the north side of the reservoir's Peace Reach (Davidson and Dawson 1990). Shrub-dominated wetlands in the Sub-boreal Spruce (SBS) and Boreal White and Black Spruce (BWBS) biogeoclimatic zones provide important low elevation habitats that are heavily used by moose in the winter (MacKinnon et al. 1990). These zones were particularly impacted by the creation of the Williston Reservoir in the late 1960s, which flooded much of the highest capability moose winter range within the watershed (BC Environment 1989, Hatler 1989). Moose inventories and site enhancements have been identified as priority compensation activities (Hatler 1989, Schick and Ovaska 1996). Moose forage enhancement projects, including prescribed burning and manual thinning, have been conducted by the Peace/Williston Fish and Wildlife Compensation Program (PFWWCP) at locations throughout the watershed, including manual thinning of mature willow and willow thickets at 6 sites on the Omineca River floodplain (Hengeveld 1998).

The PFWWCP conducted aerial inventories of moose congregated along the Omineca, Nation, and Ospika rivers in February 1999, to determine the distribution and demographics of moose wintering along these major rivers. The results of these surveys will aid wildlife managers in determining appropriate moose harvest levels and may identify other potential management needs (e.g., access management). These surveys will also help to identify important habitats and areas of concentration that may be suitable for protection and/or habitat enhancement projects.

This report documents the results of surveys conducted along riparian habitats adjacent to the Omineca, Nation and Ospika Rivers in February 1999.

2.0 SURVEY AREA

The Omineca, Nation and Ospika Rivers are 3 major watercourses that flow directly into the Williston Reservoir (Figure 1). The Omineca River flows eastward through the south end of the Omineca Mountains to the Williston Reservoir's Omineca Arm. The lower valley bottoms of the Omineca River drainage lie within the dry-cool Boreal White and Black Spruce biogeoclimatic subzone (BWBSdk1; MacKinnon et al. 1990). This lowland to montane subzone is climatically dry with an extensive fire history, and provides some of the best remaining moose winter habitat in the northern portion of the watershed. Mean annual snowfall in this subzone is 180 cm (MacKinnon et al. 1990), with maximum accumulated snow depths generally less than 60 cm (Lower Germansen snow station; BC Environment 2000). A snow depth survey conducted throughout the Williston Reservoir watershed in 1990 identified low snow depths along the Omineca River (20-80 cm, 700-800 m elevation (Martin 1994). The surveyed portion of this river drainage extended from Ogden Creek (approximately 800 m in elevation) to the Omineca Arm (672 m) (Figure 2). The Omineca River census area was divided into 3 survey units: Upper (Ogden Creek to Nina Creek), Middle (Nina Creek to tributary creek west of Blue Lake), and Lower (tributary creek west of Blue Lake to Omineca Arm). In the Upper and Middle survey units the river meanders extensively within the wide river floodplain; the floodplain is slightly more restricted downstream of Discovery Creek. The Lower survey unit is characterized by a more confined and linear watercourse, with forested upland slopes in close proximity to the main water channel.

The Nation River, situated south of the Omineca River and at the northern edge of the Interior Plateau, drains the Nation Lakes (868 m) as it also flows from the west to the Williston Reservoir. The Nation River drainage lies predominantly in the Mossvale moist-cool SBS subzone (SBSmk1; DeLong et al. 1993), but ultimately flows through the wet-cool (SBSwk2) and Williston moist-cool (SBSmk2) SBS subzones before reaching the Nation Arm of the Williston Reservoir (MacKinnon et al. 1990). Mean annual snowfall is about 310 cm in the SBSmk1 and 1,075 cm in the SBSwk2 (DeLong et al. 1993, MacKinnon et al. 1990). Moderate to high snow depths have been identified along the Nation River at Philip Creek, Rainbow Creek, and Chuchi Lake (60-100cm, 900 m elevation) (PFWWCP, data on file). The entire length of the Nation River was surveyed, as were a couple of logged areas that abutted the river downstream of the Philip Creek confluence (Figure 3).

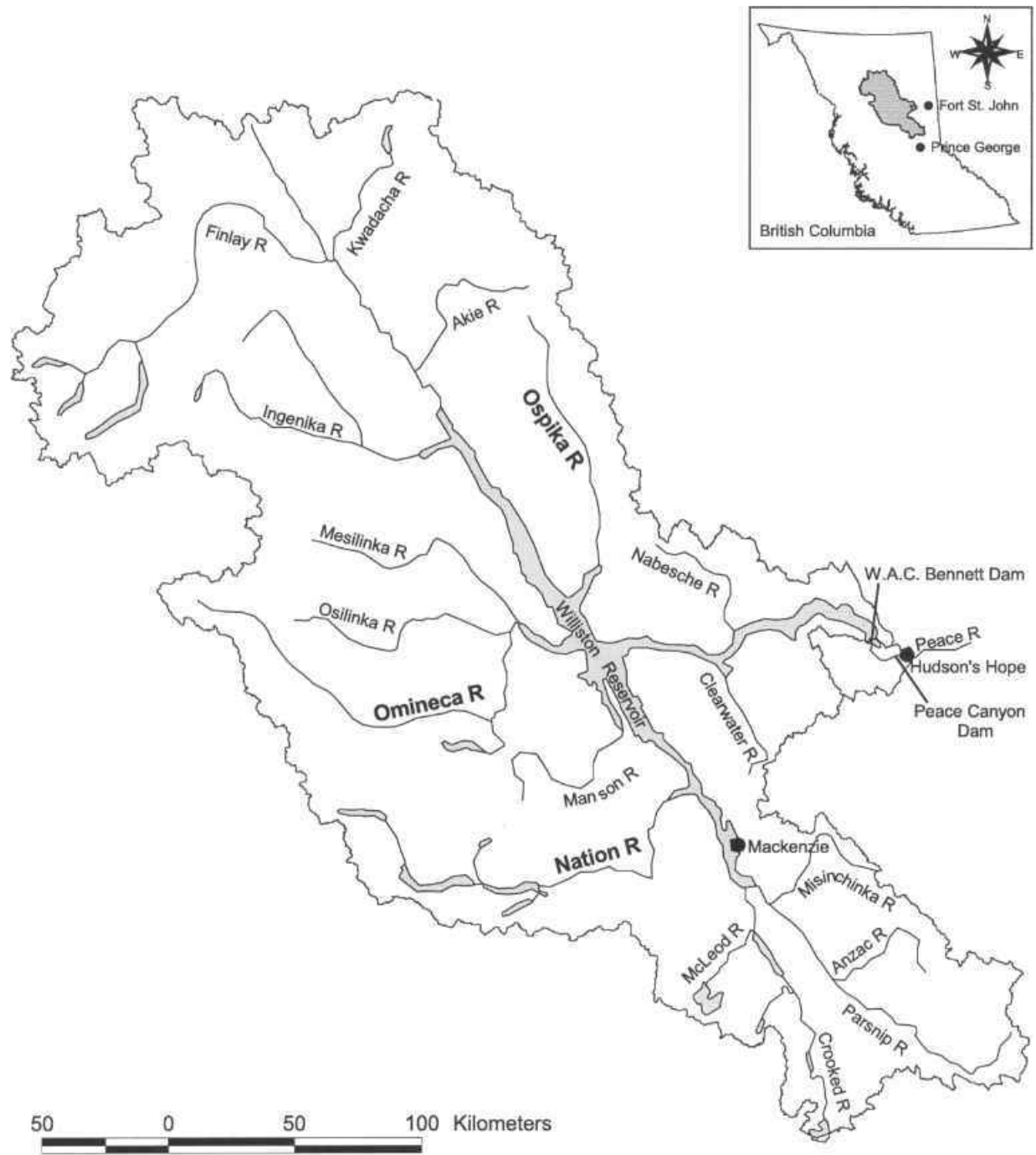


Figure 1. The Omineca, Nation, and Ospika River drainages within the Williston Reservoir watershed, north-central BC.

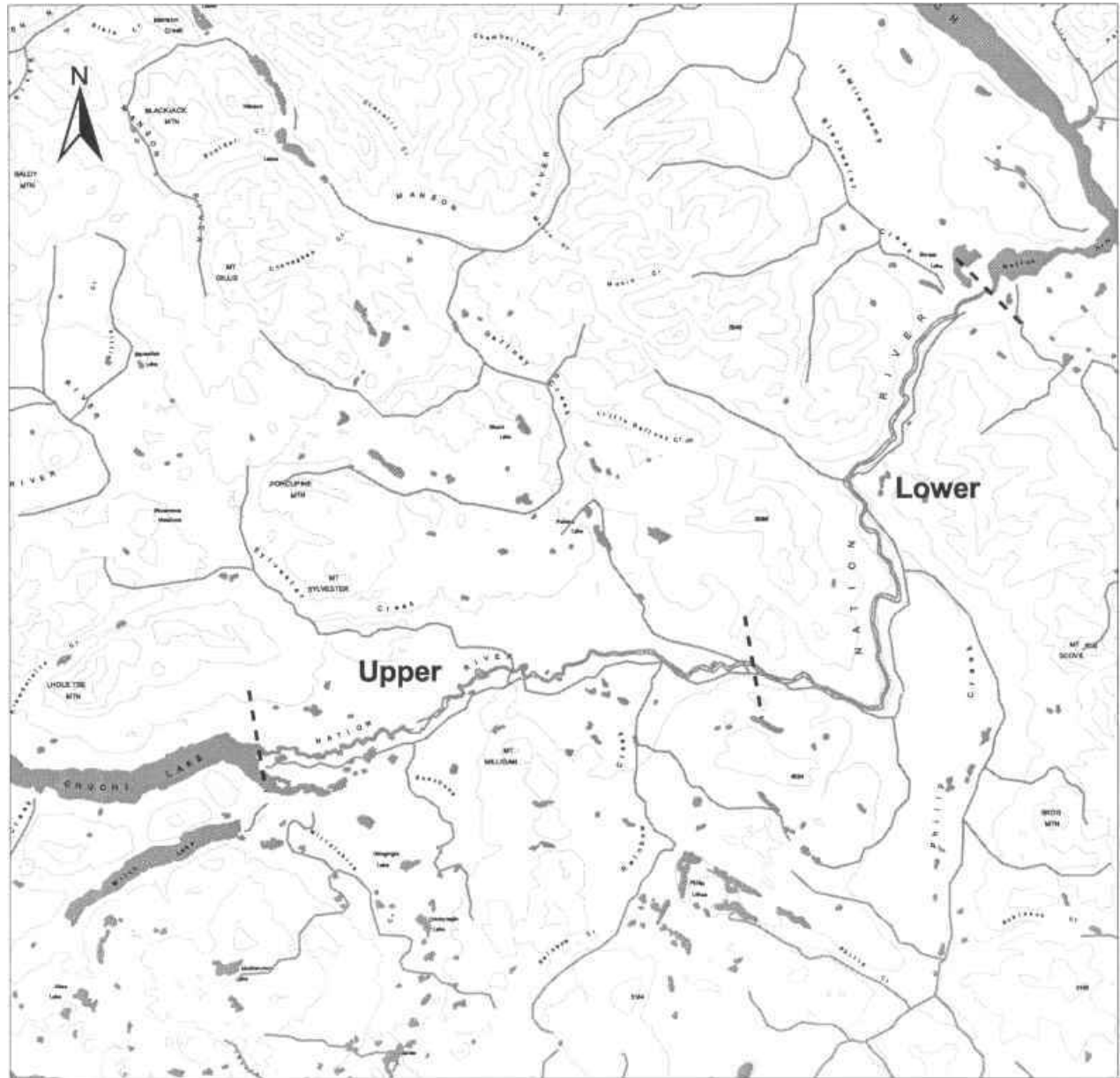


Figure 3. The Nation River drainage winter moose survey units, February 1999: Upper (Chuchi Lake to South Munro Creek area) and Lower (downstream from South Munro Creek to Nation Arm).

The Nation River is located within a relatively confined river drainage and is consequently less sinuous than the Omineca River; its adjacent slopes are also steeper and generally forested to the river bank. A wider floodplain area only occurs along the upper portion of the river, toward Chuchi Lake. The Nation River census area was divided into 2 survey units: Upper (Chuchi Lake to South Munro Creek area) and Lower (downstream from South Munro Creek area to Nation Arm).

The Ospika River is situated on the east side of the reservoir, north of the Peace Arm, and flows from the northeast down into the Ospika Arm (Finlay Reach, Williston Reservoir). The surveyed area of the Ospika River drainage lies within the SBSmk2 (MacKinnon et al 1990). Mean annual snowfall in this subzone is 335 cm (MacKinnon et al 1990), with annual snow accumulations for the survey area reaching 100 cm (Ospika Lower snow survey station, winter 1998-1999; PFWWCP, data on file). Moderate snow depths have been identified along the Ospika Arm (60-80 cm, 700-800 m elevation) (Martin 1994). The Ospika census area included the south-facing sidehill along the north shore of the Ospika Arm (Ospika Sidehill) and the Ospika River drainage proper from Balden Creek to the reservoir (Figure 4). The lower portion of the river meanders across the relatively broad floodplain; the river becomes more restricted upstream of the chasm. Deciduous and mixedwood forest stands and burned habitats are present in the uplands and along the Ospika Sidehill.

3.0 METHODS.

Surveys were conducted using a Bell 206 helicopter, flying at approximately 30 to 50 m above ground level, and a four-person crew (including the pilot). The navigator searched for, counted, and classified animals, and recorded location co-ordinates for each group of animals; co-ordinates were identified using the helicopter's on-board Global Positioning System (GPS) unit. The rear left seat observer recorded species, group number and size, and composition of animals observed. The rear right seat observer recorded location characteristics of animal locations (habitat type, slope, and aspect), and took photographs. The two rear seat observers also searched for and classified animals.

The survey flight line was concentrated on riparian and open valley bottom habitats along or adjacent to the river courses. At the Ospika Sidehill, some upland slopes were surveyed so parallel contour lines (800 m and 1,100 m elevations approximately) were flown to cover the area. Survey methodology followed the Resource Inventory Committee

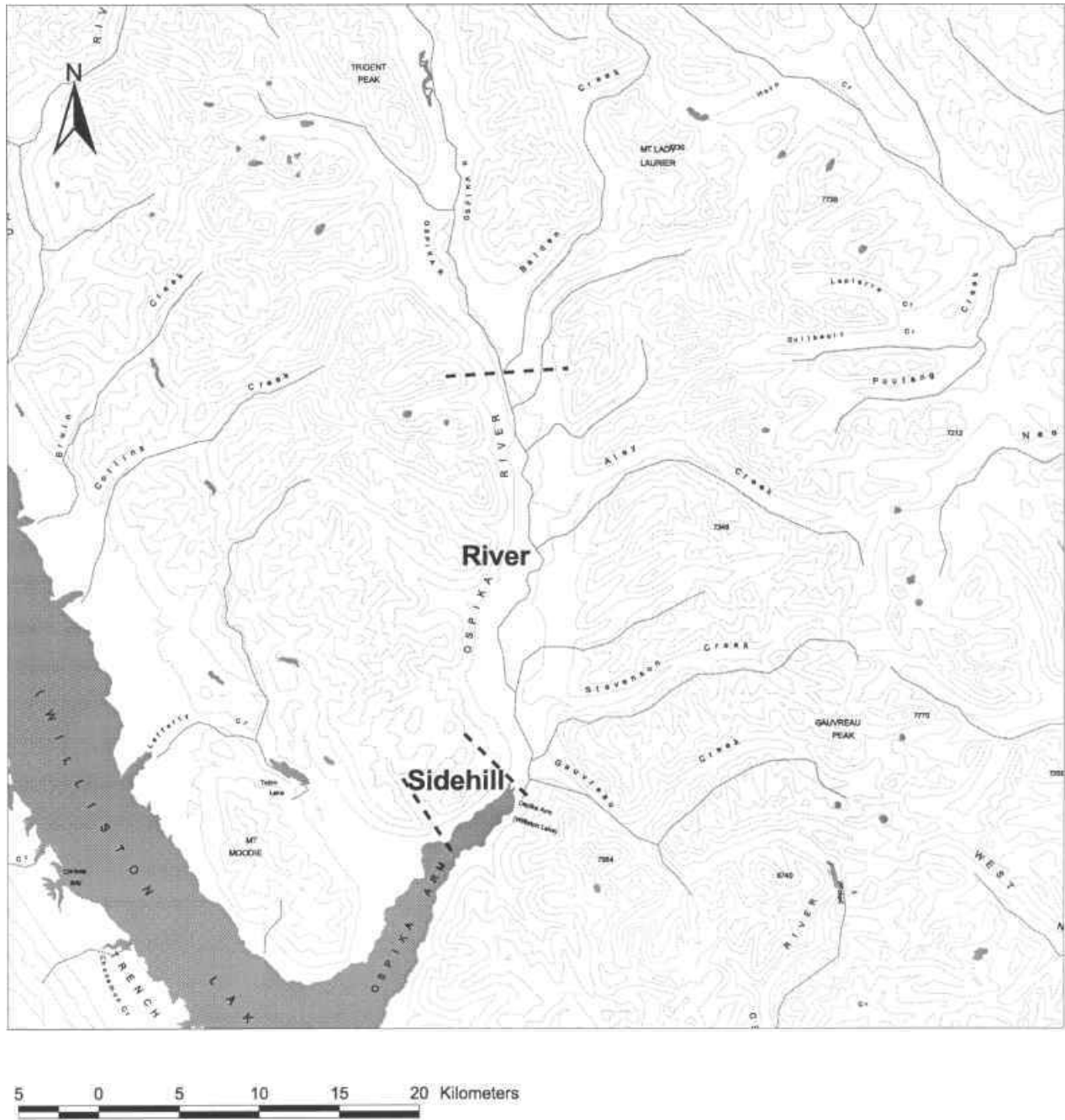


Figure 4. The Ospika River drainage winter moose survey units, February 1999: River (from Ospika Arm to Balden Creek) and Sidehill (north side of Ospika Arm, between Ospika River and Ospika Camp).

(RIC) standards for Encounter Transects, a technique recommended for obtaining general distribution and population structure data in areas where visibility is good (e.g., open deciduous areas; RIC 1997). Moose were categorized to a Level 2 classification (RIC 1997), identifying bulls, calves, and cows based on body size and disparate characteristics. In the absence of antlers, cows were distinguished from bulls based on the presence of the white vulval patch and, secondarily, by the presence of a small sized bell and lighter snout colouration. Where multiple animals were located within close proximity (e.g., 100-300 m apart), only one group and location coordinate was recorded. For some groups, more than one habitat type was noted, (i.e., in some cases individuals within a group were observed using different habitat types). Flight lines and group locations were also recorded digitally using a Trimble XLR Pro GPS system.

Following the survey, flight lines were digitally overlaid onto 1:50,000 scale shaded relief maps to assist in determining survey area coverage and the distribution of moose locations in each river drainage. After delineating the survey areas on the maps, area and distance (drainage and river) calculations were determined using a planimeter and hand-wheel, respectively. Area and distance measurements are considered accurate to $\pm 0.5 \text{ km}^2$ and 0.5 km. Maps that were produced are stored at the PFWWCP office for future reference.

4.0 RESULTS

Surveys of the Omineca, Nation and Ospika River drainages were conducted between 24 and 26 February, 1999¹. Survey conditions were good (Appendix A), as was observer visibility. Since these surveys were intended to obtain moose composition and distribution information, rather than a total count of the populations inhabiting these drainages, the moose numbers presented here do not fully reflect their wintering populations. This was evident as 2 radio-collared moose within the Omineca River drainage were not observed during our survey, as they were using conifer forests outside the census area².

¹ In order to complete the surveys in the most cost effective manner with other PFWWCP activities, these surveys were conducted in conjunction with a caribou survey of the Wolverine Mountain Range (Hengeveld and Wood 2000).

² Two GPS radio-collared moose were present in the Omineca River drainage at the time of the survey (Doug Heard, Ministry of Environment, Lands and Parks, Prince George, personal communication) but were determined to be outside the survey area; locations for the survey time period were downloaded from the GPS collars and mapped.

In total, 572 moose were observed within the 3 survey drainages. The Omineca River census area accounted for 86% (492) of the animals, with considerably fewer moose observed in the Nation (65) and Ospika (15) River drainages (Table 1; Appendix B).

The total survey area for all three drainages combined was 116.2 km², with survey units ranging in size from 4.0 km² (Ospika Sidehill) to 45.8 km² (Upper Omineca) (Table 2). The greatest number and the highest density of moose occurred in the Upper Omineca survey unit (Table 2). This survey unit also had the highest river meander index (a measure of river sinuosity and a reflection of the extent of riparian habitat present in the unit).

Most of the moose observed during the surveys were associated with willow-shrub (68%) and open (15%) habitats (Table 3). Moose observed in the Ospika survey area were primarily located in deciduous and mixedwood forested habitats.

4.1 Omineca River

Along the Omineca River, 372 (119 groups) and 120 (41 groups) moose were observed in the Upper and Middle census units respectively (Table 1). No moose were observed in the Lower census unit, however, 2 sets of moose tracks and a bed were noted. Moose distribution was concentrated between Silver Creek and Jackfish Creek (453 animals). Between Silver and Discovery Creeks, moose (207) were aggregated in several riparian oxbow areas, whereas they were more or less evenly distributed between Discovery and Nina Creeks (154) and Nina and Jackfish Creeks (92). The moose observed were predominantly located in riparian willow-shrub habitats, with fewer moose observed downstream of Jackfish Creek, beyond which the river becomes more linear and riparian shrub habitat is reduced.

The bull:cow ratio for the Upper and Middle census units combined was 27:100. The calf:cow ratio for the same area was 35:100. Three sets of twins were counted. Five moose kills were observed: 3 in the Upper census unit, 1 in the Middle unit, and 1 in the Lower unit (Appendix A). Wolf tracks were observed in all three portions of the surveyed area.

Moose use of manually slashed areas along the Omineca River (see Hengeveld 1998) was also noted. Moose were observed at sites 12W and 18, and adjacent to sites 4 and 11. Although no animals were observed, tracks were observed at sites 1, 12, 13S, and 18. No moose sign was evident at sites 13N and 14.

Table 1. Abundance, distribution and composition results from winter moose surveys conducted in the Omineca, Nation, and Ospika River drainages, 24-26 February, 1999.

Drainage & Survey Unit	No. of Groups	Total	Composition ^a				Ratios			Density	
			Bull	Cow	UA	Yrlg	Calf	Uncl.	Bull:Cow		Calf:Cow
Omineca River											
Lower	0	0									0 /km ²
Middle	41	120	8	74	10	2	25	1	11:100	34:100	7.1 /km ²
Upper	119	372	65	194	32	13	68		34:100	35:100	8.1 /km ²
Total	160	492	73	268	42	15	93	1	27:100	35:100	6.9 /km²
Nation River											
Lower	7	11	3	6			2		50:100	33:100	0.9 /km ²
Upper	22	54	13	30	2		9		43:100	30:100	3.4 /km ²
Total	29	65	16	36	2		11		44:100	31:100	2.3 /km²
Ospika River											
River	1	1	1								0.1 /km ²
Sidehill	6	14	3	7	2		2		43:100	29:100	3.5 /km ²
Total	7	15	4	7	2		2		57:100	29:100	0.9 /km²
Total	196	572	93	311	46	15	106	1			

^a Composition abbreviations: UA (unclassified adult), Yrlg (yearling, 22 months old), Calf (10 months old), Uncl, (age and sex unknown).

Table 2. Survey unit statistics for winter moose surveys conducted in the Omineca, Nation, and Ospika River drainages, 24-26 February, 1999.

Drainage & Survey Unit	Linear Distance (km)		Meander Index ^a	Survey Area (km ²)	Survey Time (hrs) ^b	Survey Intensity (min/km ²)	Moose	
	Drainage	River					Total	Density
Omineca River								
Lower	32.5	34.0	1.05	8.4			0	
Middle	23.7	29.5	1.24	16.9			120	7.1/km ²
Upper	47.5	71.0	1.49	45.8			372	8.1/km ²
Subtotal	103.7	134.5		71.1	7.4	6.2	492	6.9/km²
Nation River								
Lower	47.3	50.7	1.07	12.1			11	0.9/km ²
Upper	40.8	48.2	1.18	16.0			54	3.4/km ²
Subtotal	88.1	98.9		28.1	2.6	5.4	65	2.3/km²
Ospika River								
River	28.9	33.5	1.16	13.0			1	0.1/km ²
Sidehill	9.0	n/a		4.0			14	3.5/km ²
Subtotal	37.9	33.5		17.0	1.1	3.8	15	0.9/km ²
TOTAL	229.7	266.9		116.2	11.1		572	

^a Survey times for the individual census units were not available, thus only a total search time is reported for each drainage. Times do not include ferry or re-fueling times.

^b The meander index is an indices of river sinuosity and therefore the extent of riparian habitat. Values are the product of the linear river distance divided by the linear drainage distance.

Table 3. Moose distribution and abundance (percentage of total) by habitat type^a, for winter surveys conducted in the Omineca, Nation, and Ospika River drainages, 24-26 February 1999.

Drainage	Forested				Shrub	Open	Total
	Conifer	Deciduous	Mixed	Sb			
Omineca River	38(8)	8(2)	23(5)	7(1)	346 (70)	70(14)	492
Nation River	2(3)	3(5)	4(6)	2(3)	40 (62)	14(22)	65
Ospika River		5(33)	9(60)		1(7)		15
TOTAL	40(7)	16(3)	36(6)	9(2)	387 (68)	84(15)	572

^a Forested habitats: conifer (pine, hybrid spruce); deciduous (trembling aspen, black cottonwood); mixed (conifer and deciduous), Sb (black spruce forested wetland). Shrub habitats: willow, red-osier dogwood, and alder. Open habitats: non-vegetated areas (e.g., gravel bars); ice (frozen and snow covered portions of rivers and lakes).

4.2 Nation River

Sixty-five (65) moose in 29 groups were found sporadically distributed between Philip Creek and Chuchi Lake along the Nation River (Table 1). Over 60% of the moose observed were located along the river between Rainbow and Suschona Creeks, with the largest moose concentrations (13 and 14 animals, respectively) at the confluence of these tributaries with the Nation River. The moose observed were primarily in the Upper survey unit, where the river was situated on a broader floodplain and riparian shrub habitats were more prevalent.

The combined bull:cow ratio for the Upper and Lower census units was 44:100 (Table 1). The calf:cow ratio for the same area was 31:100. One moose kill was observed on the river, near South Munro Creek (Appendix A). Wolf tracks were observed upstream of Philip Creek (near Group #1) and downstream of Chuchi Lake (near Group #29). Both fresh and old moose and wolf tracks were observed on the river between the Nation Arm and Philip Creek, as well as in some adjacent areas (e.g., low elevation forest clearcuts). A fresh set of wolverine tracks also crossed the river.

4.3 Ospika River

Very few moose were found in the Ospika River drainage; 14 of the 15 animals located were on the Ospika Sidehill, the south-facing slopes between Ospika Camp and the Ospika River (Table 1). The lone bull moose located along the river was less than 1 km from the Ospika Arm. Both fresh and old moose tracks were observed along the river and 1 moose kill was found (Appendix B).

5.0 DISCUSSION

5.1 Distribution and Abundance

The number of moose present in the Williston Reservoir watershed may be roughly estimated at 5300 to 10,400 animals, with 547 to 1,581 of those in the southwest (includes portions of the Nation, Manson, Omineca, and Osilinka River drainages; Demarchi 2000) and 2,868 to 5,755 animals in the north (includes portions of the Mesilinka, Ingenika, Finlay, and Ospika River drainages; Demarchi 2000) (Table 4).

Table 4. Moose population demographics from other winter surveys conducted in the Williston Reservoir watershed.

Location	Year	n	Population Estimate	Density (per km ²)	Ratios		Source
					Bull:Cow	Calf:Cow	
Southern (Williston)							
Parsnip drainage	1998	160	800-2000	0.6	112:100	23:100	Heard et al. 1999
Mackenzie - Omineca Arm (WMU 7-29, 7-30)	1989	449			59:100	30:100	Hatler 1989
Nation - Omineca - Osilinka drainages (WMU 7-28, 7-29, 7-38)	2000	112	547-1581	0.3	69:100	35:100	Demarchi 2000
Peace Arm			1,100				Davidson and Dawson 1990
Omineca - Manson - Germanesen drainages	1998	315					Pacific Slope Consulting 1999
Omineca - Manson - Germanesen drainages	1998	256					Pacific Slope Consulting 1999
Northern (Williston)							
Finlay drainage (WMU 7-40, 7-41)	1998	271			77:100	28:100	Terry and Handler 1998
Ingenika - Finlay - Ospika drainages (WMU 7-37 - 7-41)	1990	423			139:100	42:100	Hatler 1990
Mesilinka - Ingenika - Finlay - Akie - Ospika drainages (WMU 7-37 - 7-41)	2000	313	2868-5755	0.6	49:100	18:100	Demarchi 2000
Osilinka - Mesilinka - Ingenika drainages	1998	269					Pacific Slope Consulting 1999
Ospika - Akie drainages	1998	244					Pacific Slope Consulting 1999
Ospika - Akie drainages	1998	286					Pacific Slope Consulting 1999

These figures provide some context for the nearly 500 moose counted during this survey in the Upper and Middle Omineca survey units combined. It is apparent that, in late winter, the Omineca River drainage accommodates a significant proportion of the moose present in the southwestern portion of the Williston Reservoir watershed. These moose were also highly concentrated, with notable densities of 8.1/km² and 7.1/km² observed in the Upper and Middle Omineca survey units, respectively. Moose densities in North America generally range from 0.1/km² to 0.5/km² in areas where their predators are not exploited (Timmerman and Buss 1997), although densities of 4.05/km² to 9.27/km² have been reported for ecological moose concentrations (i.e., those occurring in specific habitat types in specific seasons; Karns 1997). In the Williston Reservoir watershed, winter moose densities of 0.3/km² and 0.6/km² have been reported (Table 4).

A high number and density of moose in the Omineca River valley was not unexpected, as it typically has lower snow depths than the surrounding upland landscape and has extensive deciduous growth suitable for foraging moose. Physiographically, the river's sinuosity and broad floodplain make it more amenable to sustaining higher moose concentrations. A greater river meander index value suggests an increased potential for closer juxtaposition of adjacent suitable foraging habitat. Thus, a survey unit with a higher meander index value (reflecting a greater extent of riparian habitat present in the survey unit) may be more likely to have higher densities of moose. The prevalence of moose in riparian shrub habitats during the surveys, and the apparent scarcity of moose in those survey areas where these habitats were limited, is reasonable considering the value of such habitats to wintering moose (Peek 1997). However, because the survey design was biased toward riparian shrub habitats, no conclusions regarding habitat use patterns or preferences can be drawn from these data.

In the Lower Omineca and Lower Nation survey units, where each river is relatively narrow with steeper, forested banks, it is possible that moose may make more extensive use of upland deciduous areas and regenerating logged areas. Hatler (1989) reported that logged areas were the most intensively used winter moose habitats in the southern Williston Reservoir watershed, and noted that moose tracks were common in lower elevation logged areas and some slopes immediately adjacent to the Nation River.

The distribution and low numbers of moose observed in the lower Ospika drainage was similar to that reported by other surveyors (see Hatler 1990 and Pacific Slope Consulting 1999). Moose in this area were generally associated with deciduous stands and burned

habitats, (i.e., the south-facing slopes along the Ospika Arm), with observations of moose and tracks along the river suggesting the presence of low numbers of moose only.

The predominant use of forested habitats apparent in the surveyed portion of the Ospika drainage is not considered significant (and therefore may not be representative of the moose population in this drainage) because of the small sample size observed in this survey area. However, increased use of forested habitats by moose is typical in late winter, and may be due to unfavourable snow conditions, and/or reduced forage quality or availability in valley-bottom riparian habitats (Peek 1997). Deeper snow depths (>80 cm) in the upper portions of the valley (Martin 1994) and the resulting reduced forage availability may be limiting factors for moose in this area. By comparison, the lower Ospika River drainage was observed to have less extensive deciduous, valley-bottom habitat than the Upper survey units along the Omineca and Nation Rivers. Hatler (1990) noted that intensive use of logged areas in the southern Williston Reservoir watershed (includes the Omineca and Nation River drainages) contrasts with the higher use of burned habitats by moose in the northern portion of the watershed (includes the Ospika River drainage). Northern landscapes, however, are more remote and less intensively harvested than in the south, thereby allowing prescribed burns for wildlife range enhancement to be conducted (such as those conducted by the PFWWCP; see Wood et al. in prep) and more extensive wildfires to occur, especially at lower elevations.

5.2 Demographics

The average bull:cow ratio of 27 bulls per 100 cows along the Omineca River is within the lowest 25% of the ratios reported for 26 other moose surveys in northern BC (Hatter 1998, as cited by Demarchi 2000). The ratio of 44 bulls: 100 cows along the Nation River is more typical, but is below the threshold of 50 bulls: 100 cows proposed for moose management in northern BC (Hatter 1998). In comparison, bull:cow ratios reported for other winter moose surveys conducted in the Williston Reservoir watershed ranged from 49 to 139 bulls per 100 cows, with a ratio of 69:100 reported for the southwestern portion of the watershed (includes the lower Nation, Omineca, and Osilinka River drainages; Demarchi 2000) (Table 4). It is not clear whether the low number of bulls in the Omineca River drainage is suggestive of spatial segregation between bulls and cow/calf groups (e.g., distribution in upland areas versus valley-bottom habitats), or simply reflects a depressed bull count in the population. The uneven distribution of bulls between the Upper and Middle Omineca survey units may support the theory of some spatial segregation, or the remnant results of potentially higher hunting pressure on bulls

occurring in the Middle survey unit (the Upper survey unit is mainly limited to boat access only).

The calf:cow ratios for all 3 drainages (29 to 35 calves per 100 cows) indicate a healthy level of recruitment and over-winter survival (see Hatter 1998, Hatter and Bergerud 1991). The calf to cow ratios observed were comparable to those reported for other moose surveys conducted in the Williston Reservoir watershed (Table 4).

5.3 *Potential for Enhancement*

Areas with high moose concentrations (e.g., Upper and Middle Omineca River, Upper Nation River) may warrant forage enhancement activities in order to maintain their numbers. Also, if winter forage is limiting, forage enhancement activities conducted in the less populated areas may increase the distribution of moose (and therefore possibly the population) by providing alternative suitable foraging sites. Increased wildlife management attention may also have to be afforded to some of the key wintering areas.

6.0 ACKNOWLEDGEMENTS

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Appendix A Survey details for the winter moose surveys of the Omineca, Nation, and Ospika River drainages, 1999.

Weather Conditions

Snow depths recorded on 26 and 27 February 1999 at the Upper Germansen (Station 4A05; 1500 m elevation) and Mackenzie (Station 4A19; 700 m) snow survey stations were 129 cm and 111 cm, 15 cm and 25 cm respectively above the long-term mean for those dates (BC Environment, 2000). While the surveyed portions of the Omineca and Ospika Rivers were frozen, the last ~7.5 km of the Nation River (from ~1 km upstream of the bridge at 60 km on the Thutade-Nation FSR, to the outlet at Chuchi Lake) was ice-free.

Weather conditions recorded during the winter moose inventory along the Omineca, Nation, and Ospika rivers, 24-26 February 1999.

Date	Time (hrs)	Survey Area	Temperature at Elevation	Wind Direction and Speed	Cloud Cover	Precip	Snow Cover
24 Feb	1324	Upper Omineca	-3 at 3200'	calm	100%	none	100%
25 Feb	0935	Middle Omineca	-8 at 3000'	calm	100%	none	100%
	1228	Middle Omineca	0 at 3000'	E, 2-5km/hr	>50%	light	100%
26 Feb	0851	Nation	-6 at 2350'	E, 6-12 km/hr	<50%	none	100%
	1245	Lower Omineca	-4 at 3000'	SE, 6-12 km/hr	<50%	none	100%
	1353	Ospika	-5 at 3500'	SE	<50%	none	100%

Search Intensity

Total helicopter time for the winter moose inventory along the Omineca, Nation, and Ospika rivers, 24-26 February 1999.

Survey Area	Date	Times (hrs)	Ferry Time ^a	Survey Time
Omineca			use decimal hrs	use decimal hrs
Old Hogem to Wendy Creek	24 February	1324-1538	2 hrs 26 min	2 hrs 14 min
Old Hogem to Wendy Creek, cont'd.	25 February	0935-1140	0 hrs 53 min	2 hrs 05 min
Wendy Creek to N Tacla Lk Res	25 February	1228-1426	0 hrs 08 min	1 hrs 58 min
N Tacla Lk Res to W.Reservoir	26 February	1245-1341	0 hrs 08 min	1 hrs 6 min
Total			3 hrs 35 min	7 hrs 23 min
Nation	26 February	0851-1124	0 hrs 30 min	2 hrs 33 min
Ospika	26 February	1353-1458	2 hrs 10 min	1 hrs 5 min
Total			6 hrs 15 min	11 hrs 1 min

^a Ferry time includes travel to and from fuel caches, daily travel to and from Mackenzie, and final return by helicopter to Prince George.