Table 10-43: Whimbrel Foraging Habitat Distribution – Niglintgak

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	441	7
Moderate	2,489	37
Low	2,871	43
Very low to none	853	13
No data	25	<1
Total	6,679	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.2.8 Arctic Tern

Site-Specific Information

A few Arctic terns were recorded in Niglintgak during surveys in 1973, but there were no nesting colonies in the area (F.F. Slaney and Company Ltd. 1974).

Field Results

Arctic terns were abundant during aerial surveys of the outer Mackenzie Delta, and nesting colonies were seen in the survey area. Arctic tern densities remained high through June and July, and terns were widely distributed throughout the outer Mackenzie Delta. Arctic terns are an early fall migrant. Their numbers declined sharply during August aerial surveys and none were recorded in September.

Average monthly Arctic tern densities on the outer Mackenzie Delta, derived from the aerial surveys, were 78.6 birds/100 km^2 in June, 93.2 in July, 16.2 in August and 0.0 in September.

Modelling Results

A habitat model was not prepared for the Arctic tern.

10.3.2.9 Marine Species

Beluga Whale

In 1979, 1980 and 1981, several surveys of Kugmallit Bay were flown each year from early July to early August. The resulting reports include the numbers of whales seen on each survey line (Fraker and Fraker 1979, 1981, 1982). The survey results from south of Tuktoyaktuk indicate the amount of use within about

10 km of the channel where dredging and vessel traffic is proposed. The data in Table 10-44 indicates that relatively few whales use the southernmost part of the Kugmallit Bay concentration area. Only a few whales were observed in this area in the three years of the study. The largest population was seen before mid-July, and none were observed after the third week of July. For other years, either data was not reported or the survey effort ended in July.

Table 10-44: Number of Belugas Observed in Southern Kugmallit Bay 1979 to 1981

Date	K-A	K-1	K-2	Percentage of Total Present (%)
July 02, 1979	0	16	0	100
July18, 1979	0	2	0	2
July 05, 1980	0	0	11	100
July 06, 1981	0	1	174	68
July 10, 1981	0	2	0	1
July 21, 1981	0	7	0	44
NOTES: K-A = east-west survey line from about Whitefish Station Whaling Camp K-1 = east-west survey line from about Ikinaluk Whaling Camp K-2 = east-west survey line from about Tuktoyaktuk				
SOURCE: Adapted from Fraker and Fraker (1979, 1981, 1982)				

The southern part of Kugmallit Bay, which includes survey lines K-2, K-1 and K-A, is normally the least-used part of the concentration area. It is affected by normal marine traffic to Tuktoyaktuk and by hunting activities, primarily from hunting camps on the south shore of the bay. Fraker and Fraker (1982) showed a correlation between the number of hunting boats seen during aerial surveys and the distance the closest whales were from the south shore. The closest belugas were often more than 5 km from shore, and if hunters were active, belugas were farther away.

The proposed transport corridor passes through the southernmost part of the Kugmallit and Kittigazuit summer concentration area, one of the three shallow estuarine summer habitats used by belugas from late June to mid-August. Most of the potential dredging activity could occur in parts of Kugmallit and Kittigazuit bays that have lower densities of beluga whales. Individual belugas remain in the concentration area for a few to several days and then return to the Beaufort Sea offshore (Richard et al. 2001). By late July or early August, few belugas remain in the concentration area (Fraker and Fraker 1982).

For about 20 km, the transport route passes directly through the southernmost part of a beluga management area, i.e., the Kugmallit Bay Beluga Management

Zone 1A, as designated in the Beluga Management Plan (FJMC 2001). Socializing and perhaps moulting, rather than feeding, appear to be the main activities of belugas in the Kugmallit Bay area (Norton and Harwood 1986). The warm estuarine water might also offer a thermal advantage to newborn calves (Fraker et al. 1979).

Bowhead Whale

Bowhead whales congregate in areas of high zooplankton concentrations, which vary from year to year. Areas off the Tuktoyaktuk Peninsula and outer Mackenzie Delta are part of the summer feeding grounds of bowheads (Shelden and Rugh 1995; Environment Canada 2003). Many feeding bowheads can be in the waters off the Yukon coast and the Mackenzie Delta in some years, and at least a few animals occur in most years. However, bowhead whale feeding areas are far from the proposed dredging area in Kugmallit Bay.

Ringed Seal

Ringed seals periodically use Kugmallit and Kittigazuit bays, although species concentration areas are not present. It is possible that the few seals in the area might be displaced or attracted locally.

Polar Bear

Polar bears have denned on Hooper Island, Pullen Island and near Tent Island. Polar bear biologists tend to agree that there has been an increase in the number of bears denning on land in the Beaufort region of both Alaska and Canada because of regulations to protect female bears with cubs. If this trend continues, the probability of bears denning near Niglintgak could increase, although it is still likely to be a rare occurrence.

10.3.3 Taglu

10.3.3.1 Barren-Ground Grizzly

Site-Specific Information

The general description of grizzly bear distribution, denning and foraging habits in Section 10.3.2, Niglintgak applies to Taglu as well.

Field Results

Aerial and Ground Den Survey

No grizzly bear dens were observed at Taglu, although one den was observed in a pingo on the Taglu boundary and five dens were observed along Swan Channel, northeast of the lease. One den site was seen east of Taglu.

No grizzly bears were observed at Taglu during aerial surveys in 2003. However, five grizzly bears were observed, and bear sign, including tracks and scat, was reported at four other locations in Taglu during the 2002 spring and summer field surveys.

Modelling Results

Modelling results indicate that suitable grizzly bear habitat in the Taglu LSA is limited. Effective habitat included:

- fall forage habitat, at 23% (see Table 10-45)
- denning habitat, at about 3% (see Table 10-46)
- spring forage habitat, at 16% (see Table 10-47)

Table 10-45: Barren-Ground Grizzly Fall Forage Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	813	9
Moderate	1,211	14
Low	2,620	30
Very low	729	8
None	3,211	37
No data	21	<1

Table 10-46: Barren-Ground Grizzly Denning Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	31	<1
High	36	<1
Moderate	231	3
Low	2	<1
Very low	3,935	46
None	4,350	51
No data	21	<1

Table 10-47: Barren-Ground Grizzly Spring Forage Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	0	0
Moderate	1,350	16
Low	3,037	35
Very low	897	10
None	3,318	39
No data	3	<1

10.3.3.2 Greater White-Fronted Goose

Site-Specific Information

Taglu is the centre of abundance for greater white-fronted geese in the Mackenzie Delta. Mid-June surveys from 1991 to 1998 found the density of greater white-fronted geese in Taglu was five to 10 birds/km². In 1973, F.F. Slaney and Company Ltd. (1974) found a density of 15.7 birds/km² in Taglu during June 18 to 21 nesting season surveys and estimated that 15 greater white-fronted geese used Taglu during the 1973 nesting season. Large concentrations of greater white-fronted geese were recorded just north of Taglu in the spring.

Field Results

Greater white-fronted geese were observed throughout the outer Mackenzie Delta in each month of surveys from May through September. They were relatively evenly distributed as scattered nesting pairs during the spring migration and June nesting surveys. More large groups of greater white-fronted geese were observed in July, August and September, but fewer groups of one to 10 birds were recorded. Most of the largest groups were seen along the outer coast, but some were inland. These observations are consistent with the movement of geese from inland nesting areas to coastal brood-rearing sites.

Average monthly greater white-fronted geese densities in the outer Mackenzie Delta, as derived from the aerial surveys, were 79 birds/100 km^2 in June, 279 in July, 88 in August and 246 in September.

Relatively few greater white-fronted geese likely nest in Taglu, based on the pattern of distribution and abundance observed over the larger area during the aerial surveys. Beginning in July, family groups from Taglu move to the coast in large flocks to moult.

Modelling Results

Modelling results indicate that in the Taglu LSA:

- 9% of the area is effective greater white-fronted goose nesting habitat (see Table 10-48)
- 52% of the area is effective greater white-fronted goose foraging habitat (see Table 10-49). This is similar to the results for the RSA

Table 10-48: Greater White-Fronted Goose Nesting Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	166	2
Moderate	593	7
Low	1,032	12
Very low to none	6,808	79
No data	6	<1
Total	8,606	100[a]
NOTE: a Numbers do not total 100% because of rounding		

Table 10-49: Greater White-Fronted Goose Foraging Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,032	12
Moderate	3,454	40
Low	0	0
Very low to none	4,114	48
No data	6	<1
Total	8,606	100[a]
NOTE: a Numbers do not total 100% because of rounding		

10.3.3.3 Snow Goose

Site-Specific Information

Mid-June surveys from 1991 to 1998 found the average density of snow geese in Taglu was 0 to 1 birds/km². The highest densities, more than 10 birds/km^2, were found on islands and along the coast near Kendall Island, which is immediately north of Taglu.

Many spring and fall migrant geese were noted on the Mackenzie Bay coast just north of Taglu in 1972 and 1973 (F.F. Slaney and Company Ltd. 1974).

Field Results

Most snow geese sightings during the 2001 and 2002 aerial surveys were near Kendall Island or nearby along the coast. Snow geese and greater white-fronted geese were seen frequently and in relatively large flocks of brood rearing and moulting birds in July and August along the outer coast of the Mackenzie Delta southeast of Kendall Island and north of Big Lake. Snow geese were seen along the coast of the outer delta, and few were seen inland in Taglu during aerial surveys.

Modelling Results

A habitat model was not prepared for the snow goose.

10.3.3.4 Tundra Swan

Site-Specific Information

Mid-June surveys from 1991 to 1998 found the average density of tundra swans in Taglu during the breeding season was 0 to 1 birds/km². Average densities of five to 10 and more than 10 birds/km^2 were recorded in adjacent areas, especially along the coast of the outer delta.

Twenty tundra swans were estimated to be in Taglu during the 1973 breeding season (F.F. Slaney and Company Ltd. 1974). No spring or fall concentrations were observed in 1972 to 1973.

Field Results

The outer Mackenzie Delta is an important area for nesting and moulting tundra swans, which were widely scattered throughout the outer delta during the late May, June and July aerial surveys. There was evidence of large flocks of swans gathering along the coast of the outer Mackenzie Delta beginning in July and continuing into August. This was not evident in September aerial surveys.

Average monthly densities of tundra swans on the outer Mackenzie Delta, as derived from the aerial surveys, were 102 birds/100 km^2 in June, 136 in July, 179 in August and 69 in September.

It is likely that a few tundra swans nest in Taglu, based on the results of the aerial surveys. The family groups that do can move to the coast of the outer delta in July and August to continue brood rearing and to moult.

Modelling Results

Modelling results indicate that in the Taglu LSA:

- 26% of the area is effective tundra swan nesting habitat (see Table 10-50)
- 64% of the area is effective tundra swan foraging habitat, which is a result of the importance of waterbodies for foraging and the numerous waterbodies in the study area (see Table 10-51)

Table 10-50: Tundra Swan Nesting Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,235	14
Moderate	1,019	12
Low	890	10
Very low to none	5,456	63
No data	6	<1
Total	8,606	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Table 10-51: Tundra Swan Foraging Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	4,266	50
Moderate	1,234	14
Low	338	4
Very low to none	2,762	32
No data	6	<1
Total	8,606	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.3.5 Greater and Lesser Scaup

Site-Specific Information

June surveys from 1991 to 1998 found scaup in low average densities of 0 to 1/km² in Taglu.

F.F. Slaney and Company Ltd. (1974) reported a density of 0.05/km² from a late June 1973 aerial survey of Taglu.

Field Results

Field results contrast with Canadian Wildlife Service results. Greater scaup and lesser scaup, together with scoters, were the most abundant diving ducks recorded during aerial surveys of the outer Mackenzie Delta. It is not usually possible to distinguish the two species of scaups during aerial surveys, so nearly all sightings are classed as unidentified scaup. Scaups were widely distributed in small groups from late May to early June, i.e., during spring migration, and June aerial surveys. During the July, August and September aerial surveys, a greater proportion of the sightings were of larger flocks, probably moulting birds. Most of the larger flocks were seen in the central and southern parts of the survey area and not on the outer coast.

Average monthly densities of scaup on the outer Mackenzie Delta, derived from the aerial surveys, were 92 birds/100 km^2 in June, 62 in July, 61 in August and 97 in September.

Based on the results of the aerial surveys, scaup, i.e., probably greater scaup, likely nest in moderate densities in Taglu, where some of the lakes could be used for brood rearing and moulting.

Modelling Results

Modelling results indicate that in the Taglu LSA about 4% of the area is effective nesting habitat for greater scaup (see Table 10-52). The abundance of habitat that is low or very low to none is likely a result of adjustments made for proximity to water. The high-value 1-m-wide strips surrounding waterbodies make up a small portion of the LSA. All vegetation communities more than 200 m from waterbodies were assigned the very low to none value.

10.3.3.6 Peregrine Falcon

Site-Specific Information

There are no records of peregrine falcon nest sites in Taglu (RWED 2004). The flat tundra does not provide suitable cliff-nesting habitat, although prey species occur there and peregrines might use the area for hunting.

Table 10-52: Greater Scaup Nesting Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1	<1
Moderate	311	4
Low	1,218	14
Very low to none	7,069	82
No data	6	<1
Total	8,606	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Field Results

No peregrine falcons were observed during aerial surveys of the outer Mackenzie Delta.

Modelling Results

No habitat model was prepared for the peregrine falcon.

10.3.3.7 Whimbrel

Site-Specific Information

Twenty whimbrel were estimated to be in Taglu during the 1973 nesting period (F.F. Slaney and Company Ltd. 1974). Gratto-Trevor (1994) found whimbrel pairs in the Taglu-Fishing Island area during surveys in 1991 and 1992.

Field Results

One whimbrel was observed during aerial surveys of the outer Mackenzie Delta. However, whimbrels are not readily detected from fast-moving aircraft. Ground-based surveys are better suited to detecting nesting whimbrels, but no ground-based surveys were conducted in Taglu.

Modelling Results

Modelling results indicate that in the Taglu LSA:

- 61% of the area is effective whimbrel nesting habitat (see Table 10-53)
- 68% of the area is effective whimbrel foraging habitat (see Table 10-54)

Table 10-53: Whimbrel Nesting Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,321	15
Moderate	3,993	46
Low	515	6
Very low to none	2,771	32
No data	6	<1
Total	8,606	100[a]
NOTE: a Numbers do not total 100% because of rounding		

Table 10-54: Whimbrel Foraging Habitat Distribution – Taglu

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,819	21
Moderate	4,005	47
Low	2,699	31
Very low to none	76	1
No data	6	<1
Total	8,606	100[a]
NOTE: a Numbers do not total 100% because of rounding		

10.3.3.8 Arctic Tern

Site-Specific Information

A density of 0.6 birds/km² was calculated from June 18 to 21, 1973 aerial surveys of Taglu (F.F. Slaney and Company Ltd. 1974).

Field Results

Arctic terns were abundant during aerial surveys of the outer Mackenzie Delta, and nesting colonies were seen in the survey area. Arctic tern densities remained relatively high through June and July, and they were widely distributed throughout the outer Mackenzie Delta during that period. Arctic terns are an early fall migrant. Far fewer were seen during August aerial surveys, and none were recorded in September.

Average monthly Arctic tern densities on the outer Mackenzie Delta, derived from the aerial surveys, were 79 birds/100 km^2 in June, 93 in July, 16 in August and 0 in September.

Modelling Results

No habitat model was prepared for Arctic tern.

10.3.4 Parsons Lake

10.3.4.1 Barren-Ground Caribou

Site-Specific Information

Figure 10-15, shown previously, indicates that barren-ground caribou are near Parsons Lake in winter. However, area residents have suggested that hunting in the area might have changed recent movement patterns (Nagy 2003, personal communication).

Field Results

See Table 10-55 for survey results and incidental observations.

Table 10-55: Survey Results for Barren-Ground Caribou or Reindeer – Parsons Lake

Tundra Ecological Zone Habitat Type	Vegetation Type	Barren Ground Caribou or Reindeer		
		Track/km/day	Pellet Group/ha	No. of Incidental Observations
Low shrub	1, 2	0.00	43.79	7
Sedge – cotton-grass	4, 8	0.00	N/S	8
High- and low-centred polygons	5, 6	0.00	243.96	3
Delta sedge – cotton-grass	10, 12	N/S	N/S	2
Medium shrub	3	0.00	N/S	0
Riparian shrub	7	0.00	N/S	1
Delta shrub	9	N/S	N/S	1
Riparian black spruce and shrub	13	0.00	N/S	1
Disturbed	D	N/S	N/S	0
Bare ground	B	N/S	N/S	0
Water	W	N/S	N/S	1
Total Average		0.00	93.83	24

NOTES:
N/S = not surveyed
Incidental observations are those with species, location or habitat information
Data is from the 2001, 2002 and 2003 field surveys

Ungulate Aerial Survey

In 2003, 795 caribou were observed in the 544 km^2 Parsons Lake and gathering pipelines survey block. The density was 1.46 caribou/km^2.

Winter Track Survey

No caribou tracks were observed at Parsons Lake during the late-winter track surveys in 2003.

Pellet Group Survey

Pellet group surveys recorded caribou pellets in low shrubs and high- and low-centred polygon habitat types at Parsons Lake. Pellet group density was highest in the high- and low-centred polygon habitat type with a density of 244 pellets/ha.

Incidental Observations

Barren-ground caribou sign was observed in eight habitat types at Parsons Lake. Caribou sign was most often recorded in the low shrub and sedge-cotton-grass habitat types.

Modelling Results

Modelling results indicate that in the Parsons Lake LSA, 25% of the area is effective winter forage habitat for barren-ground caribou (see Table 10-56).

Table 10-56: Barren-Ground Caribou Winter Forage Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	8,839	22
High	1,102	3
Moderate	7,079	17
Low	4,986	12
Very low	609	2
None	15,559	38
No data	2,846	7

10.3.4.2 Barren-Ground Grizzly

Site-Specific Information

Grizzlies foraging on caribou carrion have been noted at Parsons Lake (Nagy 2003, personal communication).

Field Results

Aerial and Ground Den Survey

Aerial surveys were conducted over more than 60% of the Parsons Lake lease. Full survey coverage, with a 1-km gridline separation, was completed on 20% of the lease. Partial survey coverage, with a 2-km gridline separation, was completed on 40% of the lease.

Twelve grizzly bear den sites were recorded during aerial surveys in and around Parsons Lake (see Table 10-57). Of these, five were in the lease and seven were beside the lease. Ground surveys confirmed that most grizzly bear dens were in shrub habitat types and in sandy glaciofluvial soils (see Table 10-58).

Table 10-57: Barren-Ground Grizzly – Parsons Lake

Tundra Ecological Zone Habitat Type	Vegetation Type	Grizzly Bear	
		No. of Dens	No. of Incidental Observations
Low shrub	1, 2	N/S	1
Sedge – cotton-grass	4, 8	N/S	1
High- and low-centred polygons	5, 6	N/S	N/S
Delta sedge – cotton-grass	10, 12	N/S	N/S
Medium shrub	3	10 (6 off lease)	N/S
Riparian shrub	7	N/S	N/S
Delta shrub	9	N/S	N/S
Riparian black spruce and shrub	13	N/S	1
Disturbed	D	N/S	1
Bare ground	B	N/S	N/S
Water	W	N/S	N/S
Unknown		2 (1 off lease)	N/S
Total		12	4

NOTES:
N/S = not surveyed
Incidental observations are those with species, location and habitat information
Data from 2001, 2002 and 2003 field surveys

Table 10-58: Grizzly Bear Den Sites and Associated Surficial Soil – Parsons Lake

Soil Type Description	Surficial Soil	Number of Dens	
		Parsons Lake	Off Lease
Gravelly or sandy glaciofluvial undulating/thermokarst	aGm-k	1	0
Sandy glaciofluvial undulating/thermokarst	sGm-k	4	1
Unknown		0	6
Total		5	7

Modelling Results

Modelling results for the Parsons Lake LSA indicate that:

- 30% of the area is effective barren-ground grizzly fall forage habitat (see Table 10-59)
- 37% of the area is effective barren-ground grizzly denning habitat (see Table 10-60)
- 39% of the area is effective barren-ground grizzly spring forage habitat (see Table 10-61)

Table 10-59: Barren-Ground Grizzly Fall Forage Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	1,181	3
Moderate	10,873	27
Low	10,200	25
Very low	1,222	3
None	14,671	36
No data	2,875	7

Table 10-60: Barren-Ground Grizzly Denning Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	5,622	14
High	2,106	5
Moderate	7,264	18
Low	438	1
Very low	7,576	19
None	15,093	37
No data	2,920	7

Table 10-61: Barren-Ground Grizzly Spring Forage Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	1,600	4
Moderate	14,294	35
Low	6,838	17
Very low	961	2
None	14,482	35
No data	2,846	7

10.3.4.3 Greater White-Fronted Goose

Site-Specific Information

F.F. Slaney and Company Ltd. (1974) found no spring or fall staging areas for greater white-fronted geese at Parsons Lake in 1972 and 1973, but migrants flew south over the area in fall. A density of 1.85 birds/km² was estimated at the beginning of the moulting period in late June 1973.

Field Results

A few greater white-fronted geese were observed in each Parsons Lake aerial survey, from June to September. Five, or 2.1 birds/100 km², were recorded during the June surveys, although they were difficult to see from the air. Totals of 77 birds in July, 42 in August and 33 in September were largely repeated observations of a flock of post-breeding, moulting adults in a shallow stream bed near the east side of Parsons Lake.

Modelling Results

Modelling results indicate that in the Parsons Lake LSA:

- 7% of the area is effective greater white-fronted goose nesting habitat (see Table 10-62)
- 52% of the area is effective greater white-fronted foraging habitat (see Table 10-63)

Table 10-62: Greater White-Fronted Goose Nesting Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	406	1
Moderate	2,493	6
Low	4,635	11
Very low to none	30,626	75
No data	2,861	7
Total	41,021	100

Table 10-63: Greater White-Fronted Goose Foraging Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,146	3
Moderate	20,250	49
Low	641	2
Very low to none	16,124	39
No data	2,861	7
Total	41,021	100

10.3.4.4 Snow Goose

Site-Specific Information

F.F. Slaney and Company Ltd. (1974) found no spring or fall staging areas for snow geese near Parsons Lake in 1972 and 1973, but migrants flew south over the area in fall.

Field Results

There is no indication that snow geese breed at Parsons Lake. Fourteen snow geese recorded in September surveys were the only ones observed during fall migration.

Modelling Results

A habitat model was not prepared for snow geese.

10.3.4.5 Tundra Swan

Site-Specific Information

F.F. Slaney and Company Ltd. (1974) found no spring or fall staging areas for tundra swan at Parsons Lake in 1972 and 1973, although migrants flew over the area in spring and fall. A density of 29 birds/100 km² was estimated at the beginning of the moulting period in late June 1973.

Field Results

Tundra swans were abundant at Parsons Lake during the 2001 and 2002 surveys. Although densities were not as high as on the outer Mackenzie Delta, tundra swans were numerous and widely distributed around Parsons Lake. Densities increased each month from 54 birds/100 km^2 in June, to 68 in July, to 130 in August. The higher density in August is probably attributable to the young being large enough to be seen from the survey aircraft. Densities declined to 65 birds/100 km^2 in September surveys. Most swans remained in family groups from June to September. Few sightings were of more than 10 birds, and there were no flocks with more than 50 birds. Swans were distributed along all survey lines during spring, summer and fall surveys, although most sightings were to the northwest and north of Parsons Lake, fewer to the northeast and east of the lake and very few in the North Storm Hills. Two adults with one young were seen during the July 29, 2001 ground-truthing survey near West Hans Lake.

Modelling Results

Modelling results indicate that in the Parsons Lake LSA:

- 17% of the area is effective tundra swan nesting habitat (see Table 10-64)
- 49% of the area is effective tundra swan foraging habitat (see Table 10-65)

Table 10-64: Tundra Swan Nesting Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,589	4
Moderate	5,428	13
Low	6,390	16
Very low to none	24,753	60
No data	2,861	7
Total	41,021	100

Table 10-65: Tundra Swan Foraging Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	15,810	39
Moderate	4,164	10
Low	7,230	18
Very low to none	10,955	27
No data	2,861	7
Total	41,021	100[a]
NOTE: a Numbers do not total 100% because of rounding		

10.3.4.6 Greater and Lesser Scaup

Site-Specific Information

F.F. Slaney and Company Ltd. (1974) reported a density of 614 scaup/km² during late June 1973 aerial surveys. Slaney assumed all scaup at Parsons Lake were greater scaup, although fieldwork in 2001 and 2002 showed lesser scaup are also in the area.

Field Results

The two species of scaup were difficult to distinguish during aerial surveys of Parsons Lake, and most scaup were not identified to species. Only lesser scaup were positively identified, in contrary to F.F. Slaney and Company Ltd.'s (1974) assumption that all scaup were greater scaup. A lesser scaup nest with eggs was found west of Parsons Lake, which is an important area for post-breeding and moulting scaup in summer. Although more scoters were observed during June aerial surveys, scaup were by far the largest group during August surveys. The

average monthly density in August was 1,072 birds/100 km^2 from sightings of 3,681 birds on-transect. An additional 1,175 scaup were counted off-transect.

Scaup were distributed widely throughout the Parsons Lake LSA during June surveys. Although fewer sightings were recorded in July and August, sightings were of larger groups of scaup. There were nine sightings of 51 to 300 birds each and two sightings of more than 300 birds during August surveys. Parsons Lake, West Hans Lake and East Hans Lake were the important areas. A flock of 330 scaup was seen on West Hans Lake during the ground-truthing survey on July 29, 2001. Scaup densities at Parsons Lake were much higher than densities recorded in aerial surveys of the outer Mackenzie Delta.

Modelling Results

Modelling results indicate that in the Parsons Lake LSA, about 3% of the area is effective greater scaup nesting habitat (see Table 10-66). The predicted scarcity of such habitat is partly a result of the adjustments made to account for this species' preference to nest within 1 m of a waterbody.

Table 10-66: Greater Scaup Nesting Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	**Habitat** (%)
High	7	<1
Moderate	1,179	3
Low	2,804	7
Very low to none	34,170	83
No data	2,861	7
Total	41,021	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.4.7 Peregrine Falcon

Site-Specific Information

There are no records of peregrine falcon nest sites at Parsons Lake (RWED 2004). The tundra does not provide suitable cliff-nesting habitat, although prey species are there and peregrines might use the area for hunting.

Field Results

No peregrine falcons were observed at Parsons Lake during the 2001 and 2002 surveys. However, during ground-truthing surveys, an adult was observed hunting

30 km south of Parsons Lake on July 30, 2001 in habitat similar to habitat around Parsons Lake, suggesting there might be peregrines in the lease area.

Modelling Results

No habitat model was prepared for the peregrine falcon.

10.3.4.8 Whimbrel

Site-Specific Information

The time of arrival of whimbrel was established for May 28 (F.F. Slaney and Company Ltd. 1974). A density of 0.22/km² was estimated from a June 18 to 21, 1973 breeding bird aerial survey.

Field Results

Whimbrel recorded on three of five shorebird plots in the lease area included two agitated pairs and one nest just outside a plot. Incidental observations of whimbrel during aerial surveys indicate they occur in low densities over most of the lease area.

Modelling Results

Modelling results indicate that in the Parsons Lake LSA:

- 29% of the area is effective whimbrel nesting habitat (see Table 10-67). This is less than the available effective habitat in the RSA and the Niglintgak and Taglu LSAs. It could be a result of the relative scarcity of waterbodies at the higher, drier Parsons Lake study area.

- 55% of the area is effective whimbrel foraging habitat (see Table 10-68)

Table 10-67: Whimbrel Nesting Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	**Habitat** (%)
High	3,831	9
Moderate	8,399	20
Low	11,557	28
Very low to none	14,373	35
No data	2,861	7
Total	41,021	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Table 10-68: Whimbrel Foraging Habitat Distribution – Parsons Lake

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	12,702	31
Moderate	9,776	24
Low	15,624	38
Very low to none	57	<1
No data	2,861	7
Total	41,021	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.4.9 Arctic Tern

Site-Specific Information

A density of 0.43/km² was estimated from a June 18 to 21, 1973 breeding bird aerial survey in the Parsons Lake study area.

Field Results

Arctic terns were common and widespread during the 2001 and 2002 aerial surveys of Parsons Lake. Nesting colonies and foraging flocks were identified from the air in densities of 173 birds/100 km² in June, 102 birds/100 km² in July and 73 birds/100 km² in August. The drop in numbers in August indicates departure from the area. No Arctic terns were observed in September.

Modelling Results

No habitat model was prepared for Arctic tern.

10.3.5 Gathering Pipelines

10.3.5.1 Barren-Ground Caribou

Site-Specific Information

Shown previously in Figure 10-15, the two parts of the gathering pipelines that cross barren-ground caribou winter range include the:

- Parsons Lake lateral
- gathering pipelines south of Richards Island

Parsons Lake is considered a focal area for barren-ground caribou in November. Recent radio-telemetry data indicates that most barren-ground caribou move east

of Husky Lakes by mid-December (Nagy 2003, personal communication). The mortality rate of barren-ground caribou in this area is not known.

Field Results

Ungulate Aerial Survey

In 2003, 795 caribou were observed in the 544 km^2 survey block that encompassed Parsons Lake and the gathering pipelines, representing a density of 1.46 caribou/km^2.

Winter Track Survey

Barren-ground caribou tracks were not observed during winter track surveys, although windy conditions that persisted during these surveys reduced their effectiveness.

Pellet Group Survey

Caribou pellets were recorded in one of the three habitat types, low shrub, riparian shrub and riparian black spruce/shrub, surveyed along the gathering pipelines during pellet group surveys (see Table 10-69). The pellet group density in the riparian black spruce/shrub habitat type was 35 pellet groups/ha.

Table 10-69: Barren-Ground Caribou or Reindeer – Gathering Pipelines

Tundra Ecological Zone Habitat Type	Vegetation Type	Barren-Ground Caribou or Reindeer		
		Track/km/day	Pellet Groups/ha	No. of Incidental Observations
Low shrub	1, 2	N/S	0	30
Sedge – cotton-grass	4, 8	N/S	N/S	10
High- and low-centred polygons	5, 6	N/S	N/S	20
Delta sedge – cotton-grass	10, 12	N/S	N/S	2
Medium shrub	3	0.00	N/S	4
Riparian shrub	7	0.00	0	10
Delta shrub	9	N/S	N/S	0
Riparian black spruce/shrub	13	0.00	35	2
Disturbed	D	N/S	N/S	0
Bare ground	B	N/S	N/S	1
Water	W	N/S	N/S	3
Unknown		N/S	N/S	N/S
Total or Average		0.00	4	82

NOTES:
N/S = not surveyed
Incidental observations are those with species, location and habitat information
Data is from the 2001, 2002 and 2003 field surveys

Incidental Observations

Incidental observations of barren-ground caribou sign were recorded in nine habitat types in the gathering pipelines area. Caribou sign was most frequent in the low shrub and high- and low-centred polygon habitat types (see Table 10-69, shown previously).

Modelling Results

Modelling results show that 55% of the gathering pipelines LSA is effective barren-ground caribou winter forage habitat (see Table 10-70).

Table 10-70: Barren-Ground Caribou Forage Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	5,019	28
High	913	5
Moderate	3,906	22
Low	2,365	13
Very low	318	2
None	4,464	25
No data	697	4

10.3.5.2 Barren-Ground Grizzly

Site-Specific Information

Grizzly bear habitat is continuous along the gathering pipelines. Nagy (2003, personal communication) reported a possible density of grizzly bears in the gathering pipelines area of seven to eight bears/1,000 km^2. Foraging on caribou carrion has been noted at Parsons Lake. Dens along the gathering pipelines were in upland areas characterized by rolling hills and many lakes and wetlands.

Field Results

Aerial and Ground Den Survey

Sixty grizzly bear den sites were recorded during aerial surveys along and around the gathering pipelines. Twelve dens were found within 1 km of the gathering pipelines, and two dens were found near the north flowline at Parsons Lake. Along the gathering pipelines, five dens were south of Parsons Lake near Trail Creek, and seven were found north of Parsons Lake.

Preliminary analysis of ground survey data suggests key factors determining suitable denning habitat in the production area are:

- soil type
- slope, including aspect and steepness
- vegetation type

Most recorded den sites were in medium and low shrub habitat types (see Table 10-71) and in gravelly or sandy glaciofluvial deposits or moderately sloping morainal veneer (see Table 10-72).

Table 10-71: Barren-Ground Grizzly and Associated Vegetation Types – Gathering Pipelines

Tundra Ecological Zone Habitat Type	Vegetation Type	Grizzly Bear	
		No. of Dens	No. of Incidental Observations
Low shrub	1, 2	11 (10 offline)	7
Sedge – cotton-grass	4, 8	N/S	2
High- and low-centred polygons	5, 6	N/S	4
Delta sedge – cotton-grass	10, 12	N/S	1
Medium shrub	3	37 (offline)	4
Riparian shrub	7	N/S	11
Delta shrub	9	N/S	N/S
Riparian black spruce/shrub	13	N/S	3
Disturbed	D	N/S	2
Bare ground	B	N/S	N/S
Water	W	N/S	N/S
Unknown		12 (10 offline)	N/S
Total		60	34

NOTES:
N/S = not surveyed
Incidental observations are those with species, location and habitat information
Data is from the 2001, 2002 and 2003 field surveys

Incidental Observations

There were incidental observations of grizzly bear sign in eight habitat types, most often in the riparian shrub habitat type.

Table 10-72: Barren-Ground Grizzly Den Sites and Associated Surficial Soil – Gathering Pipelines

Soil Type Description	Surficial Soil	Number of Dens
Gravelly or sandy glaciofluvial undulating/thermokarst	aGm-k	16
Gravelly or sandy glaciofluvial ridges	aGr	1
Gravelly or sandy glaciofluvial plain	aGp	9
Moraine veneer/sandy complex deposit/thermokarst	Mv/sXp-k	1
Moraine veneer/sandy moraine plain/thermokarst	Mv/sMp-k	4
Gravelly or sandy glaciofluvial undulating	aGm	3
Sandy glaciofluvial undulating/thermokarst	sGm-k	1
Moraine veneer/bedrock moderately sloping	Mv/Rn	11
Unknown		14
Total		60

Modelling Results

As shown in Table 10-73, Table 10-74 and Table 10-75, modelling results indicate the gathering pipelines LSA contains:

- 27% effective barren-ground grizzly fall forage habitat
- 29% effective barren-ground grizzly denning habitat
- 52% effective barren-ground grizzly spring forage habitat

Table 10-73: Barren-Ground Grizzly Fall Forage Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	708	4
Moderate	4,067	23
Low	8,977	51
Very low	942	5
None	2,182	12
No data	808	5

Table 10-74: Barren-Ground Grizzly Denning Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	1,852	11
High	438	2
Moderate	2,793	16
Low	258	1
Very low	8,595	49
None	2,962	17
No data	785	4

Table 10-75: Barren-Ground Grizzly Spring Forage Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	1,813	10
Moderate	7,363	42
Low	5,127	29
Very low	644	4
None	2,039	12
No data	698	4

10.3.5.3 Greater White-Fronted Goose

Site-Specific Information

No previous studies of greater white-fronted geese specific to the gathering pipelines were available.

Field Results

Greater white-fronted geese were not commonly observed along the gathering pipelines. Seventeen were recorded on the spring aerial surveys. Densities ranged from 8 birds/100 km^2 in July to 18 in August. Most sightings were in the delta. Flock sizes did not exceed 50, even in August and September, and there were no sightings during the ground-truthing survey.

Modelling Results

Modelling results indicate that in the gathering pipelines LSA:

- 7% of the area is effective greater white-fronted swan nesting habitat (see Table 10-76)
- 25% of the area is effective greater white-fronted swan foraging habitat (see Table 10-77)

Table 10-76: Greater White-Fronted Goose Nesting Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	344	2
Moderate	917	5
Low	1,306	7
Very low to none	14,413	82
No data	616	4
Total	17,596	100

Table 10-77: Greater White-Fronted Goose Foraging Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	820	5
Moderate	3,546	20
Low	457	3
Very low to none	12,157	69
No data	616	4
Total	17,596	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.5.4 Snow Goose

Site-Specific Information

No previous studies of snow geese specific to the gathering pipelines were available.

Field Results

Snow geese were rare along the gathering pipelines, with only four migrants recorded – one in August and three in September.

Modelling Results

A habitat model was not prepared for snow geese.

10.3.5.5 Tundra Swan

Site-Specific Information

No previous studies of tundra swan specific to the proposed gathering pipelines were available.

Field Results

The outer Mackenzie Delta is an important tundra swan nesting area. Seventy-three were observed during the spring aerial surveys. Densities during the aerial transect surveys increased over the summer and peaked at 50 birds/100 km^2 in August. Tundra swans were seen on a higher percentage of survey times in July, August and September than any other species of waterfowl. They were in family groups of 10 or fewer even in August. Four swans were observed during the ground-truthing survey.

Modelling Results

Modelling results indicate that in the gathering pipelines LSA:

- 18% of the area is effective tundra swan nesting habitat (see Table 10-78)
- 29% of the area is effective tundra swan foraging habitat (see Table 10-79)

Table 10-78: Tundra Swan Nesting Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,312	7
Moderate	1,855	11
Low	1,809	10
Very low to none	12,004	68
No data	616	4
Total	17,596	100

Table 10-79: Tundra Swan Foraging Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	3,175	18
Moderate	1,852	11
Low	1,699	10
Very low to none	10,254	58
No data	616	4
Total	17,596	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.5.6 Greater and Lesser Scaup

Site-Specific Information

No previous studies of scaup specific to the gathering pipelines were available.

Field Results

Scaup was the most abundant species during all of the surveys. They were numerous during the spring aerial surveys, with 265 birds observed, and summer and fall densities varied from 93 birds/100 km^2 in July to 162 in August. Only two scaup were observed during the ground-truthing survey. Flock sizes were largest and birds were most concentrated in August and September.

Modelling Results

Modelling results indicate that about 4% of the gathering pipelines LSA is effective greater scaup nesting habitat (see Table 10-80). The predicted scarcity of such habitat is partly a result of the adjustments made to account for this species' preference to nest within 1 m of a waterbody.

10.3.5.7 Peregrine Falcon

Site-Specific Information

There are no records of peregrine falcon nest sites along the gathering pipelines (RWED 2004). The tundra does not provide suitable cliff-nesting habitat, although prey species are there and peregrines do use the area for hunting.

Table 10-80: Greater Scaup Nesting Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	3	<1
Moderate	654	4
Low	1,647	9
Very low to none	14,676	83
No data	616	4
Total	17,596	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Field Results

There was one sighting of an adult peregrine falcon during ground-truthing in July and one during an aerial survey in August. Nesting habitat is limited along the gathering pipelines and adjacent lands, although sightings of two adults during the breeding season indicate breeding in low densities.

Modelling Results

No habitat model was prepared for the peregrine falcon.

10.3.5.8 Whimbrel

Site-Specific Information

No previous studies of whimbrel specific to the gathering pipelines were available.

Field Results

Shorebirds were seldom observed during aerial surveys because their small size makes them inconspicuous except when they fly. They were difficult to identify to species for the same reason. Most of the identified shorebirds were whimbrels, one of the larger shorebird species. Shorebirds were most common in July and August when they were concentrated in flocks.

Modelling Results

Modelling results indicate that in the gathering pipelines LSA:

- 50% of the area is effective whimbrel nesting habitat (see Table 10-81)
- 77% of the area is effective whimbrel foraging habitat (see Table 10-82)

Table 10-81: Whimbrel Nesting Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	2,505	14
Moderate	6,386	36
Low	6,145	35
Very low to none	1,944	11
No data	616	4
Total	17,596	100

Table 10-82: Whimbrel Foraging Habitat Distribution – Gathering Pipelines

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	7,101	40
Moderate	6,580	37
Low	3,249	18
Very low to none	50	<1
No data	616	4
Total	17,596	100[a]
NOTE: a Numbers do not total 100% because of rounding		

10.3.5.9 Arctic Tern

Site-Specific Information

No previous studies of Arctic tern specific to the gathering pipelines were available.

Field Results

Arctic terns were commonly observed on the spring and transect surveys. The average monthly density peaked at 69 birds/100 km^2 in June, and the terns had left the area by September. Most of the terns seen during the aerial surveys were on the delta.

Modelling Results

No habitat model was prepared for Arctic tern.

10.3.6 Pipeline Corridor

10.3.6.1 Barren-Ground Caribou

Site-Specific Information

Barren-ground caribou winter in the Transition Forest Ecological Zone and the North Taiga Plains Ecological Zone. The Inuvik area facility is within the winter range of the Bluenose caribou herd. The proposed pipeline corridor intersects the known winter range of the Bluenose West and Bluenose East caribou herds.

Field Results

It is not possible to distinguish between tracks of barren-ground and woodland caribou. Distinction during aerial surveys is also difficult. Barren-ground caribou are not likely to be found in the South Taiga Plains Ecological Zone.

In interpreting field results, it was assumed that caribou were distributed as follows:

- barren-ground caribou in the Tundra Ecological Zone
- barren-ground and woodland caribou in the Transition Forest Ecological Zone and North Taiga Plains Ecological Zone
- woodland caribou in the South Taiga Plains Ecological Zone

Ungulate Aerial Survey

No caribou were observed during aerial surveys of the Transition Forest Ecological Zone in either 2002 or 2003 (see Table 10-83).

Table 10-83: Caribou Observed during Aerial Surveys – North Taiga Plains Ecological Zone

Survey Year	Settlement Area	Survey Block	Area	Survey Area (km^2)	Number of Caribou					
					Bulls	Cows	Calves	Unclassified	Total	Observed Density ($No./km^2$)
2002	Gwich'in	–	Pipeline corridor	67.20	0	3	0	8	11	0.16
	Sahtu	–	Pipeline corridor	235.90	0	0	0	0	0	0
			Total	303.10	0	3	0	8	11	0.04
2003	Gwich'in	5	Travaillant Lake	173.08	72	21	0	0	93	0.54

NOTES:
– = no survey block number
Data is from 2002 and 2003 field surveys

In 2003, 93 caribou were observed in a 173-km^2 survey area in the North Taiga Plains Ecological Zone, for a density of 0.54 caribou/km^2. These included 72 bulls and 21 cows. In 2002, 11 caribou were observed in a 303-km^2 survey area in the North Taiga Plains Ecological Zone, for a density of 0.04 caribou/km^2. Three cows and eight unclassified caribou were observed. In total, 104 caribou were observed in the North Taiga Plains Ecological Zone.

Winter Track Survey

Figure 10-45 summarizes the caribou track density results from the 2002 and 2003 winter track count surveys. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

In the Transition Forest Ecological Zone, the highest frequency of tracks recorded during winter surveys occurred in:

- coniferous, black spruce forest – 1.74 tracks/km/day
- mixedwood forest – 1.60 tracks/km/day

Caribou tracks were recorded in three of the eight habitat types surveyed in the Transition Forest Ecological Zone during winter track surveys. The highest average track density was recorded in the treed bog habitat type, i.e., h3, with a density of 0.98 tracks/km/day. Caribou tracks were also recorded in the black spruce-tamarack/shrub, i.e., g1 and k4, and black spruce/lichen bog, i.e., h4 and i3, habitat types.

Caribou habitat use did not differ significantly between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where n = 99, df = 6 and p = 0.622.

Caribou tracks were recorded in four of the six habitat types surveyed in the North Taiga Plains Ecological Zone during winter track surveys. The highest average track density was recorded in the black spruce/lichen bog habitat type, i.e., i3, with a density of 14.75 tracks/km/day. Caribou tracks were also recorded in the burned, i.e., C, mixedwood forest, i.e., d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat types.

Caribou habitat use did not differ significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where n = 144, df = 4 and p = 0.787.

Pellet Group Survey

Figure 10-46 summarizes the caribou pellet group densities along the pipeline corridor. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

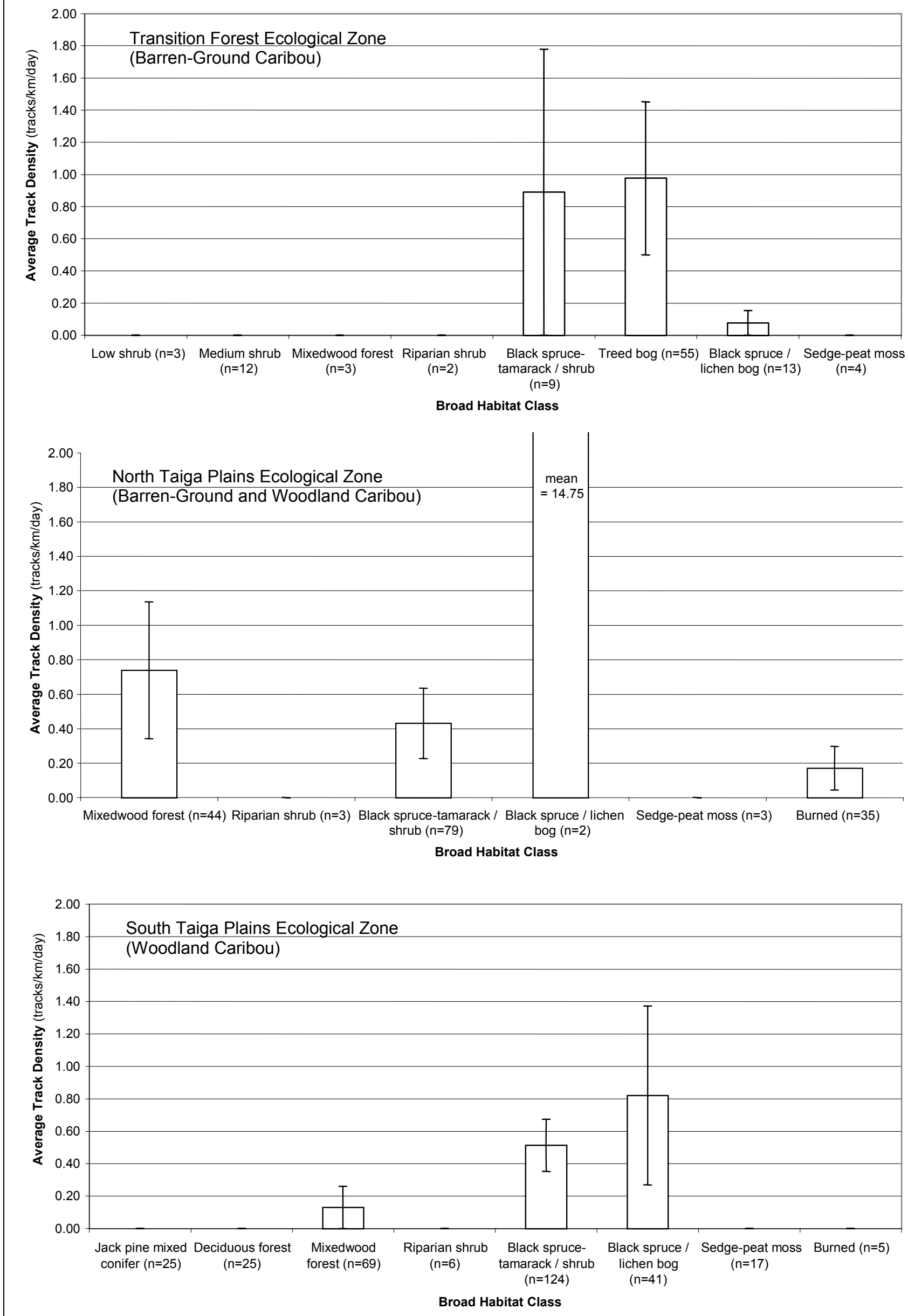

Figure 10-45: 2002 and 2003 Caribou Track Density from Winter Track Count Surveys

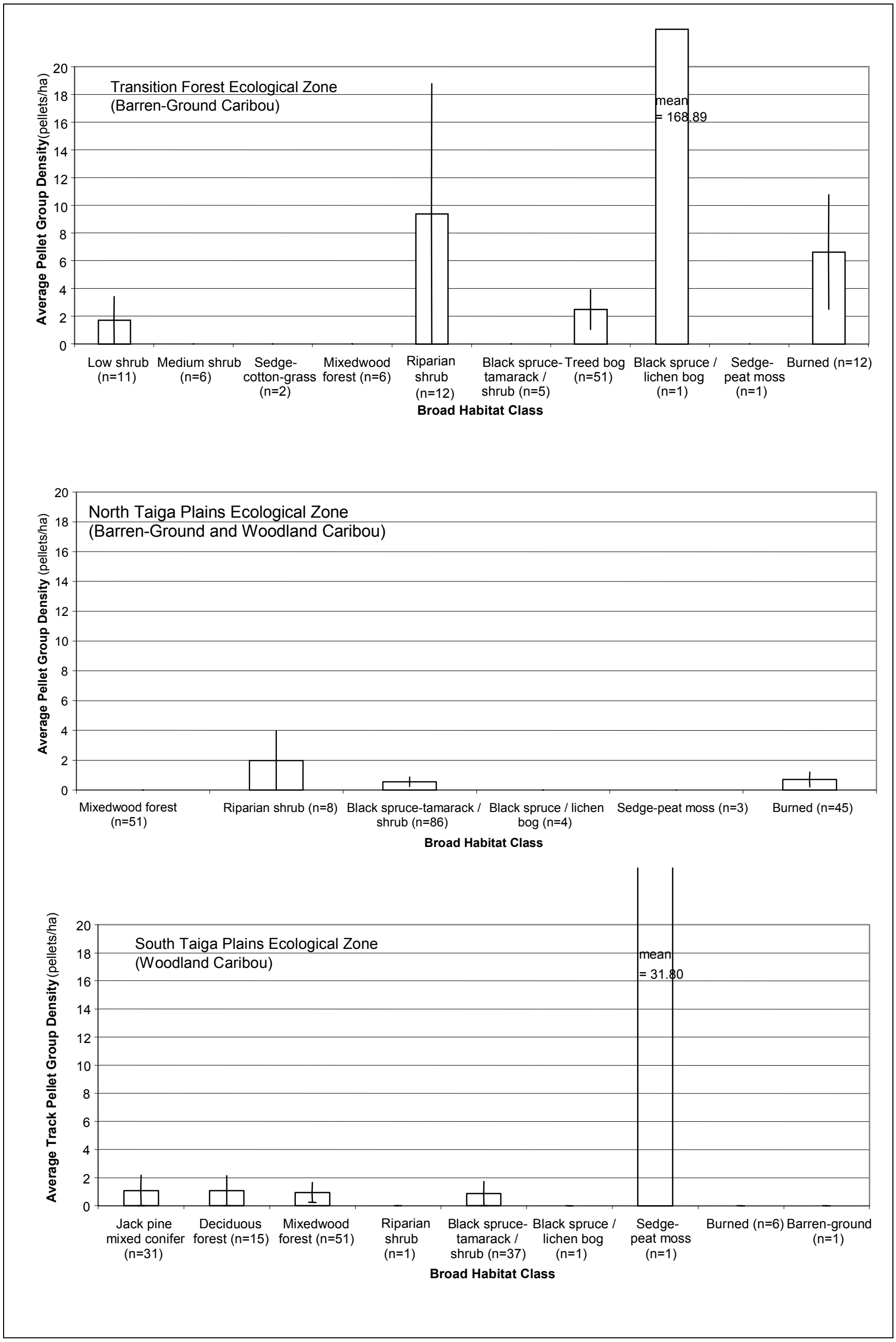

Figure 10-46: Caribou Pellet Group Densities – Pipeline Corridor

Caribou pellet groups were recorded in five of the 10 habitat types surveyed during pellet group surveys in the Transition Forest Ecological Zone. The highest average pellet group density was recorded in the black spruce/lichen bog habitat type, i.e., h4 and i3, with a density of 168.9 pellet groups/ha. Caribou pellets were also recorded in the low shrub, i.e., 1 and 2, burned, i.e., C, riparian shrub, i.e., f4, and treed bog, i.e., h3, habitat types.

Caribou habitat use did not differ significantly between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where n = 103, df = 6 and p = 0.403.

Caribou pellet groups were recorded in three of the six habitat types surveyed during pellet group surveys in the North Taiga Plains Ecological Zone. The highest average pellet group density was recorded in the riparian shrub habitat type, i.e., f4 and f5, with a density of 1.99 pellet groups/ha. Caribou pellets were also recorded in the burned, i.e., C, and black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat types.

Caribou habitat use did not differ significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where n = 197, df = 5 and p = 0.470.

Incidental Observations

Incidental observations of caribou sign were recorded in eight habitat types in the Transition Forest Ecological Zone. Most observations were in the medium shrub, i.e., 3, and black spruce-tamarack/shrub, i.e., g1 and k4, habitat types (see Table 10-84).

Table 10-84: Incidental Observations of Caribou – Transition Forest Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Low shrub	1, 2	4
Medium shrub	3	26
Mixedwood forest	d3, d5	1
Riparian shrub	f4	3
Black spruce – tamarack/shrub	g1, k4	12
Treed bog	h3	9
Black spruce/lichen bog	h4, i3	7
Burned	C	3

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Sign was recorded in seven habitat types in the North Taiga Plains Ecological Zone, most in the black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat type (see Table 10-85).

Table 10-85: Incidental Observations of Caribou – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Mixedwood forest	d3, d4, d5	21
Riparian shrub	f4, f5	3
Black spruce – tamarack/shrub	g1, k4, h2	68
Black spruce/lichen bog	i3	7
Sedge-peat moss	k3, i4	5
Burned	C	10
Disturbed	D	4

NOTE:
Incidentals observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Modelling Results

The habitat suitability models for barren-ground caribou and woodland caribou are very similar. For modelling purposes, it was assumed that caribou are likely located as follows:

- barren-ground caribou in the Tundra Ecological Zone and the Transition Forest Ecological Zone
- woodland caribou in the North Taiga Plains Ecological Zone and the South Taiga Plains Ecological Zone

Modelling results indicate that 70% of the LSA in the Transition Forest Ecological Zone along the pipeline corridor is effective barren-ground caribou winter forage habitat (see Table 10-86).

10.3.6.2 Woodland Caribou

Site-Specific Information

Woodland caribou prefer old-growth coniferous forests, particularly black spruce forests and peatlands, which have high concentrations of ground and tree lichens, their preferred forage. In winter, they tend to favour uplands, bogs and south-facing slopes where snow is less deep. In summer, they prefer forest edges, marshes and meadows, which provide fresh green vegetative growth. Forested habitats are used all year.

Table 10-86: Barren-Ground Caribou Forage Habitat Distribution – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	1,557	20
High	3,453	44
Moderate	475	6
Low	1,196	15
Very low	175	2
None	371	5
No data	546	7

Woodland caribou occur widely throughout the project area and could venture near the proposed pipeline facilities. A quantitative assessment of habitat suitability for this species has not yet been done. Radio telemetry studies being conducted by the GNWT have confirmed woodland caribou range as far north as the Transition Forest Ecological Zone in the Gwich'in Settlement Area (Nagy 2003, personal communication).

Field Results

Ungulate Aerial Survey

As described previously, the combined density of barren-ground and woodland caribou observed was 0.04 caribou/km^{2}in the North Taiga Plains Ecological Zone in 2002 and 0.54 caribou/km^2 in 2003 (see Table 10-83, shown previously).

In 2003, 21 caribou were observed in a combined survey area of 645 km^2 in the South Taiga Plains Ecological Zone, for a density of 0.03 caribou/km^2 (see Table 10-87). In 2002, no caribou were observed in a 431 km^2 survey area in the South Taiga Plains Ecological Zone.

Track Count Survey

Caribou tracks were recorded in four of the six habitat types surveyed during winter track surveys. The highest average track density was recorded in the black spruce/lichen bog habitat type, i.e., i3, with a density of 14.75 tracks/km/day. Caribou tracks were also recorded in the burned, i.e., C, mixedwood forest, i.e., d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat types (see Figure 10-45, shown previously). Caribou habitat use did not differ significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where n = 144, df = 4 and p = 0.787.

Table 10-87: Woodland Caribou Aerial Survey Results – South Taiga Plains Ecological Zone

Survey Year	Administrative Region	Survey Block	Area	Survey Area (km^2)	Number of Woodland Caribou					
					Bulls	Cows	Calves	Unclassified	Total	Observed Density ($No./km^2$)
2002	Sahtu Settlement Area	–	Pipeline corridor	84.50	0	0	0	0	0	0
	Deh Cho Region	–	Pipeline corridor	346.40	0	0	0	0	0	0
		Total		430.90	0	0	0	0	0	0
2003	Deh Cho Region	6	Blackwater River	80.68	0	0	0	0	0	0
		7	Willowlake River south	68.06	0	0	0	0	0	0
		8	Trail River North	141.44	2	12	6	1	21	0.15
		9	Trail River South	66.14	0	0	0	0	0	0
		10	Mackenzie South	87.36	0	0	0	0	0	0
		11	Ochre River	81.26	0	0	0	0	0	0
		12	Willowlake River north	119.52	0	0	0	0	0	0
		Total		644.46	2	12	6	1	21	0.03

NOTE:
– = no survey block number

Caribou tracks were recorded in three of the eight habitat types surveyed during winter track surveys in the South Taiga Plains Ecological Zone, and caribou habitat use differed between habitat types, i.e., Kruskal-Wallis, where n = 167, df = 7 and p = 0.022. The highest average track density was recorded in the black spruce-tamarack/shrub habitat type, i.e., g1, k4, k5 and i1, with a density of 0.90 tracks/km/day. There were also noticeably more caribou tracks in the mixedwood forest, i.e., d2, d3, d4 and d5, and black spruce/lichen bog, i.e., i3, habitat types.

Pellet Group Survey

Caribou pellet groups were recorded in three of the six habitat types surveyed during pellet group surveys in the North Taiga Plains Ecological Zone. The highest average pellet group density was recorded in the riparian shrub habitat type, i.e., f4 and f5, with a density of 1.99 pellet/ha. Caribou pellets were also recorded in the burned, i.e., C, and black spruce–tamarack/shrub, i.e., g1, k4 and h2, habitat types (see Figure 10-46, shown previously). Caribou habitat use did not differ significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where n = 197, df = 5 and p = 0.470.

Caribou pellet groups were recorded in five of the nine habitat types surveyed during pellet group surveys in the South Taiga Plains Ecological Zone. The highest average pellet group density was recorded in the sedge – peat moss habitat type, i.e., k3 and i4, with a density of 31.81 pellet/ha. Caribou pellets were also recorded in the jack pine mixed conifer, i.e., a1, deciduous forest, i.e., d1, mixedwood forest, i.e., d2, d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4, k5 and i1, habitat types. Caribou habitat use did not differ significantly between habitat types in the South Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where n = 140, df = 4 and p = 0.952.

Pipeline Proximity Analysis

Sign test results for caribou (see Table 10-88 and Figure 10-47) indicate that caribou use of the control and experimental areas does not differ greatly. However, the power of the analysis for caribou is low because of low sample sizes.

Table 10-88: Sign Test Results for Moose, Woodland Caribou, Lynx, Marten and Hare

Species	Winter Track Survey Data			Pellet Group Survey Data			Combined Winter Track and Pellet Data		
	n	p	Comparison	n	p	Comparison	n	p	Comparison
Moose	17	0.143	12+, 5-	21	>0.05	10+, 11-	38	>0.05	22+, 16-
Caribou	6	0.69	2+, 4-	7	1.00	3+, 4-	13	0.55	5+, 8-
Lynx	11	1.00	5+, 6-	N/A	N/A	N/A	–	–	–
Marten	72	0.05	27+, 45-	N/A	N/A	N/A	–	–	–
Hare	65	>0.05	27+, 36-	89	>0.05	44+, 45-	154	>0.05	73+, 81-

NOTES:
N/A = not applicable
n = number
p = probability level for statistical significance
+ = those cases with a high pellet or track density in the control area, i.e., outside the 300 m buffer
– = those cases with a high pellet or track density in the experimental area, i.e., within the 300 m buffer
This table compares the density of tracks or pellet groups less than 300 m from the existing Enbridge pipeline right-of-way, or more than 300 m away

Incidental Observations

Incidental observations of caribou sign were recorded in seven habitat types in the North Taiga Plains Ecological Zone. Caribou sign was most often recorded in the black spruce – tamarack/shrub, i.e., g1, k4, h2, habitat type (see Table 10-85, shown previously).

Caribou sign was recorded in 11 habitat types in the South Taiga Plains Ecological Zone. Caribou sign was most often recorded in the black spruce – tamarack/shrub, i.e., g1, k4, k5 and i1, habitat type (see Table 10-89).

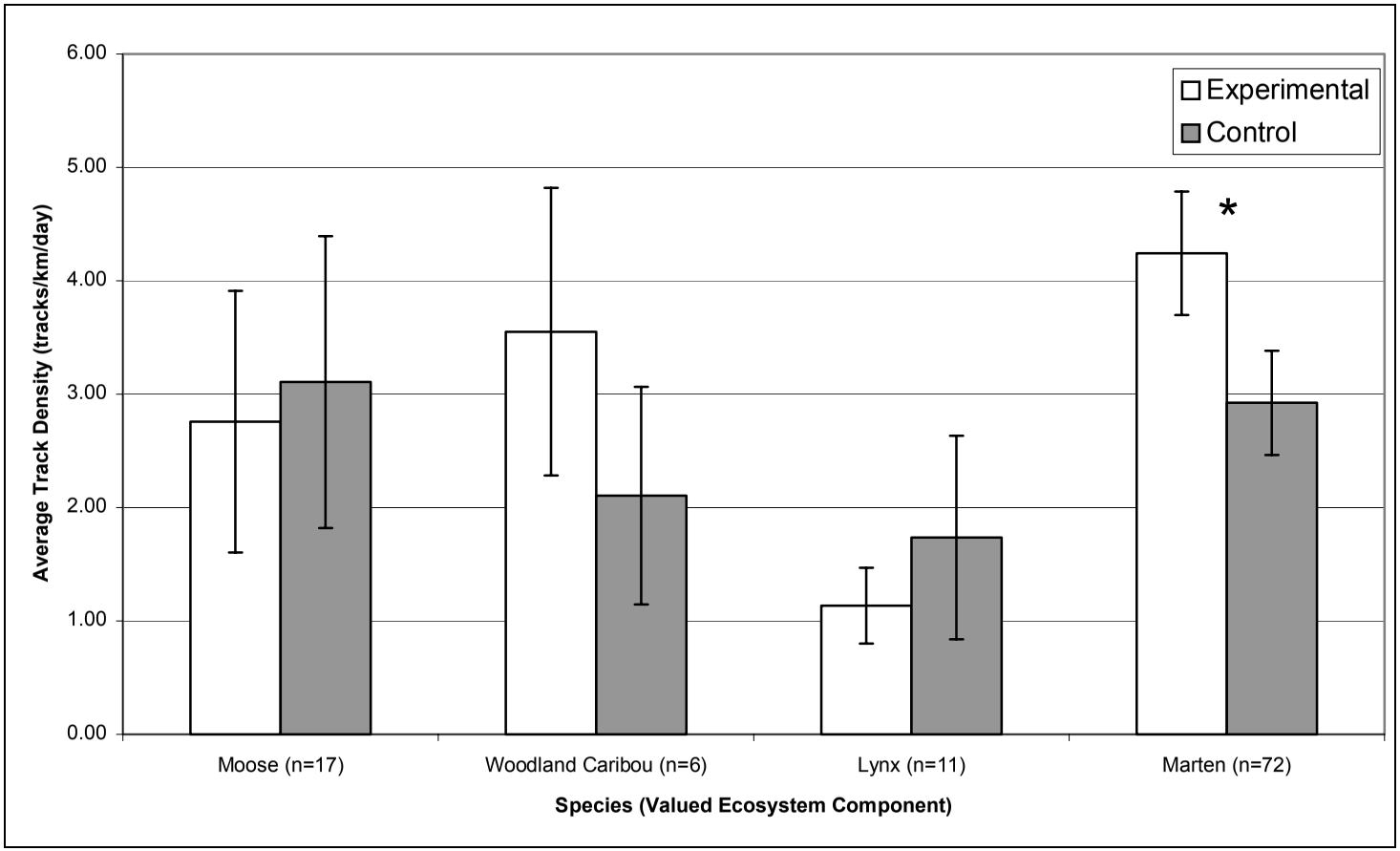

Figure 10-47: Proximity Analysis

Table 10-89: Woodland Caribou – South Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Jack pine mixed conifer	a1	8
Deciduous forest	d1	4
Mixedwood forest	d2, d3, d4, d5	12
Riparian shrub	f4, f5, f6	8
Black spruce – tamarack/shrub	g1, k4, k5, i1	61
Black spruce/lichen bog	i3	19
Sedge – peat moss	k3, i4	11
Burned	C	5
Disturbed	D	25
Bare ground	B	4
Water	W	1

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Modelling Results

The models for barren-ground caribou and woodland caribou are very similar. Refer to the Modelling Results discussion under Section 10.3.6.1, Barren-Ground Caribou for an explanation of the modelling assumptions for barren-ground and woodland caribou.

Modelling results indicate that, along the pipeline corridor:

- 51% of the LSA in the North Taiga Plains Ecological Zone is effective woodland caribou winter forage habitat (see Table 10-90)
- about 20% of the LSA in the South Taiga Plains Ecological Zone is effective woodland caribou winter forage habitat (see Table 10-91)

10.3.6.3 Moose

Field Results

Field observations indicate that moose are widespread along the proposed pipeline corridor throughout the Gwich'in Settlement Area, Sahtu Settlement Area, Deh Cho Region and northwestern Alberta.

Table 10-90: Woodland Caribou Forage Habitat Distribution – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	7,503	16
High	9,078	19
Moderate	7,695	16
Low	4,285	9
Very low	8,045	17
None	10,545	22
No data	657	1

Table 10-91: Woodland Caribou Forage Habitat Distribution – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	303	<1
High	1,571	2
Moderate	11,525	17
Low	10,881	17
Very low	18,475	28
None	18,675	28
No data	4,482	7

Ungulate Aerial Survey

During the 2003 aerial surveys of the Transition Forest Ecological Zone, four moose were observed in a 130 km^2 survey area, for a density of 0.03 moose/km^2. One bull, two cows and one calf were observed (see Table 10-92). In 2002, six moose were observed in a 49 km^2 survey area, for a density of 0.12 moose/km^2. In total, 10 moose were observed in the Transition Forest Ecological Zone.

Table 10-92: Moose Aerial Survey Observations – Transition Forest Ecological Zone

Survey Year	Survey Block	Area	Survey Area (km^2)	Number of Moose					
				Bulls	Cows	Calves	Unclassified	Total	Observed Density (No./km^2)
2002	–	Pipeline corridor	48.90	0	3	3	0	6	0.12
2003	4	Thunder River	129.82	1	2	1	0	4	0.03

NOTE:
– = no block survey block number

In 2003, 14 moose were recorded in a 173-km^2 survey area in the North Taiga Plains Ecological Zone, for a density of 0.08 moose/km^2 (see Table 10-93). In 2002, 27 moose were observed in a 303-km^2 survey area, for a density of 0.09 moose/km^2. In total, 41 moose were observed in the North Taiga Plains Ecological Zone.

Table 10-93: Moose Aerial Survey Observations – North Taiga Plains Ecological Zone

Survey Year	Administrative Region	Survey Block	Area	Survey Area (km^2)	Number of Moose					
					Bulls	Cows	Calves	Unclassified	Total	Observed Density (No./km^2)
2002	Gwich'in	–	Pipeline corridor	67.20	0	1	1	0	2	0.03
	Sahtu	–	Pipeline corridor	235.90	4	14	5	2	25	0.11
			2002 Total	303.10	4	15	6	2	27	0.09
2003	Gwich'in	5	Travaillant Lake	173.08	6	2	2	4	14	0.08

NOTE:
– = no survey block number

In 2003, 41 moose were observed in an area of 644.46 km^2 in the South Taiga Plains Ecological Zone, for a density of 0.06 moose/km^2 (see Table 10-94). In 2002, in an area of 430.90 km^2 in the South Taiga Plains Ecological Zone, 14 moose were observed, for a density of 0.03 moose/km^2. In total, 55 moose were observed in the South Taiga Plains Ecological Zone.

Table 10-94: Moose Aerial Survey Observations – South Taiga Plains Ecological Zone

Survey Year	Administrative Region	Survey Block	Area	Survey Area (km^2)	Moose					
					Bulls	Cows	Calves	Unclassified	Total	Observed Density (No./km^2)
2002	Sahtu	–	Pipeline corridor	84.50	4	0	0	3	7	0.08
	Deh Cho	–	Pipeline corridor	346.40	3	2	1	0	6	0.01
			2002 Total	430.90	7	2	1	3	13	0.03
2003	Deh Cho	6	Blackwater River	80.68	8	2	2	0	12	0.15
		7	Willowlake River south	68.06	0	1	2	0	3	0.04
		8	Trail River north	141.44	1	1	0	0	2	0.01
		9	Trail River south	66.14	1	2	2	0	5	0.08
		10	Mackenzie south	87.36	1	3	2	0	6	0.07
		11	Ochre River	81.26	6	1	1	0	8	0.10
		12	Willowlake River north	119.52	0	2	3	0	5	0.04
			2003 Total	644.46	17	12	12	0	41	0.06

NOTE:
– = no survey block number

Winter Track Survey

Figure 10-48 summarizes the moose track densities from the 2002 and 2003 winter track surveys. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

Moose tracks were recorded in two of the eight habitat types surveyed in the Transition Forest Ecological Zone during winter track surveys. The highest average track density was in the riparian shrub habitat type, i.e., f4, with a density of 0.25 tracks/km/day. Moose tracks were recorded in only one other habitat type, treed bog, i.e., h3, with a density of 0.01 tracks/km/day. The riparian shrub type was removed from the statistical analysis because of its small sample size. Moose habitat use did not differ significantly between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where $n = 99$, $df = 6$ and $p = 0.992$.

Moose tracks were recorded in three of the six habitat types surveyed in the North Taiga Plains Ecological Zone during winter track surveys. The highest average track density was recorded in the burned habitat type, i.e., C, with a density of 0.46 tracks/km/day. Moose tracks were also recorded in the mixedwood forest, i.e., d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat types. Moose habitat use did not differ between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 144$, $df = 4$ and $p = 0.714$.

Moose tracks were recorded in six of the eight habitat types surveyed in the South Taiga Plains Ecological Zone during winter track surveys. The highest average track densities were in the following habitat types:

- mixedwood, i.e., d2, d3, d4 and d5 – 0.35 tracks/km/day
- black spruce – tamarack/shrub, i.e., g1, k4, k5 and i1 – 0.31 tracks/km/day

Moose tracks were also recorded in the jack pine mixed conifer, i.e., a1, deciduous forest, i.e., d1, black spruce/lichen bog, i.e., i3, and sedge – peat moss, i.e., k3 and i4, habitat types. Moose habitat use did not differ between habitat types in the South Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 167$, $df = 7$ and $p = 0.317$.

Pellet Group Survey

Figure 10-49 summarizes the moose pellet group densities from pellet group surveys. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

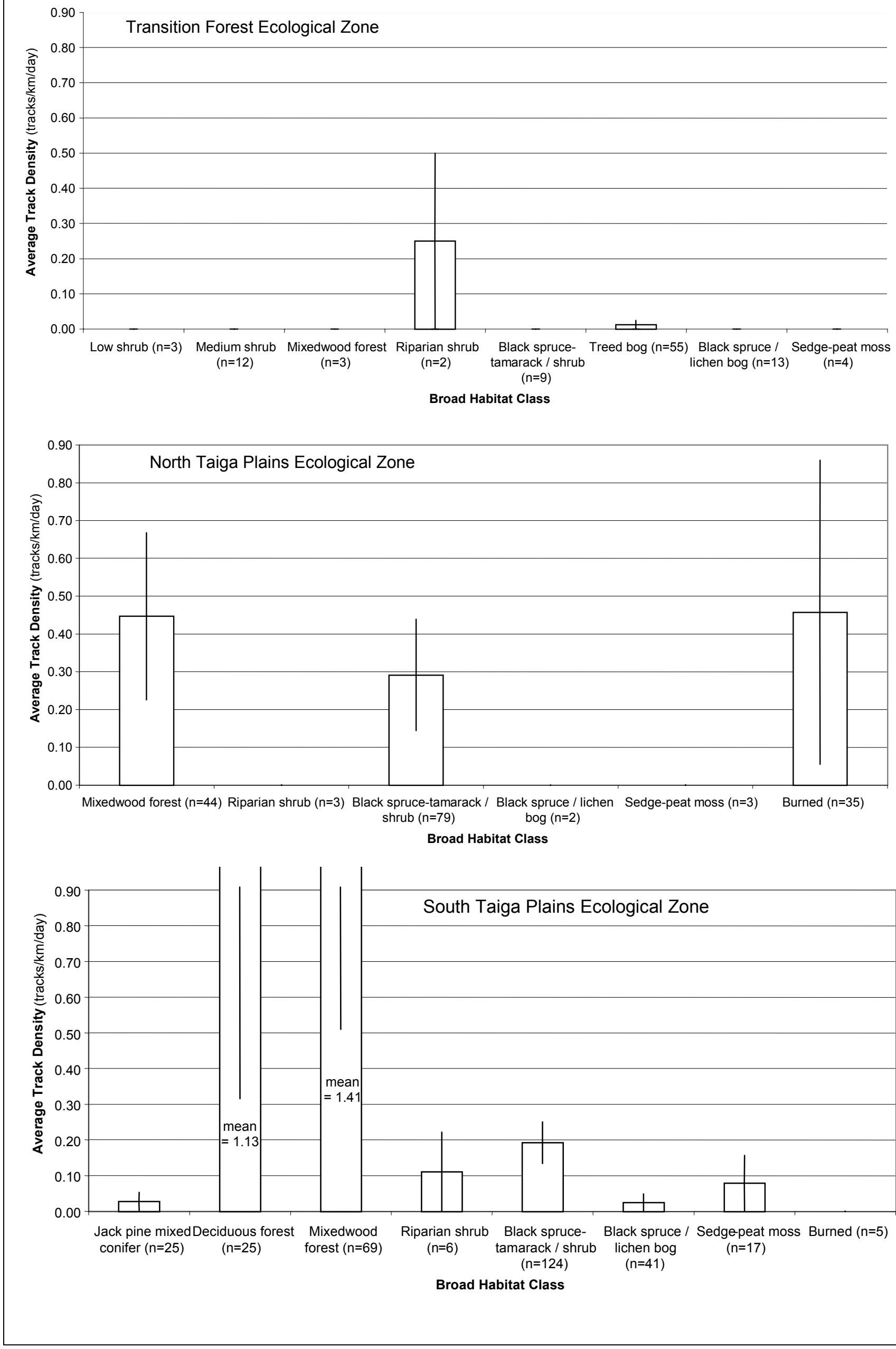

Figure 10-48: Moose Track Density from the 2002 and 2003 Winter Track Surveys

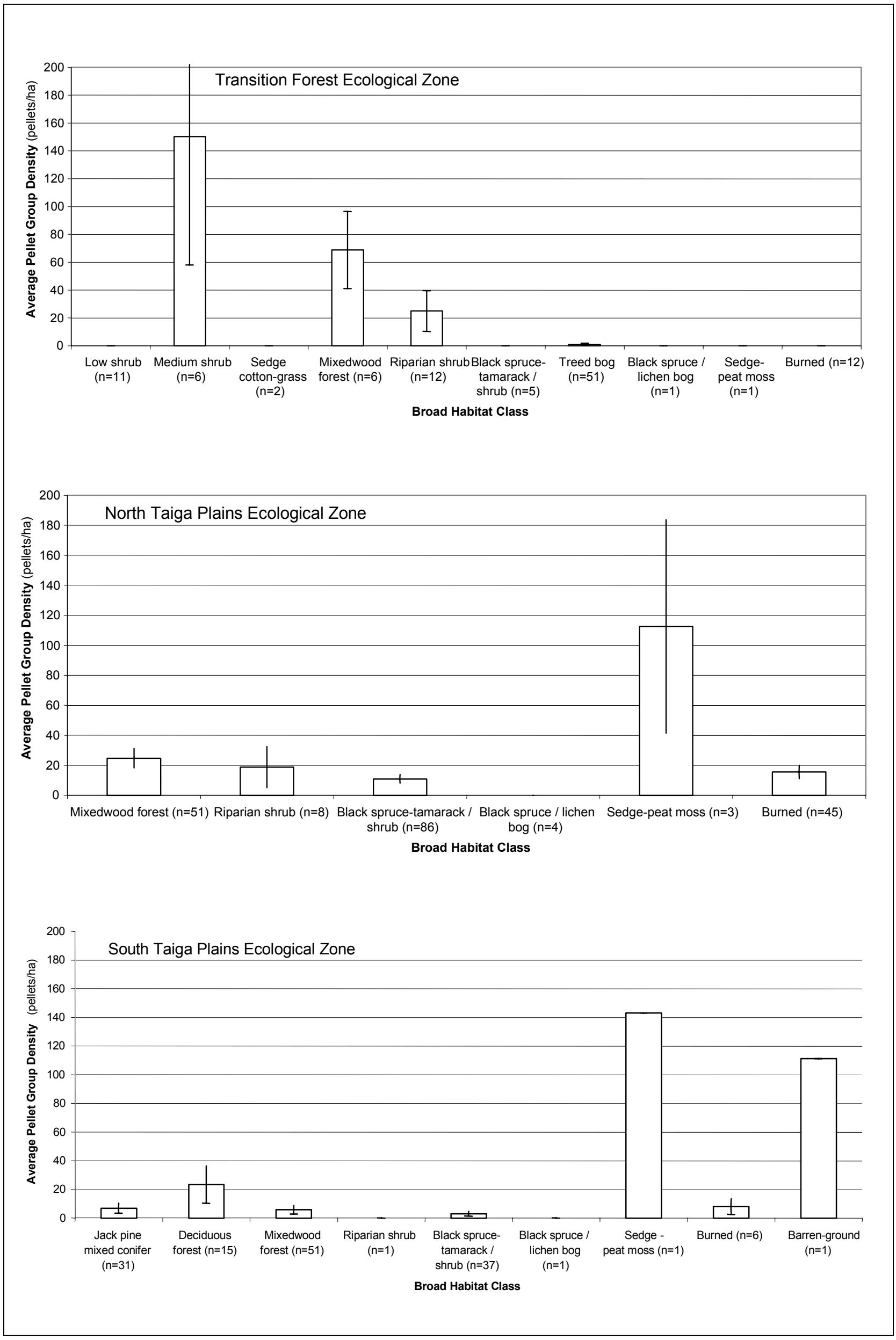

Figure 10-49: Moose Pellet Density – 2002 and 2003 Pellet Group Surveys

Moose pellet groups were observed in four of the 10 habitat types surveyed in the Transition Forest Ecological Zone during pellet group surveys. The highest average pellet group density was in the medium shrub habitat type, i.e., 3, with a density of 150.13 pellet groups/ha. Moose pellets were also recorded in the mixedwood forest, i.e., d3 and d5, riparian shrub, i.e., f4, and treed bog, i.e., h3, habitat types. Moose habitat use differed significantly between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where n = 103, df = 6 and p = 0.000. Pair comparisons revealed that the riparian shrub, i.e., f4, habitat type received notably different levels of use by VCs than did other habitat types. The medium shrub and mixedwood shrub habitat types had similar levels of VC use, which differed considerably from all other habitat types.

Proximity Analysis

Sign test results for moose (see Table 10-88, shown previously) indicate that use of control and experimental areas by moose does not differ considerably. The power of the combined analysis, i.e., pellet and track data, would be high enough to detect a difference of 70:30 in the use of the two areas, if in fact such a difference existed. Given that the combined use indices were more equally distributed between the two areas than even a 60:40 split, it is unlikely that moose are affected by the proximity of the Enbridge pipeline.

Incidental Observations

Incidental observations of moose sign were recorded in nine habitat types in the Transition Forest Ecological Zone. Sign was most often recorded in the treed bog, i.e., h3, and the riparian shrub, i.e., f4, habitat types (see Table 10-95).

Table 10-95: Moose Incidental Observations – Transition Forest Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Low shrub	1, 2	9
Medium shrub	3	4
Sedge–cotton-grass	4, 8	2
Mixedwood forest	d3, d5	8
Riparian shrub	f4	12
Black spruce – tamarack/shrub	g1, k4	3
Treed bog	h3	16
Black spruce/lichen bog	h4, i3	1
Burned	C	4

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Moose sign was also recorded in 10 habitat types in the North Taiga Plains Ecological Zone, with black spruce – tamarack/shrub, i.e., g1, k4 and h2, and mixedwood forest, i.e., d3, d4 and d5, habitat types accounting for most of these sightings (see Table 10-96).

Table 10-96: Moose Incidental Observations – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Upland shrub	a4	6
Mixedwood forest	d3, d4, d5	115
Riparian shrub	f4, f5	27
Black spruce – tamarack/shrub	g1, k4, h2	163
Black spruce/lichen bog	i3	8
Sedge – peat moss	k3, i4	28
Burned	C	54
Disturbed	D	8
Bare ground	B	2
Water	W	2

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Moose sign was recorded in 10 habitat types in the South Taiga Plains Ecological Zone. Sign was most often recorded in the black spruce – tamarack/shrub, i.e., g1, k4, k5 and i1, habitat type (see Table 10-97).

Table 10-97: Moose Incidental Observations – South Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Jack pine mixed conifer	a1	38
Deciduous forest	d1	36
Mixedwood forest	d2, d3, d4, d5	44
Riparian shrub	f4, f5, f6	39
Black spruce – tamarack/shrub	g1, k4, k5, i1	124
Black spruce/lichen bog	i3	7
Sedge – peat moss	k3, i4	12
Burned	C	34
Disturbed	D	48
Bare ground	B	7

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Modelling Results

Modelling results indicate that:

- in the Transition Forest Ecological Zone LSA, 67% of the area is effective moose winter forage habitat (see Table 10-98)
- in the North Taiga Plains Ecological Zone LSA, 39% of the area is effective moose winter forage habitat (see Table 10-99)
- in the South Taiga Plains Ecological Zone LSA, 20% of the area is effective moose winter forage habitat (see Table 10-100)

Table 10-98: Moose Forage Habitat Distribution – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	82	1
High	2,059	26
Moderate	3,095	40
Low	1,466	19
Very low	203	3
None	321	4
No data	546	7

Table 10-99: Moose Forage Habitat Distribution – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	1,361	3
High	6,058	13
Moderate	10,825	23
Low	17,651	37
Very low	5,868	12
None	5,242	11
No data	1,361	3

Table 10-100: Moose Forage Habitat Distribution – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	803	2
High	1,438	2
Moderate	10,502	16
Low	17,549	27
Very low	14,206	22
None	8,057	12
No data	9,673	15

10.3.6.4 Grizzly Bear

Site-Specific Information

Grizzly bears inhabit barren-ground and northern interior ecotypes along the pipeline corridor. For the purposes of the field and modelling results the following assumptions are made:

- barren-ground grizzly inhabit the Tundra Ecological Zone and the Transition Forest Ecological Zone
- northern interior grizzly inhabit the North Taiga Plains Ecological Zone and the South Taiga Plains Ecological Zone

Field Results

Grizzly bears were not surveyed along the pipeline corridor.

Incidental observations of grizzly bear sign were recorded in six habitat types in the North Taiga Plains Ecological Zone. Grizzly bear sign was most often recorded in the mixedwood forest, i.e., d3, d4 and d5, habitat type (see Table 10-101).

Incidental observations of grizzly bear sign in the South Taiga Plains Ecological Zone were limited to a single record in the disturbed, i.e., D, habitat type.

Table 10-101: Grizzly Bear Incidental Observations – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Upland shrub	a4	1
Mixedwood forest	d3, d4, d5	7
Riparian shrub	f4, f5	1
Black spruce – tamarack/shrub	g1, k4, h2	2
Sedge – peat moss	k3, i4	2
Burned	C	1

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Modelling Results

Transition Forest Ecological Zone

Results of habitat suitability modelling for the grizzly bear along the pipeline corridor are summarized as follows:

- 7% of the LSA is effective fall forage habitat (see Table 10-102)
- about 3% is effective denning habitat (see Table 10-103)
- 37% is effective spring forage habitat (see Table 10-104)

Table 10-102: Barren-Ground Grizzly Fall Forage Habitat – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	63	1
Moderate	463	6
Low	5,415	70
Very low	787	10
None	363	5
No data	682	9

Table 10-103: Barren-Ground Grizzly Denning Habitat – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	24	<1
High	79	1
Moderate	156	2
Low	0	0
Very low	5,492	71
None	1,359	17
No data	663	9

Table 10-104: Barren-Ground Grizzly Spring Forage Habitat – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	253	3
Moderate	2,605	34
Low	4,065	52
Very low	18	<1
None	286	4
No data	546	7

North Taiga Plains Ecological Zone

Results of habitat suitability modelling for the grizzly bear along the pipeline corridor are summarized as follows:

- 77% of the LSA is effective fall forage habitat (see Table 10-105)
- 25% is effective denning habitat (see Table 10-106)
- 77% is effective spring forage habitat (see Table 10-107)

South Taiga Plains Ecological Zone

Results of habitat suitability modelling for the grizzly bear along the pipeline corridor are summarized as follows:

- 48% is effective fall forage habitat (see Table 10-108)
- 25% is effective denning habitat (see Table 10-109)
- 77% is effective spring forage habitat (see Table 10-110)

Table 10-105: Northern Interior Grizzly Fall Forage Habitat – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	11,915	25
High	22,787	48
Moderate	1,966	4
Low	5,411	11
Very low	1,316	3
None	3,756	8
No data	657	1

Table 10-106: Northern Interior Grizzly Denning Habitat – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	2,557	5
High	1,747	4
Moderate	7,428	16
Low	885	2
Very low	21,624	45
None	12,183	25
No data	1,384	3

Table 10-107: Northern Interior Grizzly Spring Forage Habitat – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	10,844	23
High	22,454	47
Moderate	3,087	7
Low	5,979	13
Very low	1,054	2
None	3,734	8
No data	657	1

Table 10-108: Northern Interior Grizzly Fall Forage Habitat – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	900	1
High	14,485	22
Moderate	16,285	25
Low	19,891	30
Very low	6,209	10
None	3,655	6
No data	4,487	7

Table 10-109: Northern Interior Grizzly Denning Habitat – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	5,023	8
High	3,046	5
Moderate	7,935	12
Low	4,223	6
Very low	6,656	10
None	33,146	50
No data	5,883	9

Table 10-110: Northern Interior Grizzly Spring Forage Habitat – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	5,073	8
High	25,686	39
Moderate	19,542	30
Low	5,474	8
Very low	2,910	4
None	2,733	4
No data	4,492	7

10.3.6.5 Marten

Site-Specific Information

Previous studies in the Northwest Territories indicate that marten inhabit a wide range of habitat types, with habitat use varying with prey species availability. Unlike food habits in other parts of its North American range, marten in the Northwest Territories rely heavily on snowshoe hares as a food source, shifting their prey selection to voles and lemmings when snowshoe hare cycles decline.

Field Results

2002 to 2003 winter track count data indicates that marten are common and widely distributed along the proposed pipeline corridor. Marten were recorded in all the habitat types sampled in the Transition Forest Ecological Zone, the South Taiga Plains Ecological Zone and the North Taiga Plains Ecological Zone.

Winter Track Survey

Figure 10-50 summarizes the marten track densities from the 2002 and 2003 winter track surveys. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

Marten tracks were recorded in all eight habitat types sampled in the Transition Forest Ecological Zone during winter track surveys (see Table 10-111). The highest average marten track density was recorded in the black spruce-tamarack/shrub habitat type, i.e., g1 and k4, with a density of 3.96 tracks/km/day. Marten tracks were also recorded in relatively high densities in the following habitat types:

- medium shrub, i.e., 3 – 2.44 track/km/day
- treed bog, i.e., h3 – 2.33 track/km/day

Marten habitat use was not significantly different between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where $n = 99$, $df = 6$ and $p = 0.295$.

Marten tracks were recorded in all six habitat types surveyed in the North Taiga Plains Ecological Zone during winter track surveys. The highest average marten track density was recorded in the sedge-peat moss habitat type, i.e., k3 and i4, with a density of 17.33 tracks/km/day. Marten tracks were also recorded in relatively high densities in the burned, i.e., C, habitat type with density of 10.40 tracks/km/day. Marten habitat use varied significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 144$, $df = 4$ and $p = 0.006$.

Table 10-111: Marten Incidental Observations – Transition Forest Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Marten Incidental Observations
Low shrub	1, 2	18
Medium shrub	3	15
Upland shrub	a4	1
Mixedwood forest	d3, d5	1
Riparian shrub	f4	1
Treed bog	h3	6
Burned	C	1

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Pairwise comparisons in the North Taiga Plains Ecological Zone revealed that the burned, i.e., C, and sedge-peat moss, i.e., k3 and i4, habitat types were used much more than other habitat types surveyed. The burned and sedge-peat moss habitat types are also considerably different from each other.

Marten tracks were recorded in all eight habitat types surveyed in the South Taiga Plains Ecological Zone during winter track surveys. The highest average marten track densities were recorded in the black spruce-tamarack/shrub, i.e., g1, k4, k5 and i1, and black spruce/lichen bog, i.e., i3, habitat types, with densities of 3.64 and 3.06 tracks/km/day. Marten habitat use varied significantly between habitat types in the South Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 167$, $df = 7$ and $p = 0.024$).

Pairwise comparisons in the South Taiga Plains Ecological Zone revealed that marten used the black spruce and mixedwood forest habitat types more than other habitat types.

Marten sign was recorded in five habitat types in the North Taiga Plains Ecological Zone. Marten sign was most often recorded in the black spruce tamarack/shrub, i.e., g1, k4 and h2, and mixedwood forest, i.e., d3, d4 and d5, habitat types (see Table 10-112).

Marten sign was recorded in five habitat types in the South Taiga Plains Ecological Zone, with the black spruce-tamarack/shrub, i.e., g1, k4, k5 and i1, habitat type and mixedwood forest types showing the most use (see Table 10-113).

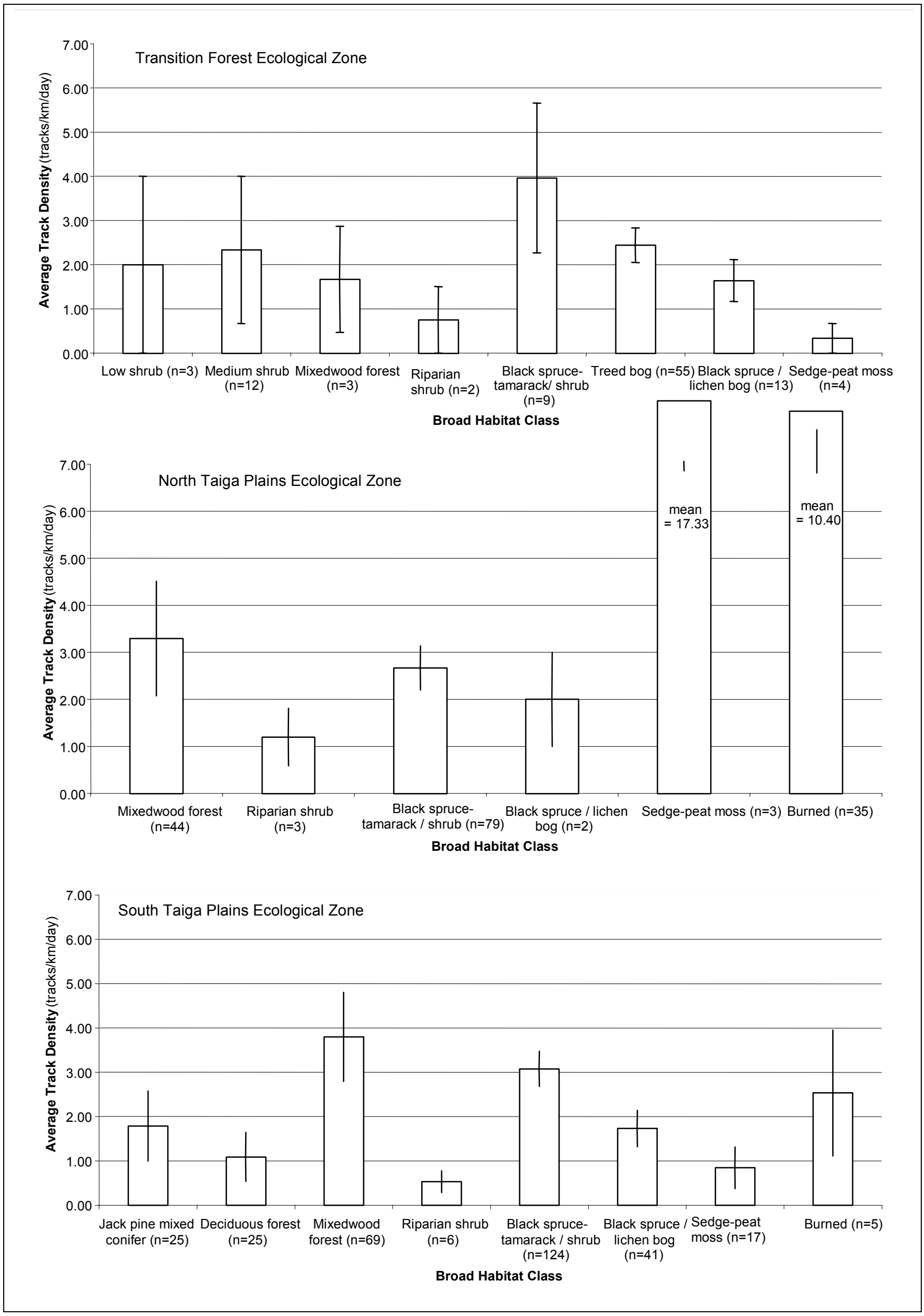

Figure 10-50: Marten Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

Table 10-112: Marten Incidental Observations – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Marten Incidental Observations
Mixedwood forest	d3, d4, d5	15
Riparian shrub	f4, f5	1
Black spruce-tamarack/shrub	g1, k4, h2	16
Sedge-peat moss	k3, i4	1
Burned	C	4

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Table 10-113: Marten Incidental Observations – South Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Deciduous forest	d1	2
Mixedwood forest	d2, d3, d4, d5	3
Black spruce-tamarack/shrub	g1, k4, k5, i1	4
Burned	C	2
Disturbed	D	1

NOTE:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Proximity Analysis

Sign test results for marten (see Table 10-88 and Figure 10-47, both shown previously) indicate that marten use control areas much more than experimental areas. This indicates that marten are positively affected by the proximity of the Enbridge pipeline.

Incidental Observations

Incidental observations of marten sign were recorded in seven habitat types in the Transition Forest Ecological Zone, with the low shrub, i.e., 1 and 2, and medium shrub, i.e., 3, habitat types accounting for most of these sightings (see Table 10-111, shown previously).

Modelling Results

Results of habitat suitability modelling indicate that most of the LSA is suitable marten habitat:

- 74% of the Transition Forest Ecological Zone LSA is effective marten habitat (see Table 10-114)
- 85% is effective habitat in the North Taiga Plains Ecological Zone (see Table 10-115)
- 75% is effective habitat in the South Taiga Plains Ecological Zone (see Table 10-116)

Table 10-114: Marten Habitat Distribution – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,263	16
Moderate	4,476	58
Low	885	11
None	603	8
No data	546	7

Table 10-115: Marten Habitat Distribution – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	34,986	73
Moderate	5,860	12
Low	1,972	4
None	4,332	9
No data	657	1

Table 10-116: Marten Habitat Distribution – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	29,599	45
Moderate	19,409	30
Low	9,324	14
None	3,087	5
No data	4,491	7

10.3.6.6 Lynx

Field Results

Results of winter track surveys indicate that lynx live widely throughout the pipeline corridor at low densities. Figure 10-51 summarizes the lynx winter track densities from the 2002 and 2003 winter surveys. The shaded columns indicate habitat groups not included in the statistical analyses because the sample size was less than three.

Lynx tracks were recorded in four of the eight habitat types surveyed in the Transition Forest Ecological Zone during winter track surveys. The highest average lynx track density was in the riparian shrub habitat type, i.e., f4, with a density of 1.25 tracks/km/day. Lynx track density was second highest in the black spruce tamarack/shrub habitat type, i.e., g1 and k4, with a density of 0.89 tracks/km/day. Lynx tracks were also found in the treed bog, i.e., h3, and sedge-peat moss, i.e., k3, habitat types. The riparian shrub habitat type was removed from the statistical analysis because of its low sample size. Lynx habitat use did not vary significantly between habitat types in the Transition Forest Ecological Zone, i.e., Kruskal-Wallis, where $n = 99$, $df = 6$ and $p = 0.305$.

Lynx tracks were recorded in four of the six habitat types surveyed in the North Taiga Plains Ecological Zone during winter track surveys. The highest average lynx track density was in the sedge-peat moss habitat type, i.e., k3 and i4, with a density of 6.67 tracks/km/day. Lynx track density was notably lower in all other habitat types surveyed. Lynx tracks were also found in the burned, i.e., C, mixedwood forest, i.e., d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4 and h2, habitat types. Lynx habitat use varied significantly between habitat types in the North Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 144$, $df = 4$ and $p = 0.020$). Pairwise comparisons revealed that the sedge-peat moss, i.e., k3 and i4, habitat type in the North Taiga Plains Ecological Zone was used much more than other habitat types surveyed.

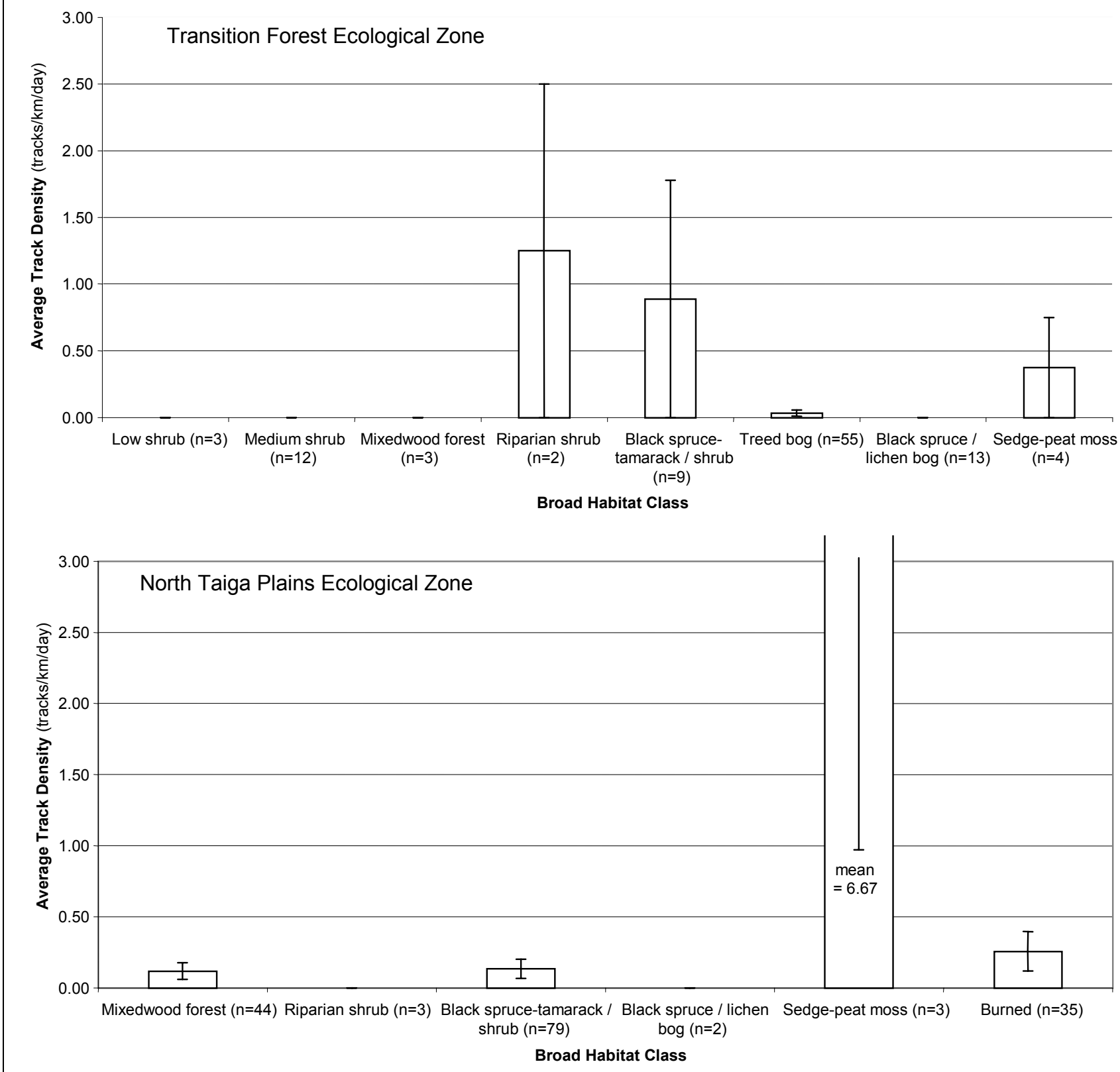

Figure 10-51: Lynx Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

Lynx tracks were recorded in four of the eight habitat types surveyed in the South Taiga Plains Ecological Zone during winter track surveys. The highest average lynx track density was in the deciduous forest habitat type, i.e., d1, with a density of 0.73 tracks/km/day. Lynx tracks were also found in the jack pine mixed conifer, i.e., a1, mixedwood forest, i.e., d3, d4 and d5, and black spruce-tamarack/shrub, i.e., g1, k4, k5 and h2, habitat types. Lynx habitat use varied significantly between habitat types in the South Taiga Plains Ecological Zone, i.e., Kruskal-Wallis, where $n = 167$, $df = 7$ and $p = 0.001$. Pairwise comparisons revealed VCs used the deciduous forest habitat type and jack pine mixed conifer type much more than other habitats in the South Taiga Plains Ecological Zone.

Proximity Analysis

Sign test results for lynx (see Table 10-88 and Figure 10-47, both shown previously) indicate that lynx use of control and experimental area do not differ significantly. The power of the analysis is low because of small sample size. However, given that use indices were almost evenly split between the two areas, it is unlikely that lynx are affected by the proximity of the Enbridge pipeline. Moreover, hare, as the main prey base of lynx, does not seem to be affected by the proximity of the pipeline (see Table 10-88, shown previously).

Incidental Observations

No incidental observations of lynx or lynx sign were recorded in the Transition Forest Ecological Zone. However, lynx sign was recorded in five habitat types in the North Taiga Plains Ecological Zone (see Table 10-117) and in six habitat types in the South Taiga Plains Ecological Zone (see Table 10-118). Most observations were recorded in mixedwood forest and black spruce-tamarack and shrub habitat types.

Table 10-117: Lynx Incidental Observations – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Mixedwood forest	d3, d4, d5	11
Riparian shrub	f4, f5	2
Black spruce-tamarack/shrub	g1, k4, h2	6
Burned	C	2
Disturbed	D	2

NOTES:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Table 10-118: Lynx Incidental Observations – South Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Jack pine mixed conifer	a1	2
Deciduous forest	d1	3
Mixedwood forest	d2, d3, d4, d5	2
Riparian shrub	f4, f5, f6	1
Black spruce-tamarack/shrub	g1, k4, k5, i1	3
Bare ground	B	1

NOTES:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Modelling Results

Modelling results indicate that:

- 89% of the Transition Forest Ecological Zone LSA is effective lynx winter forage habitat (see Table 10-119)
- 78% of the North Taiga Plains Ecological Zone LSA is effective lynx winter forage habitat (see Table 10-120)
- 84% of the South Taiga Plains Ecological Zone LSA is effective lynx winter forage habitat (see Table 10-121)

Table 10-119: Lynx Habitat Distribution – Transition Forest Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	6,905	89
Low	0	0
None	321	4
No data	546	7

Table 10-120: Lynx Habitat Distribution – North Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	18,584	39
Moderate	18,606	39
Low	5,839	12
None	4,122	9
No data	657	1

Table 10-121: Lynx Habitat Distribution – South Taiga Plains Ecological Zone

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	11,167	17
Moderate	43,927	67
Low	3,335	5
None	3,011	5
No data	4,471	7

10.3.6.7 Beaver

Site-Specific Information

Poole and Croft (1990) reported an average active beaver lodge density of 26 lodges/100 km^2 in the western Northwest Territories. The blocks surveyed included several near the pipeline route in the Sahtu Settlement Area and Deh Cho Region. Poole and Croft concluded that beaver colony densities in most of the western Northwest Territories were moderate to high and comparable with densities reported in other northern boreal habitats. Densities are even higher in some parts of the Mackenzie Valley. For example, observed densities in the Sahtu Settlement Area ranged from 43 to 58 lodges/100 km^2 (Popko 2003, personal communication).

Field Results

Beaver colonies were not surveyed along the pipeline corridor. Incidental observations recorded during other biophysical baseline investigations provide some information on habitat use in the three ecological zones in the proposed pipeline corridor.

Beaver sign was recorded in three habitat types in the Transition Forest Ecological Zone: water, i.e., W, treed bog, i.e., h3, and medium shrub, i.e., 3, (see Table 10-122).

Table 10-122: Beaver Incidental Observations – Transition Forest Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Medium shrub	3	1
Treed bog	h3	2
Water	W	2

NOTES:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Beaver sign was recorded in six habitat types in the North Taiga Plains Ecological Zone. Beaver sign was most often recorded in the mixedwood forest, i.e., d3, d4 and d5, riparian shrub, i.e., f4 and f5, and sedge – peat moss, i.e., k3 and i4, habitat types (see Table 10-123).

Table 10-123: Beaver Incidental Observations – North Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Mixedwood forest	d3, d4, d5	6
Riparian shrub	f4, f5	6
Black spruce – tamarack/shrub	g1, k4, h2	5
Sedge-peat moss	k3, i4	6
Burned	C	1
Water	W	1

NOTES:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Beaver sign was recorded in eight habitat types in the South Taiga Plains Ecological Zone. Most sign was in jack pine mixed conifer, i.e., a1, mixedwood forest, i.e., d2, d3, d4 and d5, and black spruce – tamarack/shrub, i.e., g1, k4, k5 and i1, habitat types (see Table 10-124).

Although the number of beaver colonies affected by vegetation clearing is not known, it has been estimated that the pipeline will cross over 500 streams and rivers. Most of these are small drainages that could support beaver.

10.3.6.8 Snow Goose

Site-Specific Information

There is no nesting population of snow geese along the pipeline corridor. Their spring migration congregation sites along the Mackenzie River are the key features for snow geese along the pipeline corridor. These sites, identified as key

habitat sites by the Canadian Wildlife Service (Alexander et al. 1991), are also used by other waterfowl species during spring migration.

Table 10-124: Beaver Incidental Observations – South Taiga Plains Ecological Zone

Habitat Type	Vegetation Type[1]	No. of Incidental Observations
Jack pine mixed conifer	a1	7
Deciduous forest	d1	1
Mixedwood forest	d2, d3, d4, d5	7
Riparian shrub	f4, f5, f6	3
Black spruce – tamarack/shrub	g1, k4, k5, i1	7
Black spruce/lichen bog	i3	3
Sedge – peat moss	k3, i4	1
Water	W	1

NOTES:
Incidental observations are those with species, location and habitat information
1 See Table 10-3 for a full description of the vegetation types shown

Few snow geese are typically found along the pipeline corridor during the June to August nesting season.

Field Results

No snow geese were recorded in the pipeline corridor during surveys in 2001 and 2002, although migrating snow geese were found on the Mackenzie River in May 2002. In the Sahtu Settlement Area, 337 snow geese, including a flock of 250, were observed mostly south of Tulita. The only other snow geese found during the May 2002 surveys were four along the Mackenzie River in the Deh Cho Region.

Modelling Results

A habitat model was not prepared for snow geese.

10.3.6.9 Greater and Lesser Scaup

Site-Specific Information

Late spring, i.e., May 26 to June 3, and mid summer, i.e., July 11 to 16, aerial surveys of waterfowl in the pipeline corridor between the Alberta boundary and The Ramparts were conducted in 1972 (Davis 1974). Comparison of the late May 1972 and late May 2002 surveys of the pipeline corridor in the Deh Cho Region and Sahtu Settlement Area show similar areas of spring migrant concentrations. The area from Wrigley north to between Norman Wells and Fort Good Hope had lots of scaup. As many as 460 scaup/km² were recorded in 1972, and in 2002,

eight flocks of 51 to 300 birds each were observed. Late May surveys showed fewer scaup in the Deh Cho Region than in the Sahtu Settlement Area in both 1972 and 2002.

Mid-July 1972 surveys of the pipeline corridor provide some information on the location of moulting scaup concentrations. Densities of up to 309 birds/100 km^2 from the southern boundary of the Sahtu Settlement Area to Tulita and 402 birds/100 km^2 in the 80 km segment north from Norman Wells were the highest reported concentrations of moulting scaup.

Field Results

Greater scaup and lesser scaup are difficult to distinguish during aerial surveys, so virtually all scaup are classed as unidentified scaup. Scaup were common during spring migration and in June along the pipeline corridor in the Sahtu Settlement Area and the Gwich'in Settlement Area. Scaup ranked second to scoters as the most numerous waterfowl during the May surveys. The largest concentration was of 220 birds. The density of scaup in the Sahtu Settlement Area in June was 59 birds/100 km², making it the most abundant waterfowl. Scaup were less common farther south in the Deh Cho Region, where few were recorded during May aerial surveys and where a relatively low density of 6 birds/100 km² was recorded during June aerial surveys. Scaup were scarce in spring in Alberta, with only 12 recorded during May surveys. More, i.e., 27 birds/100 km², were observed during June surveys.

Scaup on the Mackenzie River were mostly spring migrants. Few were on the river during June surveys. In the Gwich'in Settlement Area, 205 scaup were found during the spring surveys, but only 28 were seen in June. The highest concentration of spring scaup on the Mackenzie River was 974 recorded in the Sahtu Settlement Area, mostly in a section of river between Old Fort Point and Redstone River.

In the Deh Cho Region, 570 scaup were recorded along the Mackenzie River in spring surveys. Concentrations were noted south of Blackwater River and north of Willowlake River.

Modelling Results

Modelling results indicate that in the pipeline corridor LSA about 2% of the area is effective lesser scaup nesting habitat (see Table 10-125).

Table 10-125: Lesser Scaup Nesting Habitat Distribution – Pipeline Corridor

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	102	<1
Moderate	627	1
Low	908	1
Very low to none	114,389	94
No data	5,724	5
Total	121,750	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.6.10 Peregrine Falcon

Site-Specific Information

Campbell and Davies (1973) found seven active peregrine falcon nest sites west of the pipeline corridor during surveys in 1972. Three were along the Mackenzie River: two on the 61 m cut banks at the ramparts and one at an unspecified location. Four active nests were found on the cliffs of Campbell Lake, and a mean distance of 2.6 km between nests indicated a high density.

Field Results

An apparently territorial adult around a rocky outcrop south of Norman Wells in late May 2002 was the only peregrine falcon recorded on the pipeline corridor.

More peregrine falcons were found along the Mackenzie River than the pipeline corridor because of better cliff habitat. Most sightings were of adults that flew off cliffs as the survey aircraft flew past. Some of the birds might have been on breeding territory. An adult in the Gwich'in Settlement Area was flushed off a cliff south of Tsiigehtchic in May.

Modelling Results

No habitat model was prepared for the peregrine falcon.

10.3.6.11 Lesser Yellowlegs

Site-Specific Information

Salter and Davis (1974b) found 25 lesser yellowlegs on 10 of the 12 terrestrial survey transects along the pipeline corridor between the Mackenzie Highway and the ramparts during the 1972 breeding season. Fifteen were found on the five sites

in the southern section between the Mackenzie Highway and Fort Simpson, and 10 were found on five of the seven survey sites between Fort Simpson and the ramparts. It was the most widespread shorebird species along the pipeline corridor between the Mackenzie Highway and the ramparts. Habitat preferences were difficult to determine because most birds were observed high in the air engaged in aerial courtship or flying around calling at the observers.

Field Results

Lesser yellowlegs are hard to see from the air. They were the most frequently observed shorebird in the pipeline corridor from Alberta to the Gwich'in Settlement Area, but densities were very low. Breeding season densities were highest in the north, with June aerial survey results of 0.2 birds/100 km² in the Deh Cho Region and 0.5 birds/100 km² in the Sahtu Settlement Area.

Modelling Results

Modelling results indicate that in the pipeline corridor LSA, 9% of the area is effective lesser yellowleg nesting habitat (see Table 10-126).

Table 10-126: Modelling Results of Lesser Yellowlegs Nesting Habitat – Pipeline Corridor

Habitat Value	Local Study Area	
	Habitat Area (ha)	Habitat (%)
High	2,158	2
Moderate	8,274	7
Low	22,349	18
Very low to none	83,246	68
No data	5,724	5
Total	121,750	100

10.3.6.12 Arctic Tern

Site-Specific Information

Arctic terns nest throughout the Mackenzie River in low densities (Godfrey 1986).

Field Results

Arctic terns were recorded only in the northern part of the pipeline corridor. Low densities of 3 birds/100 km² in the Gwich'in Settlement Area and 2 birds/100 km² in the Sahtu Settlement Area were recorded in June surveys. The exception was Travaillant Lake, which borders the pipeline corridor in the Gwich'in Settlement Area and had a density of 30 birds/100 km² in June 2001

surveys. Arctic terns were not observed during surveys in the Deh Cho Region or in northwestern Alberta.

Modelling Results

No habitat model was prepared for Arctic tern.

10.3.6.13 Boreal Chickadee

Site Specific Information

Salter and Davis (1974a) found 11 boreal chickadees on six of 12 terrestrial survey transects along the pipeline corridor between the Mackenzie Highway and the ramparts during the 1972 breeding season. Seven were found at four sites on the southern section between the Mackenzie Highway and the Fort Simpson area. The preferred habitat was closed coniferous forest followed by closed deciduous scrub.

Field Results

The boreal chickadee was recorded only on ground-truthing surveys in the Sahtu Settlement Area. Five were recorded while the observers were moving between point counts.

Modelling Results

Modelling results indicate that in the pipeline corridor LSA, 14% of the area is effective boreal chickadee nesting habitat (see Table 10-127).

Table 10-127: Modelling Results of Boreal Chickadee Nesting Habitat – Pipeline Corridor

Habitat Value	Local Study Area	
	Habitat Area (ha)	**Habitat** (%)
High	1,290	1
Moderate	15,324	13
Low	54,041	44
Very low to none	45,372	37
No data	5,724	5
Total	121,750	100

10.3.7 Production Area Infrastructure

Infrastructure includes:

- roads
- barge landings
- airstrips
- helipads
- borrow sites
- camps
- stockpile sites
- fuel storage sites

For all infrastructure sites and VCs, only the RSA was modelled.

No bird population field studies were done at proposed infrastructure sites in the production area, including at transportation features and borrow sites.

10.3.7.1 Barren-Ground Caribou

Field Results

Evidence of barren-ground caribou was found:

- in all areas where road construction is planned
- at all barge landings except Camp Farewell and Tununuk Point, i.e., Bar C

Barren-ground caribou are only expected to be in the production area in the winter.

Parsons Lake was rated as having moderate value for caribou, with higher value in winter. Lucas Point was considered to have low sensitivity to development because it has already been disturbed, compared with the more sensitive areas beside the site. Caribou is an important harvested species at both borrow sites, which are moderately sensitive to disturbance because of their position near lakeshores, i.e., ridge–stream valley units.

Caribou were observed in all but one, i.e., Site 2.029 near Parsons Lake, of the borrow sites in the Inuvialuit Settlement Region.

Modelling Results

Modelling results indicate that 9% of the RSA for the infrastructure sites in the Tundra Ecological Zone are effective barren-ground caribou winter forage habitat (see Table 10-128).

Table 10-128: Barren-Ground Caribou Habitat – Tundra Ecological Zone Infrastructure Sites

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	217,040	2
High	158,751	2
Moderate	503,186	5
Low	514,234	5
Very low	170,591	2
None	3,437,907	34
No data	5,193,651	51

10.3.7.2 Barren-Ground Grizzly

Site-Specific Information

Grizzly bear is a listed species and is therefore included in the special features list for all sites at which they were recorded.

Field Results

Evidence of grizzly bears in the production area was found at all infrastructure sites, including proposed roads and barge landings. Permanent and temporary road locations were not known during the survey, so were not examined for grizzly bear sign. A high concentration, i.e., 46 dens of varying age, was located south of Niglintgak and Taglu on the north and south sides of the East Channel, particularly in the Yaya Lake esker-kame complex.

Grizzly bear sign was recorded at three borrow sites in the production area, i.e., sites 1.005, 1.008 and 1.009. Two bears and a concentration of more than 30 dens were recorded during aerial surveys over the Yaya Lake esker-kame complex. This area has abundant granular resources, which makes it an important area for bear denning and provides habitat for Arctic ground squirrels, which are an important food source for bears.

Modelling Results

For infrastructure sites in the Tundra Ecological Zone, modelling results indicate:

- 12% of the RSA is effective barren-ground grizzly fall forage habitat (see Table 10-129)
- about 18% is effective barren-ground grizzly denning habitat (see Table 10-130)
- about 38% is effective barren-ground grizzly spring forage habitat (see Table 10-131)

Table 10-129: Barren-Ground Grizzly Fall Forage Habitat – Tundra Ecological Zone Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	0	0
High	114,047	5
Moderate	178,420	7
Low	267,709	11
Very low	771,181	32
None	1,035,563	42
No data	76,969	3

Table 10-130: Barren-Ground Grizzly Denning Habitat – Tundra Ecological Zone Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	320,236	13
High	123,864	5
Moderate	5,371	<1
Low	129,628	5
Very low	1,807,101	74
None	57,690	2
No data	0	0

Table 10-131: Barren-Ground Grizzly Spring Forage Habitat – Tundra Ecological Zone Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
Very high	11,090	<1
High	434,836	18
Moderate	496,810	20
Low	312,427	13
Very low	113,151	5
None	1,075,577	44
No data	0	0

10.3.7.3 Greater White-Fronted Goose

Field Results

No bird population field studies were done at proposed infrastructure sites in the production area, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the production area RSA:

- 7% of the area is effective greater white-fronted goose nesting habitat (see Table 10-132)
- 54% of the area is effective greater white-fronted goose foraging habitat (see Table 10-133)

Table 10-132: Greater White-Fronted Goose Nesting Habitat – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	75,364	4
Moderate	67,240	3
Low	94,752	4
Very low to none	2,206,534	90
No data	0	0
Total	2,443,890	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Table 10-133: Greater White-Fronted Goose Terrestrial Foraging Habitat – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	110,227	5
Moderate	1,190,795	49
Low	36,826	2
Very low to none	1,106,042	45
No data	0	0
Total	2,443,890	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.7.4 Tundra Swan

Field Results

No bird population field studies were done at proposed infrastructure sites in the production area, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the production area RSA:

- 12% of the area is effective tundra swan nesting habitat (see Table 10-134). This is partly because of adjustments for proximity to waterbodies, made because of tundra swans' preference to nest with 45 m of water
- 59% of the area is effective tundra swan foraging habitat (see Table 10-135)

Table 10-134: Tundra Swan Nesting Habitat – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	171,523	7
Moderate	127,993	5
Low	223,559	9
Very low to none	1,920,815	79
No data	0	0
Total	2,443,890	100

Table 10-135: Tundra Swan Terrestrial Foraging Habitat – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,329,906	54
Moderate	125,403	5
Low	108,309	4
Very low to none	880,271	36
No data	0	0
Total	2,443,890	100

10.3.7.5 Greater and Lesser Scaup

Field Results

No bird population field studies were done at proposed infrastructure sites in the production area, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the production area infrastructure RSA, 6% of the area is effective greater scaup nesting habitat (see Table 10-136). The predicted scarcity of such habitat is partly because of adjustments made to account for this species' preference to nest within 1 m of a waterbody.

Table 10-136: Greater Scaup Nesting Habitat Distribution – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	**Habitat** (%)
High	0	0
Moderate	144,462	6
Low	199,040	8
Very low to none	2,100,388	86
No data	0	0
Total	2,443,890	100

10.3.7.6 Whimbrel

Field Results

No bird population field studies were done at proposed infrastructure sites in the production area, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the production area infrastructure RSA:

- 40% of the area is effective whimbrel nesting habitat (see Table 10-137)
- 45% of the area is effective whimbrel foraging habitat (see Table 10-138)

Table 10-137: Whimbrel Nesting Habitat Distribution – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	594,431	24
Moderate	389,941	16
Low	383,687	16
Very low to none	1,075,831	44
No data	0	0
Total	2,443,890	100

Table 10-138: Whimbrel Terrestrial Foraging Habitat Distribution – Production Area Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	683,315	29
Moderate	381,878	16
Low	1,367,409	56
Very low to none	11,288	<1
No data	0	0
Total	2,443,890	100[a]
NOTE: a Numbers do not total 100% because of rounding		

10.3.8 Pipeline Corridor Infrastructure

10.3.8.1 Barren-Ground and Woodland Caribou

Site-Specific Information

As discussed previously, it is not possible to distinguish between tracks of barren-ground and woodland caribou. Distinguishing the two types during aerial surveys is also difficult. Therefore, for field results it was assumed that they inhabit the following areas:

- barren-ground caribou in the Tundra Ecological Zone
- barren-ground and woodland caribou in the Transition Forest Ecological Zone and the North Taiga Plains Ecological Zone
- woodland caribou in the South Taiga Plains Ecological Zone

Barren-ground caribou were assumed to not inhabit the South Taiga Plains Ecological Zone.

Field Results

Evidence of barren-ground caribou along the pipeline corridor was found only in the Travaillant Lake area, and not at any borrow sites. However, several proposed borrow sites are within the winter range of the Bluenose caribou herd. Little information on the movement of barren-ground caribou along the pipeline corridor is available. Caribou move into the area in October or November and depart in April or May. Movements within the winter range vary seasonally and from year to year and depend on forage availability and snow conditions. Migration routes that might exist in the project area have not been identified. Site-specific information on seasonal habitat use by caribou near the borrow sites is not available.

Woodland caribou might be found along most of the pipeline corridor, so interaction with infrastructure sites is possible.

Evidence of woodland caribou was found at Little Chicago, Norman Wells, Blackwater River, McGill Station, Trout Lake, the Alberta – Northwest Territories boundary, Wildboy Trail and Wiebe camp, where roads and barge landings are planned.

Woodland caribou were recorded at 13 of the borrow sites in the Gwich'in Settlement Area and were either found or might be found at the barge landing site at the mouth of the Travaillant River and at the camp site east of Travaillant Lake. The river mouth is considered highly sensitive to development because it is beside riparian features and is a suspected travel corridor. The east end of Travaillant Lake rated low in sensitivity to development because the area is uniform and lacks riparian features.

Caribou were recorded at 24 of the proposed borrow sites in the Sahtu Settlement Area, of which 20 were rated highly sensitive to development because of heavy wildlife activity, wildlife habitat use and low disturbance. The four remaining sites were rated low in sensitivity because of existing disturbance.

Caribou were recorded at two infrastructure sites in the Sahtu Settlement Area:

- barge landing and storage site at Little Chicago
- barge landing and stockpile site opposite the mouth of the Ontaratue River

The sites were rated for their sensitivity to disturbance as follows:

- Little Chicago – low because site is already highly disturbed
- Ontaratue River – moderate because it is an actively trapped area

Woodland caribou were found at 21 borrow sites in the Deh Cho Region.

Caribou were listed at three infrastructure sites in the Deh Cho Region:

- barge landing, camp and stockpile and compressor station site at Blackwater River
- barge landing, camp and stockpile at Hodgson Creek
- camp and stockpile site at McGill Station

These sites are all rated low for sensitivity to disturbance because of existing disturbance and because well-used wildlife corridors are nearby.

Of the two camp and stockpile sites identified along the northwestern Alberta section of the corridor, the site at Petitot River showed use by woodland caribou. This site was rated high for sensitivity to disturbance because the area is currently undisturbed, the Petitot River is nearby and the area is mostly black spruce-lichen stands.

10.3.8.2 Moose

Field Results

Evidence of moose was found at Inuvik, Campbell Lake, Little Chicago, Fort Good Hope, Little Smith Creek, Ochre River, Camsell Bend, Fort Simpson, McGill Station and Trout Lake, where roads and barge landings are planned.

In the Gwich'in Settlement Area, moose or their sign was observed at 20 borrow sites and at all six planned infrastructure sites. All sites in the Gwich'in Settlement Area were rated as having a low sensitivity to development, with the exception of the proposed site at the mouth of the Travaillant River.

Moose were recorded at 37 borrow sites in the Sahtu Settlement Area, of which 23 were rated high for sensitivity to disturbance, one was rated moderate and 13 were rated low. The high rating was because of heavy wildlife activity and habitat use. Moose were recorded at 11 of the infrastructure sites surveyed in the Sahtu Settlement Area, including:

- Little Chicago
- Ontaratue River mouth
- Hare Indian River
- Hume River mouth
- Carcajou River
- Patricia Island
- Little Smith Creek
- Old Fort Point
- Harry's Island

- Saline River
- Blackwater River

Five of these sites were rated low for sensitivity to disturbance because of a high level of disturbance currently on site. Three were rated moderate because of high levels of disturbance or active trapping in the area, and three were rated high because of riparian areas nearby, high wildlife density and highly valued wildlife habitat.

Evidence of moose activity was found at 23 borrow sites in the Deh Cho Region. There were several sites with optimal moose habitat, although no moose were observed, perhaps because of the relative proximity of the sites to settlement or development areas. Moose were recorded at eight infrastructure sites surveyed in the Deh Cho Region, including:

- Ochre River
- Trail River
- Enbridge
- Fort Simpson
- Old Enbridge support site
- Alternate Mackenzie crossing
- Trout River
- Trainor Lake

Six of these sites were rated low for sensitivity to disturbance because of large existing disturbances and because there was a road nearby. Two sites were rated medium for sensitivity to disturbance because of a nearby creek and other riparian areas.

10.3.8.3 Grizzly Bear

Site-Specific Information

Grizzly bear live throughout the project area and can be expected near many of the proposed infrastructure sites.

Field Results

Evidence of grizzly bear was found at Campbell Lake, Smith Creek, Camsell Bend, McGill Station and at the mouth of the Travaillant River, where roads and barge landings are planned. As grizzly bears are a listed species, these sites are deemed to be highly sensitive to development.

Evidence of grizzly bear activity was found at 41 of the borrow sites planned for construction. Grizzly bears were found at two sites in the Gwich'in Settlement Area. Both sites were suitable denning areas.

Grizzly bears were also recorded at two sites in the Sahtu Settlement Area, both of which were rated high for sensitivity to disturbance because of heavy wildlife activity, habitat use and low disturbance. A den site, possibly of a grizzly bear, was recorded at one site.

10.3.8.4 Marten

Field Results

Evidence of marten was found at Tulita, Little Smith Creek, Blackwater River, Ochre River, Camsell Bend, Trail River, Fort Simpson, Liard River and Trout Lake, where roads, barge landings, camps, stockpile sites and fuel storage sites are planned. The barge landing sites at Fort Simpson and Enbridge were described as providing important or high-quality marten habitat.

Marten was not listed at any infrastructure sites in the Gwich'in Settlement Area.

Marten were recorded at two sites in the Sahtu Settlement Area. One, Site 5.036, was rated high for sensitivity to development because of potential den sites and because of a nearby wildlife travel corridor and watercourse. In the Sahtu Settlement Area, the likely occurrence of marten was listed at five sites described as providing important or high-quality marten habitat:

- Little Smith Creek
- Old Fort Point
- Harry's Island
- Saline River
- Blackwater River

Marten were mentioned as special features at four sites in the Deh Cho Region. Most sites are considered moderately sensitive to development. Marten are extensively trapped throughout the Deh Cho Region. Eight sites have been described as having high value. The occurrence or likely occurrence of marten was listed at four sites, with three sites described as providing important or high-quality marten habitat:

- stockpile site at the Enbridge storage site
- stockpile site at Trout River
- camp at Trainor Lake

10.3.8.5 Lynx

Field Results

Lynx live throughout the project area and can be expected near proposed infrastructure sites.

Lynx in the Gwich'in Settlement Area were found at two of the borrow sites, which were classed as unknown and low in their sensitivity to development. The only barge landing site at which lynx were recorded was in the Gwich'in Settlement Area by the mouth of the Travaillant River. This location is considered highly sensitive to development pressures because it is beside riparian habitat and a wildlife corridor. Lynx is an important harvested species in the area.

Lynx were recorded at two borrow sites in the Sahtu Settlement Area. One site was rated high for sensitivity to disturbance because of the uncommon wildlife species recorded on site and because of the moderate wildlife habitat quality. The other site was rated low for sensitivity to disturbance because it lacks critical habitat or listed species.

Suitable lynx habitat was noted at four sites in the Sahtu Settlement Area and at 11 sites in the Deh Cho Region, sites identified as having potentially high value for lynx, although the species was not actually observed on the sites.

Lynx were not recorded on either of the two sites in northwestern Alberta, but the camp and stockpile site at Petitot River was noted as having high value.

10.3.8.6 Beaver

Field Results

Site-specific surveys have not been conducted to determine if beaver habitat is available near proposed infrastructure sites. Many of the sites are not expected to provide high-quality habitat for this species. Fourteen of the 22 infrastructure site locations are barge landing sites, most of which are on either the mainstream or major channels of the Mackenzie River. The major channels are classified as low-capability, Class 4 habitat for beaver because of silt or gravel and large seasonal discharge fluctuations (Dennington et al. 1973).

In the Gwich'in Settlement Area, beaver were recorded at the barge landing site by the mouth of the Travaillant River, and evidence of beaver was found at eight of the borrow sites.

Two sites in the Sahtu Settlement Area are potential trapping areas for beaver, and beaver were recorded at one borrow site in the area.

Two sites in the Deh Cho Region are also potential trapping areas for beaver, and beaver were found at five borrow sites in the region. These sites ranged from low to high sensitivity mainly because some areas are already overtrapped and have a pre-existing low wildlife density.

Beaver was listed as an important harvested species for the camp and stockpile site at Petitot River in northwestern Alberta, a site rated high for disturbance because the:

- area is currently undisturbed
- Petitot River is nearby

10.3.8.7 Greater and Lesser Scaup

Field Results

No bird population field studies were done at proposed infrastructure sites in the pipeline corridor, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the pipeline corridor infrastructure RSA, less than 1% of the area is effective lesser scaup nesting habitat (see Table 10-139).

Table 10-139: Lesser Scaup Nesting Habitat Distribution – Pipeline Corridor Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	3,977	<1
Low	92,616	1
Very low to none	7,654,892	99
No data	0	0
Total	7,751,485	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.8.8 Lesser Yellowlegs

Field Results

No bird population field studies were done at proposed infrastructure sites in the pipeline corridor, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the pipeline corridor infrastructure RSA, 13% of the area is effective lesser yellowlegs nesting habitat (see Table 10-140).

Table 10-140: Lesser Yellowlegs Nesting Habitat Distribution – Pipeline Corridor Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	188,574	2
Moderate	821,449	11
Low	1,423,834	18
Very low to none	5,317,628	69
No data	0	0
Total	7,751,485	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.3.8.9 Boreal Chickadee

Field Results

No bird population field studies were done at proposed infrastructure sites in the pipeline corridor, including at transportation features and borrow sites.

Modelling Results

Modelling results indicate that in the pipeline corridor infrastructure RSA, 11% of the area is effective boreal chickadee nesting habitat (see Table 10-141).

Table 10-141: Boreal Chickadee Nesting Habitat Distribution – Pipeline Corridor Infrastructure

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	176,558	2
Moderate	704,617	9
Low	3,120,609	40
Very low to none	3,749,700	48
No data	0	0
Total	7,751,485	100[a]

NOTE:
a Numbers do not total 100% because of rounding

10.4 Summary

10.4.1 Inuvialuit Settlement Region

10.4.1.1 Modelling Results

Modelling results indicate that the RSA in the Inuvialuit Settlement Region provides effective habitat as follows (see Table 10-142):

- 30% – barren-ground caribou winter forage habitat
- 12% – barren-ground grizzly fall forage habitat
- about 18% – barren-ground grizzly denning habitat
- about 37% – barren-ground grizzly spring forage habitat

10.4.1.2 Ungulates

Barren-ground caribou density in the Inuvialuit Settlement Region was estimated at 1.03 caribou/km^2 in 2003. Although caribou are grouped with reindeer in the production area analysis, it is thought that few caribou range onto the delta and that most tracks, pellet groups and observations on the delta are from reindeer (Binder 2001, personal communication). Caribou and reindeer habitat associations, as drawn from pellet data, indicate a preference for riparian black spruce or shrub and high- and low-centred polygon habitat types (see Figure 10-45, shown previously).

10.4.1.3 Large Carnivores

Grizzly bear dens were recorded at Parsons Lake, along the gathering pipelines and west of the main pipeline route. Dens were most often in medium shrub habitat and sandy glaciofluvial soil. Combinations of soil type and vegetation are key factors in determining denning habitat suitability. Previous research found dens mostly in sandy or silty soil in morainal outwash deposits (F.F. Slaney and Company Ltd. 1974).

Incidental grizzly bear sign was recorded most often in the riparian shrub habitat type. There were extensive grizzly bear diggings for sweet vetch (*Hedysarum alpinum*) throughout the Holmes Creek valley bottom from previous seasons. There were also several old diggings in ground squirrel colonies on dry sandy slopes along the valley.

Table 10-142: Habitat Distribution for the Regional Study Area – Inuvialuit Settlement Region

Valued Component Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Barren-ground caribou winter forage	Very high	226,806	9
	High	120,867	5
	Moderate	382,828	15
	Low	278,658	11
	Very low	90,264	4
	None	1,434,903	56
	No data	23,253	1
Barren-ground grizzly fall forage	Very high	0	0
	High	121,251	5
	Moderate	185,380	7
	Low	279,062	11
	Very low	804,961	32
	None	1,065,983	42
	No data	100,942	4
Barren-ground grizzly denning	Very high	335,172	13
	High	129,773	5
	Moderate	6,077	<1
	Low	134,713	5
	Very low	1,885,811	74
	None	66,033	3
	No data	0	0
Barren-ground grizzly spring forage	Very high	11,090	<1
	High	446,886	17
	Moderate	520,146	20
	Low	333,895	13
	Very low	118,672	5
	None	1,103,637	43
	No data	23,253	1

10.4.1.4 Birds

Greater White-Fronted Goose

Field Results

Greater white-fronted geese were recorded throughout the outer delta study area during each month of surveys, from late May through September. In spring surveys, i.e., May 31, June 3 and later June surveys, white-fronted geese were relatively evenly distributed on the outer delta as scattered nesting pairs. In July, August and September, more large groups of greater white-fronted geese were observed and fewer groups of one to 10 birds were recorded. Most of the largest groups were seen along the outer coast, but some were seen inland. These observations are consistent with a movement of birds from inland nesting areas to coastal brood-rearing sites.

Fewer geese were recorded along the gathering pipelines and in the Parsons Lake survey area than in the outer delta. Seventeen were recorded during the spring aerial surveys. Densities ranged from 8 birds/100 km^2 in July to 18 in August. Most sightings were in the delta part of the gathering pipelines. Flock sizes did not exceed 50, even in August and September, and none were observed during the ground-truthing surveys.

Modelling Results

Modelling results indicate that in the Inuvialuit Settlement Region RSA:

- 6% of the area is effective greater white-fronted goose nesting habitat (see Table 10-143)
- 53% of the area is effective greater white-fronted goose foraging habitat (see Table 10-144)

Table 10-143: Greater White-Fronted Goose Nesting Habitat – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	78,775	3
Moderate	70,190	3
Low	98,317	4
Very low to none	2,270,471	90
No data	0	0
Total	2,517,754	100

Table 10-144: Greater White-Fronted Goose Terrestrial Foraging Habitat – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	115,157	5
Moderate	1,217,240	48
Low	38,294	2
Very low to none	1,147,062	46
No data	0	0
Total	2,517,754	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Snow Goose

Field Results

The Kendall Island Bird Sanctuary on the outer Mackenzie Delta was created in part to protect colonies of nesting snow geese. Most snow geese sightings during the aerial surveys were near Kendall Island or nearby along the coast. Snow geese were seen frequently and in relatively large flocks in July and August along the outer coast of the delta southeast of Kendall Island and north of Big Lake. At 1,793 birds, the snow goose was the most abundant waterfowl species during the spring aerial surveys on May 31 and June 3.

Fewer geese were recorded in the Parsons Lake survey area. Snow geese were recorded there, but the average monthly densities were much lower than on the outer delta.

Tundra Swan

Field Results

The outer Mackenzie Delta is an important area for nesting tundra swans. Average monthly densities of this conspicuous bird ranged from 101 to 179 birds/100 km^2 during June, July and August aerial surveys. Tundra swans were widely scattered throughout the outer delta during the spring, June and July aerial surveys. There was evidence of large flocks of swans gathering along the coastal edges of the outer delta beginning in July and continuing into August. This was not evident in September aerial surveys.

Tundra swans were also relatively abundant in the Parsons Lake survey area. Although densities were not as high as on the outer Mackenzie Delta, tundra swans were numerous and widely distributed around Parsons Lake. Densities

increased each month from 53.6 birds/100 km^2 in June, to 68.2 in July, to 130 in August. The density was probably higher in August because by then the young were large enough to be seen from the survey aircraft. Densities declined to 65 birds/100 km^2 in the September surveys. Most swans remained in family groups from June to September. Few sightings were of more than 10 birds, and there were no flocks of more than 50 birds. Swans were distributed along all survey lines during spring, summer and fall surveys, although most sightings were to the northwest and north of Parsons Lake, fewer to the northeast and east of the lake and very few in the North Storm Hills.

Modelling Results

Modelling results indicate that in the Inuvialuit Settlement Region RSA:

- 17% of the area is effective tundra swan nesting habitat (see Table 10-145). This is partly because of adjustments for proximity to waterbodies, made because of tundra swans' preference to nest within 45 m of water
- 59% of the area is effective tundra swan foraging habitat (see Table 10-146)

Scaup

Field Results

Scaup are difficult to distinguish during aerial surveys, so virtually all sightings are classed as *unidentified scaup*. Scaup were widely distributed in small groups during the spring migration and June nesting period aerial surveys. During the July, August and September aerial surveys, a greater proportion of the sightings were of larger flocks, most of which were seen in the central and southern parts of the survey area and not on the outer coast. Average monthly densities of unidentified scaup were 92 birds/100 km^2 in June, 62 in July, 61 in August and 97 in September.

Table 10-145: Tundra Swan Nesting Habitat Distribution – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	180,033	7
Moderate	133,165	5
Low	231,162	9
Very low to none	1,973,393	78
No data	0	0
Total	2,517,754	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Table 10-146: Tundra Swan Terrestrial Foraging Habitat Distribution – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	1,361,526	54
Moderate	131,398	5
Low	112,929	4
Very low to none	911,901	36
No data	0	0
Total	2,517,754	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Parsons Lake appears to be an important area for scaup in late summer. Although less numerous than scoters in June, scaup were by far the most abundant group during August aerial surveys. The average monthly density in August was 1,072 birds/100 km^2, which represented sightings of 3,681 birds on-transect. An additional 1,175 scaup were counted off-transect.

Scaup were widely distributed throughout the Parsons Lake LSA during spring and June surveys. Although fewer sightings were recorded in July and August, sightings were of larger groups of scaup. There were nine sightings of 51 to 300 birds each and two sightings of more than 300 birds during August surveys. Parsons Lake, West Hans Lake and East Hans Lake were important areas. A flock of 330 scaup was seen on West Hans Lake during the ground-truthing survey on July 29, 2001. Scaup densities in Parsons Lake were much higher than densities recorded during aerial surveys of the outer Mackenzie Delta.

Modelling Results

Modelling results indicate that in the Inuvialuit Settlement Region RSA, 6% of the area is effective greater scaup nesting habitat (see Table 10-147). The predicted scarcity of such habitat is partly because of adjustments made to account for this species' preference to nest within 1 m of a waterbody.

Arctic Tern

Field Results

Arctic terns were widely distributed throughout the outer delta. Densities of Arctic tern, an early fall migrant, remained relatively high through June and July, but their numbers declined sharply during August aerial surveys, and none were recorded in September. Few were seen during the June 2002 spring aerial survey because they are a late-migrating species and were just beginning to arrive in the

area. Densities in the Parsons Lake survey area were 173 birds/100 km^2 in June, 102 in July and 73 in August surveys. Nearly all birds were seen northwest, north and northeast Parsons Lake. Groups of 11 to 50 Arctic terns were nesting colonies and foraging flocks.

Table 10-147: Greater Scaup Nesting Habitat Distribution – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	151,816	6
Low	205,802	8
Very low to none	2,160,135	86
No data	0	0
Total	2,517,754	100

Whimbrel

Field Results

One whimbrel was recorded during aerial transect surveys in the outer Mackenzie Delta, and one pair was found in moderately wet habitat with pure sedge or patterned ground, i.e., low-centre polygons, on the breeding bird plots. Fourteen whimbrel were recorded in Parsons Lake during the spring aerial surveys, and 10 were recorded during the aerial transect surveys. The breeding bird plot surveys also found one whimbrel in moderately wet habitat with pure sedge or patterned ground, i.e., low-centre polygons, and five in upland tundra habitat. Whimbrel were recorded during aerial transect surveys on the gathering pipelines at densities of 3 birds/100 km^2 in June, 6 in July and 1.1 in August.

Modelling Results

Modelling results indicate that in the Inuvialuit Settlement Region RSA:

- 40% of the area is effective whimbrel nesting habitat (see Table 10-148)
- 44% of the area is effective whimbrel foraging habitat (see Table 10-149)

Peregrine Falcon

There are no records in the RWED database of specific locations for the peregrine falcon nest sites in the Inuvialuit Settlement Region (RWED 2004).

Table 10-148: Whimbrel Nesting Habitat Distribution – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	614,371	24
Moderate	405,694	16
Low	400,178	16
Very low to none	1,097,510	44
No data	0	0
Total	2,517,754	100

Table 10-149: Whimbrel Terrestrial Foraging Habitat Distribution – Inuvialuit Settlement Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	709,320	28
Moderate	397,321	16
Low	1,399,508	56
Very low to none	11,604	<1
No data	0	0
Total	2,517,754	100[a]
NOTE: a Numbers do not total 100% because of rounding		

Field Results

No peregrine falcons were recorded in the outer Mackenzie Delta or at Parsons Lake, although one was recorded during aerial transect surveys along the gathering pipelines in August 2001.

10.4.2 Gwich'in Settlement Area

10.4.2.1 Modelling Results

Modelling results indicate that the RSA in the Gwich'in Settlement Area provides effective habitat as follows (see Table 10-150):

- 7% – barren-ground caribou winter forage habitat
- 42% – woodland caribou winter forage habitat
- 64% – moose winter forage habitat
- 13% – barren-ground grizzly bear fall forage habitat
- 12% – barren-ground grizzly bear denning habitat
- 22% – barren-ground grizzly bear spring forage habitat

- 46% – northern interior grizzly bear fall forage habitat
- 12% – northern interior grizzly bear denning habitat
- 46% – northern interior grizzly bear spring forage habitat
- 66% – marten habitat
- 72% – lynx habitat

Table 10-150: Habitat Distribution for the Gwich'in Settlement Area

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Barren-ground caribou winter forage	Very high	3	0
	High	73	0
	Moderate	108,527	7
	Low	248,116	16
	Very low	84,743	5
	None	698,759	45
	No data	425,872	27
Woodland caribou	Very high	247,406	16
	High	381,261	24
	Moderate	30,317	2
	Low	86,518	6
	Very low	196,594	13
	None	588,788	38
	No data	35,208	2
Moose	Very high	290,954	19
	High	472,227	30
	Moderate	235,256	15
	Low	163,533	10
	Very low	45,864	3
	None	357,674	23
	No data	585	<1
Barren-ground grizzly fall forage	Very high	41,719	3
	High	13,756	1
	Moderate	134,728	9
	Low	157,169	10
	Very low	319,763	20
	None	459,780	29
	No data	439,177	28

Table 10-150: Habitat Distribution for the Gwich'in Settlement Area (cont'd)

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Barren-ground grizzly denning	Very high	161,935	10
	High	10,783	1
	Moderate	12,792	1
	Low	33,324	2
	Very low	1,313,862	84
	None	33,396	2
	No data	0	0
Barren-ground grizzly spring forage	Very high	135,764	9
	High	52,185	3
	Moderate	156,080	10
	Low	413,962	26
	Very low	8,338	1
	None	375,450	24
	No data	424,313	27
Northern interior grizzly fall forage	Very high	310,345	20
	High	346,055	22
	Moderate	59,499	4
	Low	322,356	21
	Very low	114,490	7
	None	376,068	24
	No data	37,278	2
Northern interior grizzly denning	Very high	71,981	10
	High	4,822	1
	Moderate	5,683	1
	Low	14,961	2
	Very low	597,480	86
	None	1,114	<1
	No data	0	0
Northern interior grizzly spring forage	Very high	195,742	13
	High	377,846	24
	Moderate	143,240	9
	Low	435,732	28
	Very low	13,752	1
	None	363,895	23
	No data	35,884	2

Table 10-150: Habitat Distribution for the Gwich'in Settlement Area (cont'd)

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Marten	High	841,516	54
	Moderate	183,479	12
	Low	36,779	2
	None	503,654	32
	No data	664	<1
Lynx	High	526,679	34
	Moderate	587,518	38
	Low	16,850	1
	None	434,380	28
	No data	664	<1

10.4.2.2 Ungulates

Data was collected for moose and woodland or barren-ground caribou in the Gwich'in Settlement Area.

Moose density was estimated at 0.06 moose/km^2 in 2002 and 0.05 moose/km^2 in 2003 in the Gwich'in Settlement Area. The densities are low but typical of most regions this far north (Benn 1999; Brackett et al. 1985; Marshal 1999; Stenhouse and Kutny 1988; Veitch 1998).

Moose were recorded in shrubby habitats, such as the riparian and medium shrub habitat types that they prefer for high-quality browsing (see Figure 10-52 for moose pellet group density and Figure 10-53 for moose track density) (LeResche 1974). Moose were also recorded in mixedwood stands, e.g., white spruce, black spruce or occasional birch, which can provide suitable deciduous browse. A combination of factors, e.g., short growing season, scarcity of adequate thermal cover and snow depth threshold, likely regulate moose movements and habitat use in this area.

Caribou density was estimated at 0.31 caribou/km^2 in 2002 and 0.07 caribou/km^2 in 2003 within this political unit. Density estimates from 2003 surveys correspond to estimates, suggesting one to three woodland caribou per 100 km^2 in the Northwest Territories (Olsen et al. 2001). Density estimates from 2003 are higher than expected.

Woodland or barren-ground caribou sign was observed in the Gwich'in Settlement Area, although the type of sign recorded during the field surveys did not permit differentiation between the species. As Figure 10-54 and Figure 10-55 illustrate, most caribou observations were in relatively open habitats such as the

black spruce lichen bog habitat type, which provides preferred forage, e.g., terrestrial lichens and graminoids.

10.4.2.3 Large Carnivores

Grizzly bear incidental sign was found only in mixedwood forest habitat, which provides various plant species, ground squirrels and other small mammals as seasonal food sources (Shideler and Hechtel 2000).

10.4.2.4 Furbearers

Four furbearer VCs were recorded in surveys in the Gwich'in Settlement Area:

- Canada lynx
- American marten
- snowshoe hare
- beaver

As Figure 10-56 shows, lynx sign in the Gwich'in Settlement Area was most often found in the sedge-peat moss habitat type. This is an unusual habitat association because lynx typically prefer forests with a dense understorey (Pattie and Fisher 1999; Todd 1983). Lynx sign was also observed in a variety of habitat types inhabited by their primary prey species, snowshoe hare. These include the mixedwood forest and black spruce-tamarack and shrub habitat types.

Snowshoe hare were often recorded in the mixedwood and black spruce-tamarack or shrub habitat types (see Figure 10-57 for hare pellet group density and Figure 10-58 for hare track density). Snowshoe hare was also recorded in shrubby habitats, e.g., low and riparian shrub habitat types, which provide cover and food.

Marten sign was observed in a variety of different habitat types, primarily in burned, sedge-peat moss and mixedwood forest habitat (see Figure 10-59). The association of marten with burned habitat is unusual because martens do not typically occupy recently burned areas (Fisher et al. 2000). The other habitat types provide winter hunting opportunities and a diversity of food in spring, summer and fall (Buskirk and Ruggiero 1994; Corn and Raphael 1992; Gwich'in Elders 1997). Incidental observations of one semi-aquatic furbearer, beaver, were usually associated with water.

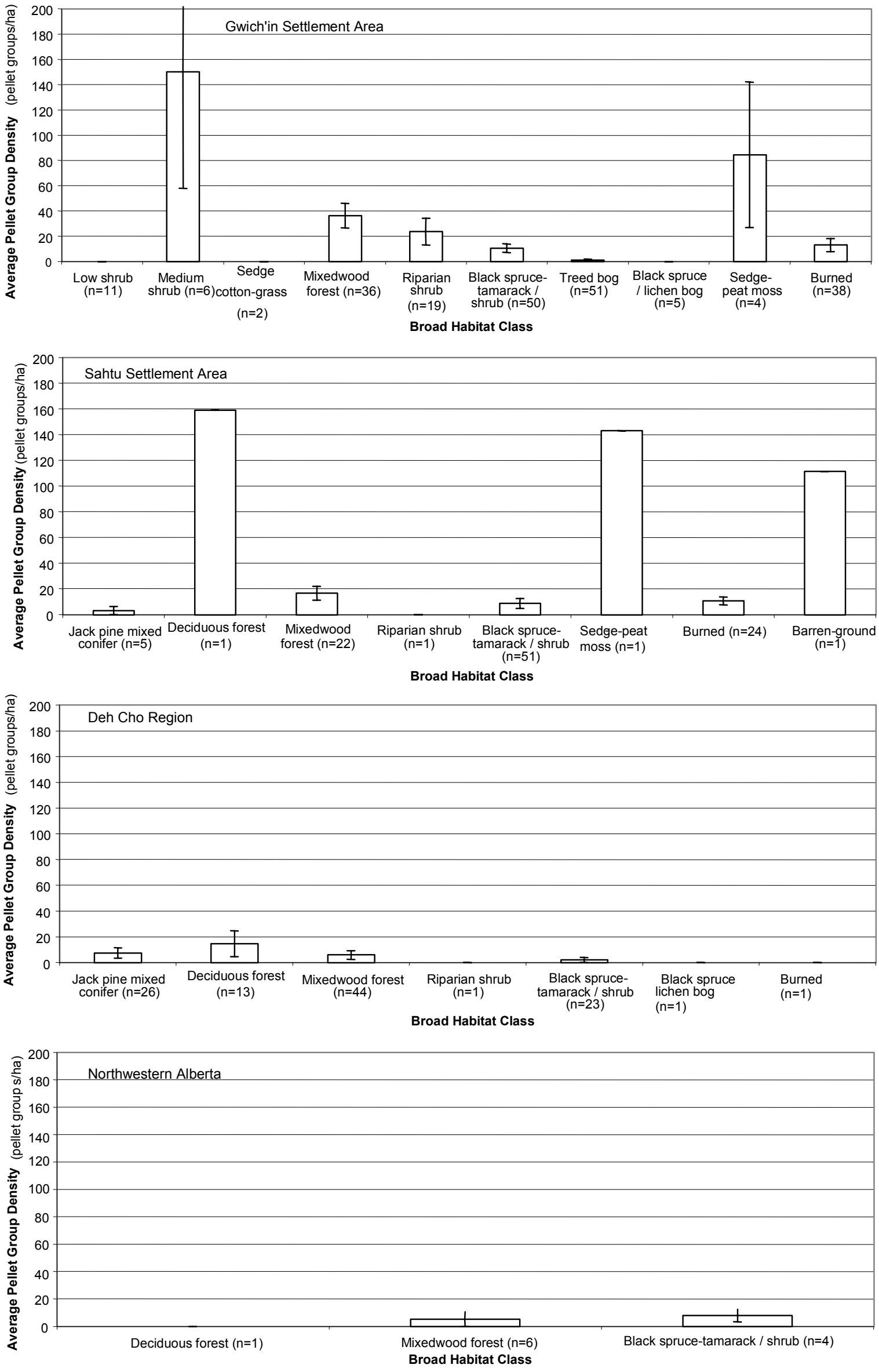

Figure 10-52: Moose Pellet Group Densities – Pipeline Corridor 2002 and 2003 Pellet Group Surveys

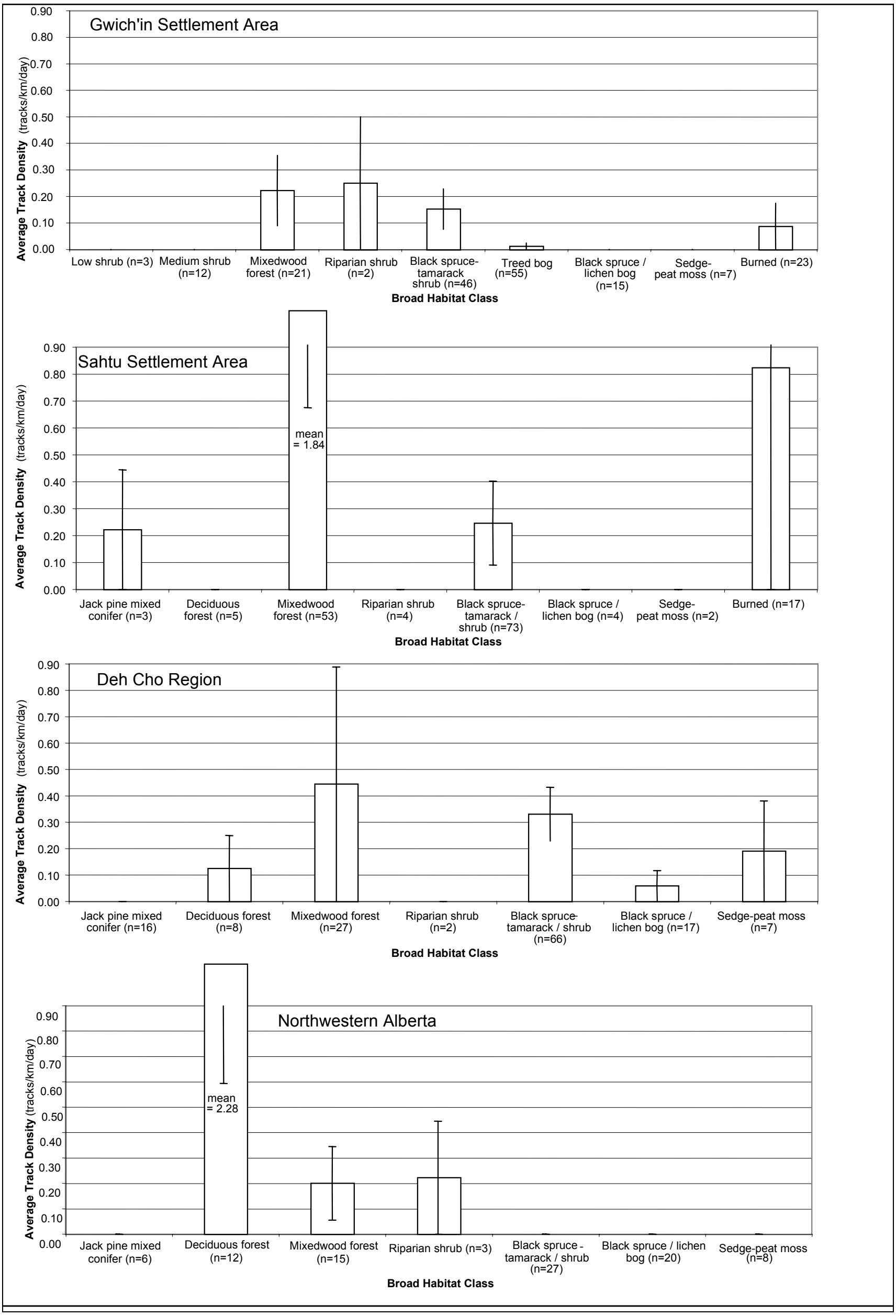

Figure 10-53: Moose Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

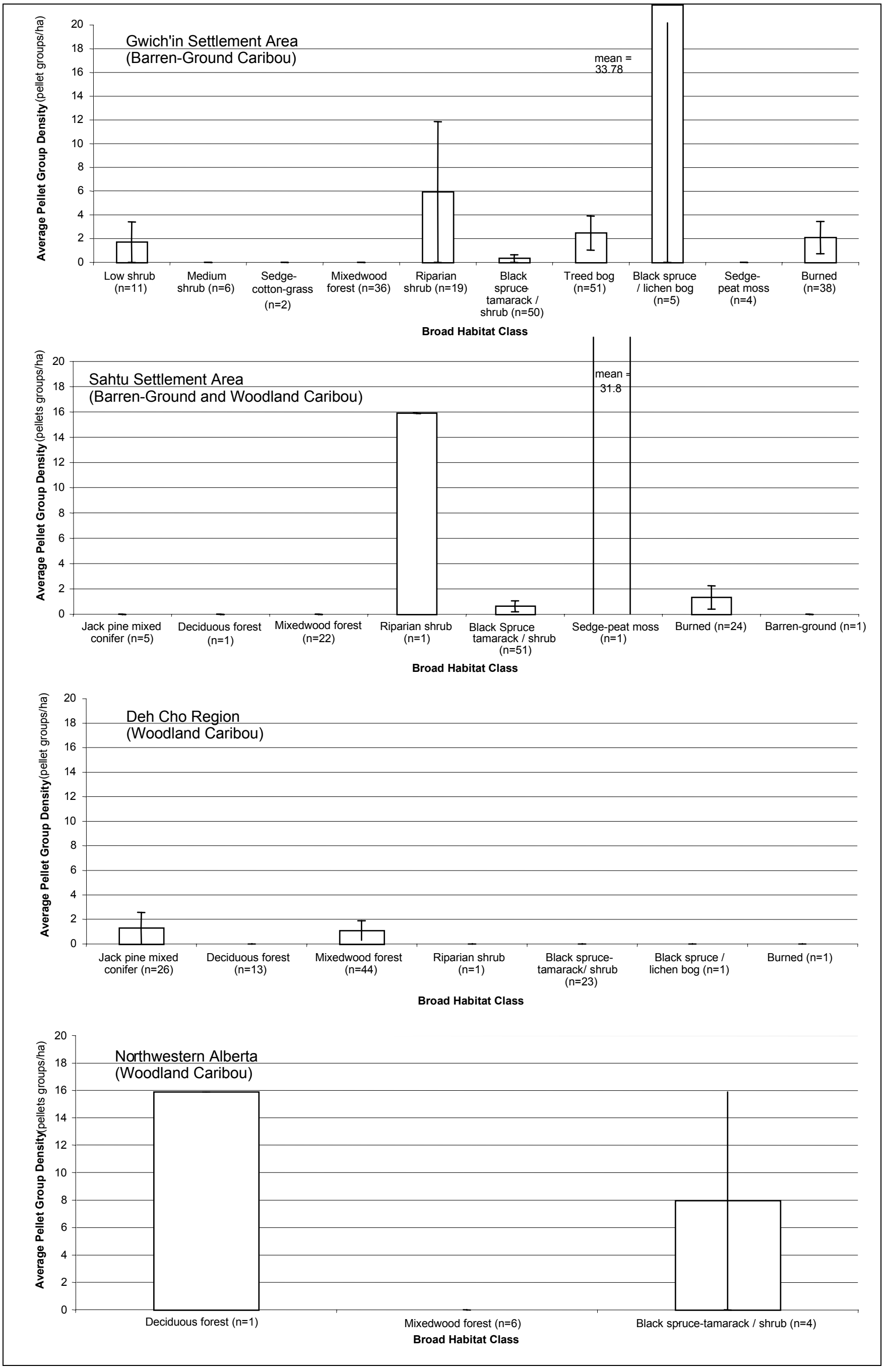

Figure 10-54: Caribou Pellet Densities – Pipeline Corridor 2002 and 2003 Pellet Group Surveys

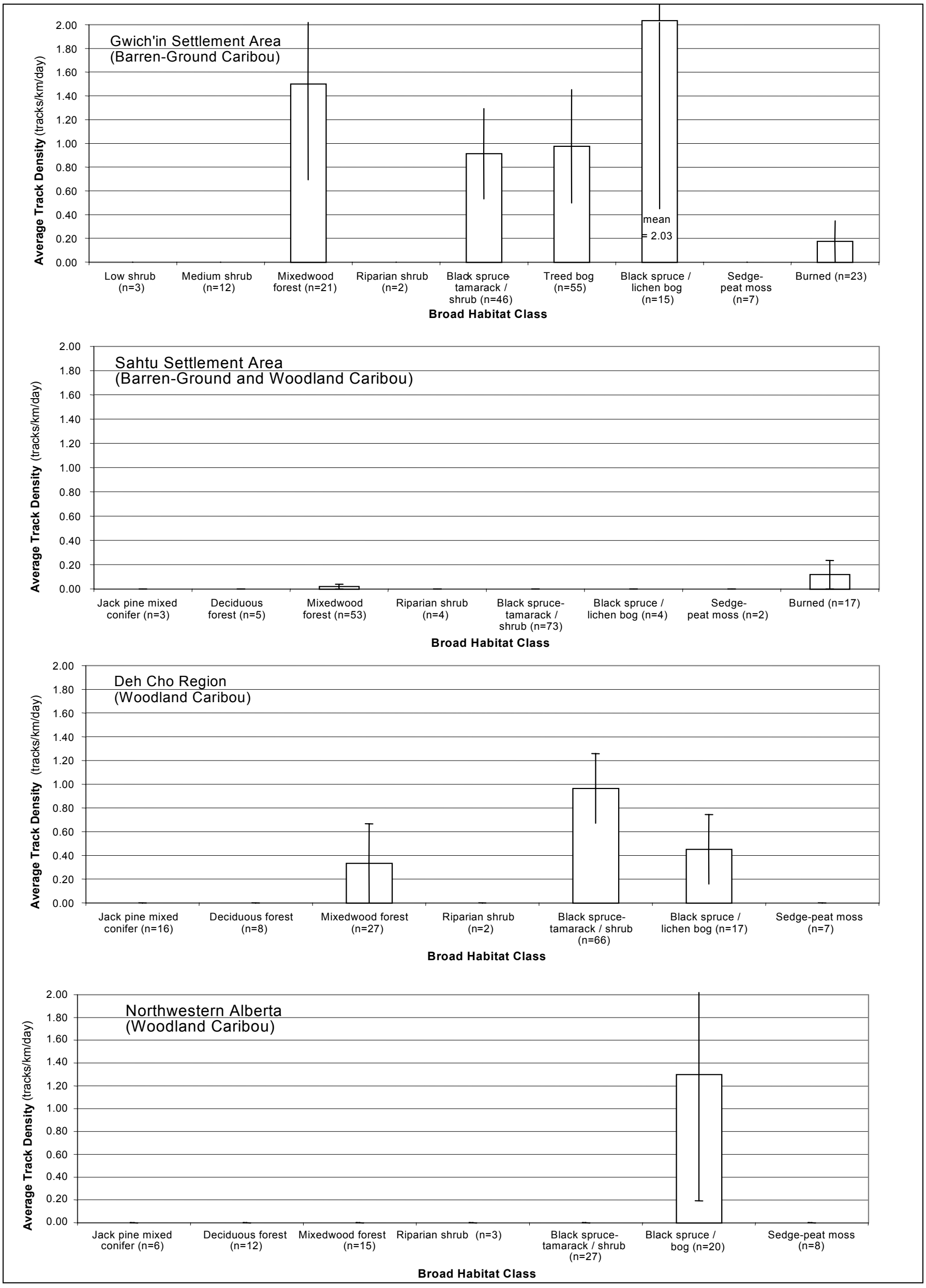

Figure 10-55: Caribou Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

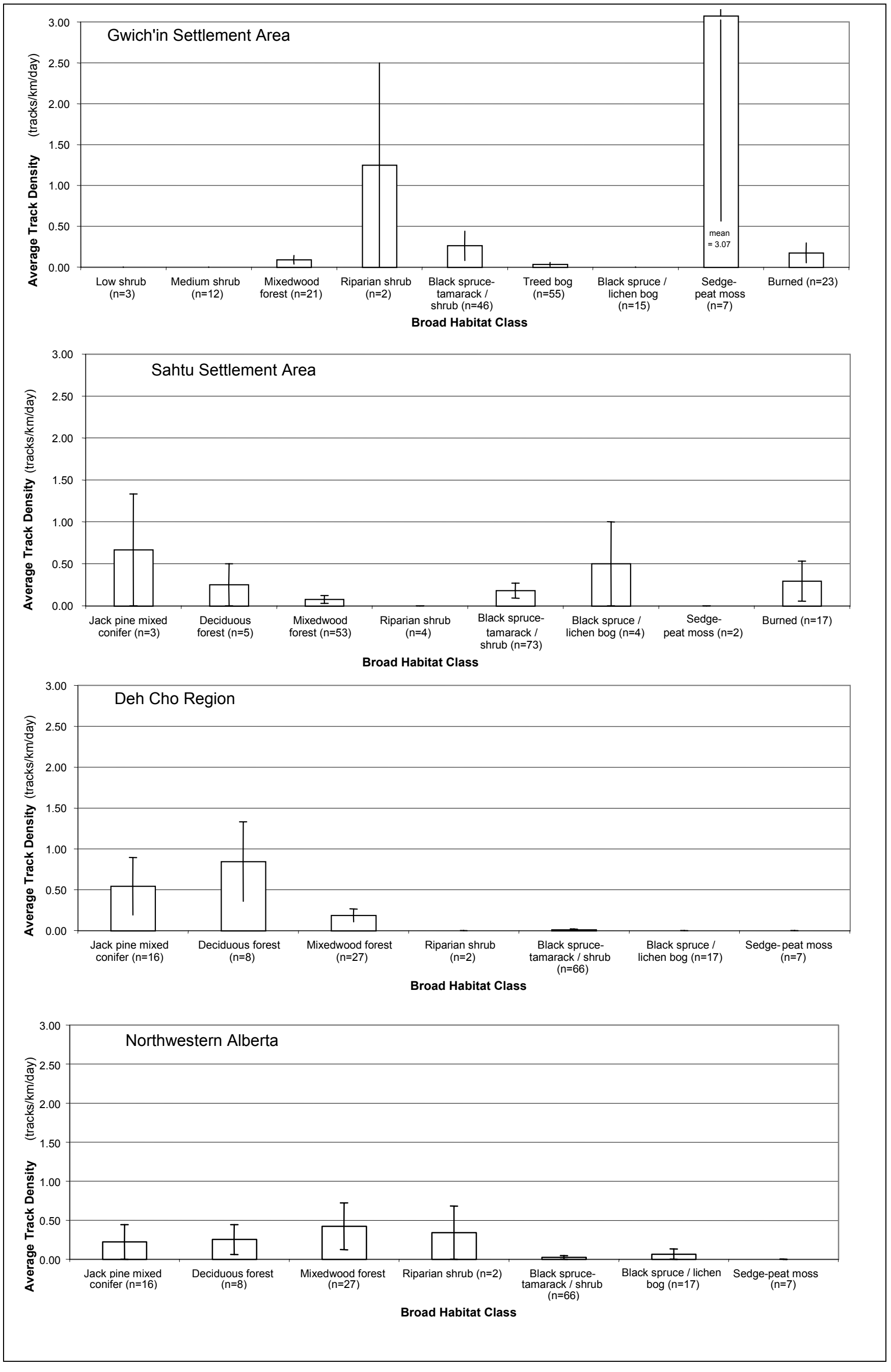

Figure 10-56: Canada Lynx Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

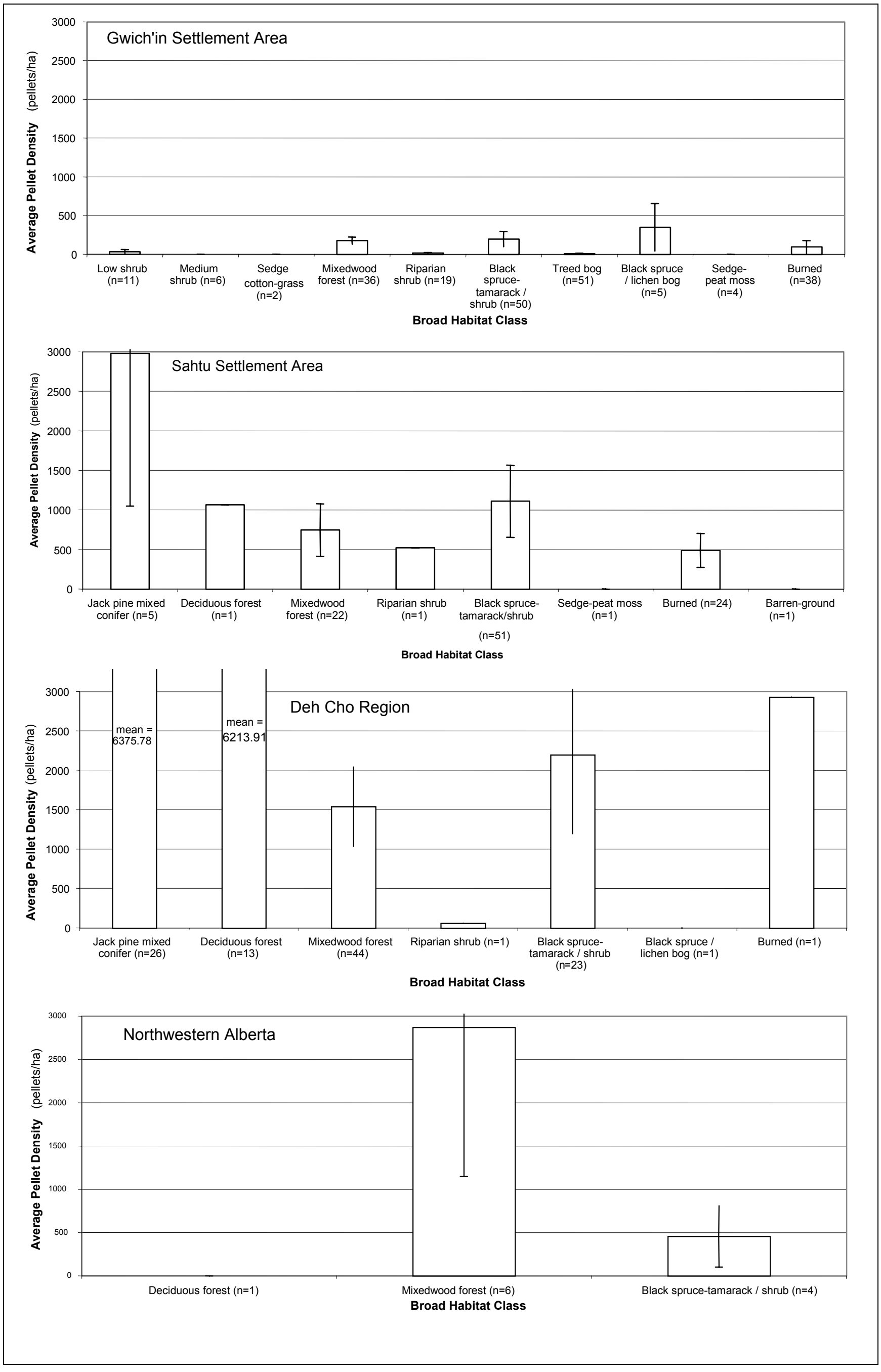

Figure 10-57: Snowshoe Hare Pellet Group Densities – Pipeline Corridor 2002 and 2003 Pellet Group Surveys

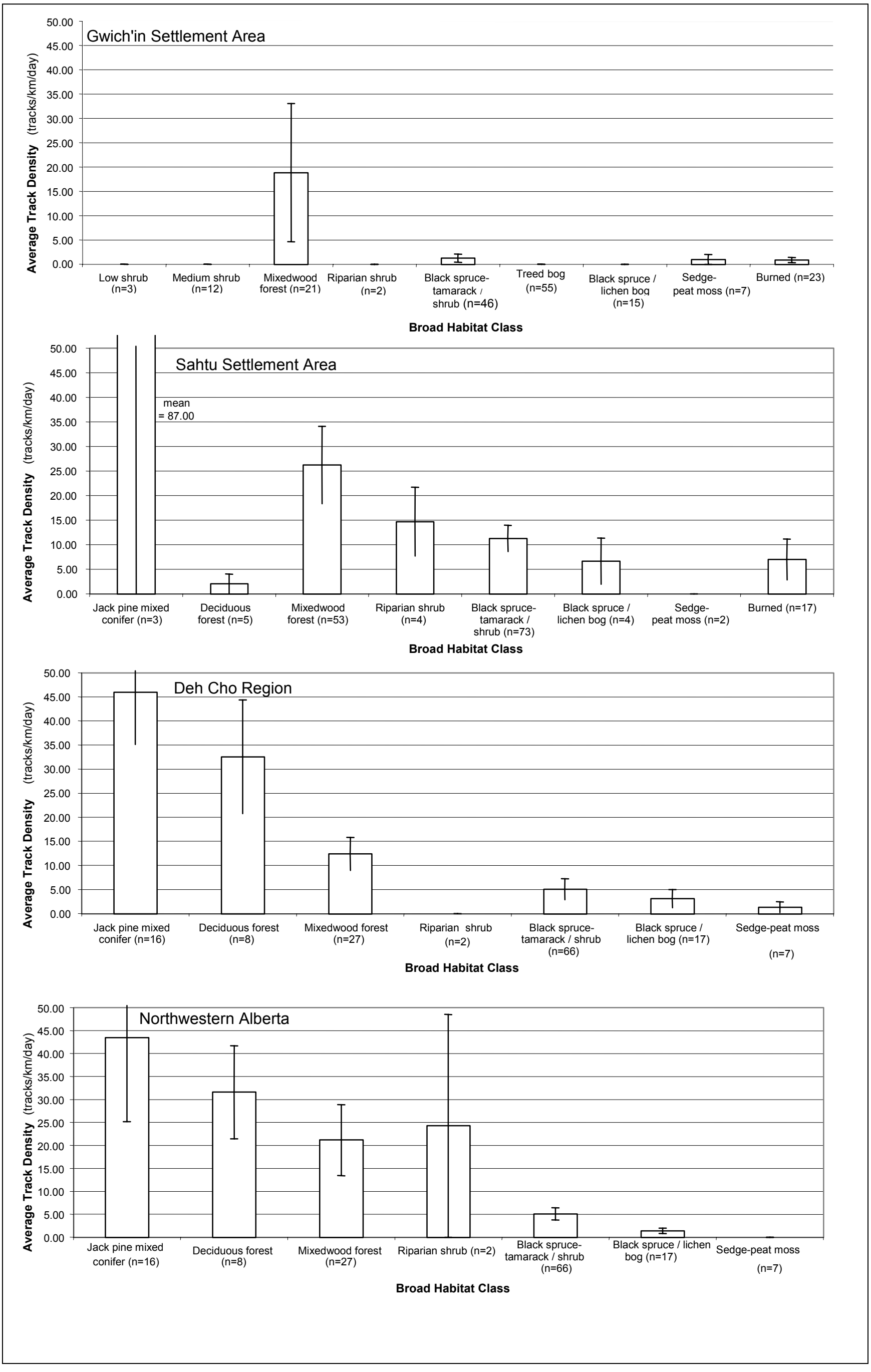

Figure 10-58: Snowshoe Hare Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

10.4.2.5 Birds

Snow Goose

Field Results

No snow geese were recorded during field surveys in the Gwich'in Settlement Area. However, snow geese are seen in the area only during spring migration, and the spring surveys were conducted after the peak snow goose migration had passed. The Mackenzie River from the southern boundary of the Gwich'in Settlement Area to the Tree River is an important spring staging area for snow geese (Alexander et al. 1991).

Scaup

Field Results

Scaup were more abundant along the proposed pipeline route than along the Mackenzie River. The highest concentrations of scaup during the spring aerial surveys were in the Sitidgi Lake area, the Hill Lake area, north of Travaillant Lake and in the southernmost part of the Gwich'in Settlement Area. During the late June aerial transect surveys, scaup were most concentrated in the Hill Lake area and north of Travaillant Lake.

Modelling Results

Modelling results indicate that in the Gwich'in Settlement Area RSA, less than 1% of the area is effective lesser scaup nesting habitat (see Table 10-151). The predicted scarcity of such habitat is partly because of adjustments made to account for this species' preference to nest within 1 m of a waterbody.

Peregrine Falcon

There are 25 records of peregrine nest sites along the Mackenzie River in the Gwich'in Settlement Area (RWED 2004). There is also a concentration of nest sites, i.e., 23 records, near Campbell Lake (RWED 2004).

Field Results

One peregrine falcon was recorded during the spring aerial survey along the Mackenzie River.

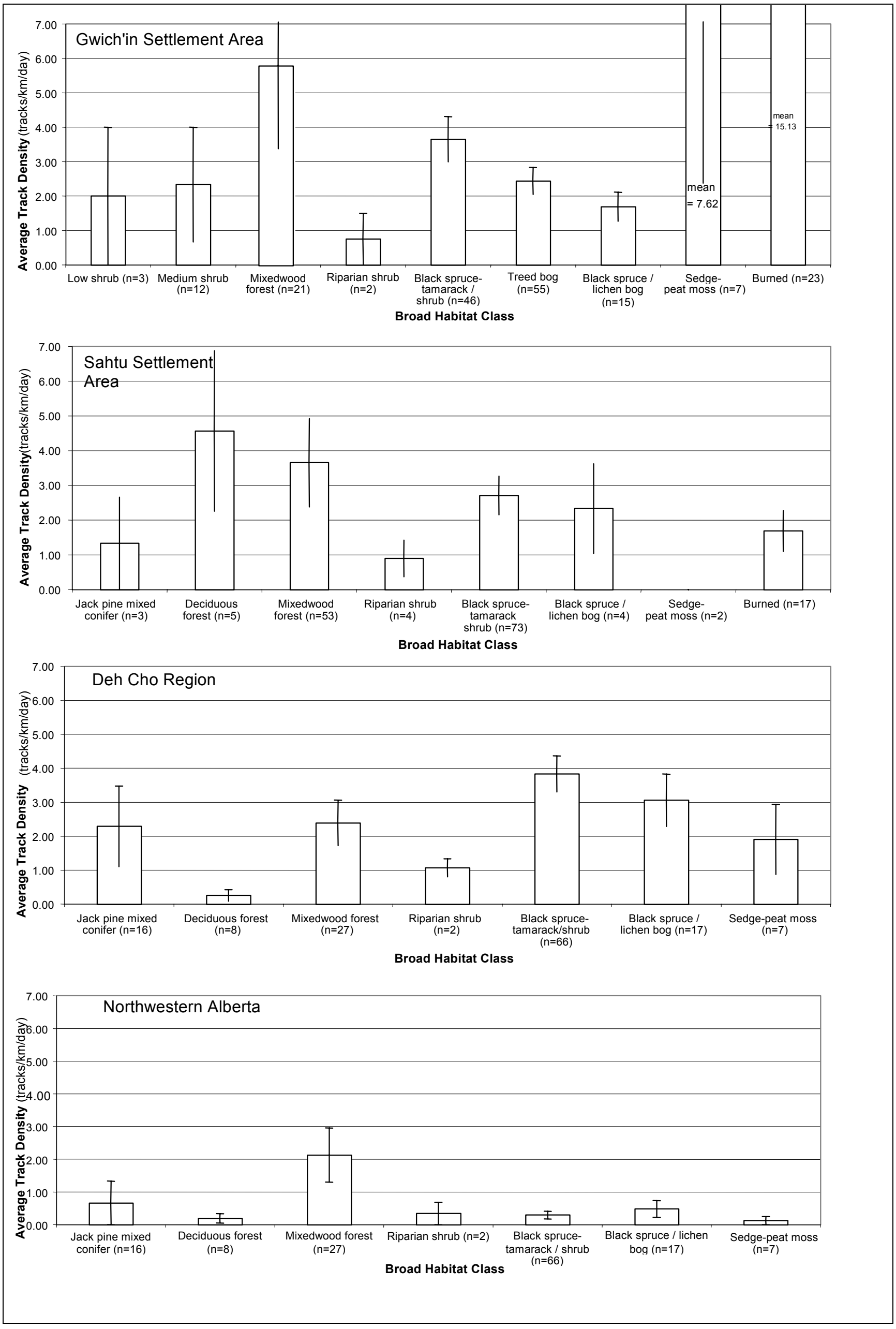

Figure 10-59: Marten Track Densities – Pipeline Corridor 2002 and 2003 Winter Track Surveys

Table 10-151: Lesser Scaup Nesting Habitat Distribution – Gwich'in Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	3,938	<1
Low	34,032	2
Very low to none	1,528,122	98
No data	0	0
Total	1,566,092	100[a]

NOTE:
a Numbers do not total 100% because of rounding

Lesser Yellowlegs

Field Results

Lesser yellowlegs was the most abundant shorebird species recorded during the surveys, although only 37 were observed. However, most of the survey effort was by aerial surveys, and it is difficult to detect and identify shorebirds from the air. Lesser yellowlegs were found more often along the pipeline corridor than along the Mackenzie River.

Modelling Results

Modelling results indicate that in the Gwich'in Settlement Area RSA, 23% of the area is effective lesser yellowlegs nesting habitat (see Table 10-152).

Table 10-152: Lesser Yellowlegs Nesting Habitat Distribution – Gwich'in Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	104,553	7
Moderate	257,445	16
Low	309,948	20
Very low to none	894,145	57
No data	0	0
Total	1,566,092	100

Arctic Tern

Field Results

Arctic terns were found in low numbers in the Gwich'in Settlement Area, except for a high density of 141 birds/100 km^2 found at Travaillant Lake and surrounding area.

Boreal Chickadee

Field Results

No boreal chickadees were recorded during field surveys in the Gwich'in Settlement Area.

Modelling Results

Modelling results indicate that in the Gwich'in Settlement Area RSA, 12% of the area is effective boreal chickadee nesting habitat (see Table 10-153).

Table 10-153: Boreal Chickadee Nesting Habitat Distribution – Gwich'in Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	181,647	12
Low	550,390	35
Very low to none	834,055	53
No data	0	0
Total	1,566,092	100

10.4.3 Sahtu Settlement Region

10.4.3.1 Modelling Results

Modelling results indicate that the Sahtu Settlement Area RSA comprises the following effective habitat (see Table 10-154):

- 49% is woodland caribou winter forage habitat
- 67% is moose winter forage habitat
- 62% is northern interior grizzly bear fall forage habitat
- about 23% is northern interior grizzly bear denning habitat
- 72% is northern interior grizzly bear spring forage habitat
- 74% is marten habitat
- 74% is lynx habitat

Table 10-154: Habitat Distribution in the Sahtu Settlement

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Woodland caribou winter forage	Very high	734,848	24
	High	407,904	13
	Moderate	379,816	12
	Low	164,950	5
	Very low	309,848	10
	None	1,070,716	35
	No data	296	<1
Moose winter forage	Very high	508,053	17
	High	524,814	17
	Moderate	1,003,320	33
	Low	528,998	17
	Very low	48,936	2
	None	454,132	15
	No data	124	0
Northern interior grizzly fall forage	Very high	562,361	18
	High	1,172,072	38
	Moderate	198,732	6
	Low	520,256	17
	Very low	196,868	6
	None	417,806	14
	No data	283	<1
Northern interior grizzly denning	Very high	202,750	15
	High	1,053	<1
	Moderate	114,566	8
	Low	61,524	5
	Very low	982,333	72
	None	1,497	<1
	No data	0	0
Northern interior grizzly spring forage	Very high	571,089	19
	High	1,328,822	43
	Moderate	311,013	10
	Low	326,867	11
	Very low	114,463	4
	None	415,873	14
	No data	251	<1

Table 10-154: Habitat Distribution in the Sahtu Settlement (cont'd)

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Marten	High	1,689,232	55
	Moderate	572,926	19
	Low	168,938	6
	None	636,957	21
	No data	324	<1
Lynx	High	1,029,220	34
	Moderate	1,216,319	40
	Low	382,477	12
	None	440,036	14
	No data	324	<1

10.4.3.2 Ungulates

Two ungulate VCs, moose and woodland or barren-ground caribou were recorded during surveys in the Sahtu Settlement Area.

Moose density in the area was estimated at 0.10 moose/km^2 in 2002, which is low, but typical of most regions this far north (Benn 1999; Brackett et al. 1985; Marshal 1999; Stenhouse and Kutny 1988; Veitch 1998).

Figure 10-52 and Figure 10-53, shown previously, show moose sign was observed mostly in burned, deciduous and sedge-peat moss habitats, which provide high-quality browse (LeResche 1974).

Caribou sign was most often observed in burned and sedge-peat moss habitat types during surveys (see Figure 10-54 and Figure 10-55, shown previously). The sedge-peat moss habitat provides graminoid forage and possibly moderate terrestrial lichen growth for caribou.

10.4.3.3 Large Carnivores

Grizzly bear incidental sign was found infrequently in a variety of habitats, making habitat associations difficult to determine.

10.4.3.4 Furbearers

Four furbearer VCs were recorded during surveys in the Sahtu Settlement Area:

- Canada lynx
- American marten

- snowshoe hare
- beaver

Canada lynx sign was recorded most often in the jack pine mixed conifer and mixedwood habitat types in the Sahtu Settlement Area (see Figure 10-56, shown previously). Most observations of snowshoe hare, a major prey species, were also in jack pine mixed conifer forests (see Figure 10-57 and Figure 10-58, shown previously).

Marten sign was found in a variety of habitat types, most often deciduous, black spruce-tamarack or shrub, and mixedwood forests (see Figure 10-59, shown previously). These habitat types provide winter hunting opportunities for marten and a diversity of foods in spring, summer and fall (Buskirk and Ruggiero 1994; Corn and Raphael 1992; Gwich'in Elders 1997).

Incidental observations of beaver were most common in mixedwood forest habitat, which has suitable forage species.

10.4.3.5 Birds

Snow Goose

Field Results

A total of 337 snow geese, including a flock of 250 birds, were recorded in the Sahtu Settlement Area during the spring, i.e., May, aerial surveys. All were seen along the Mackenzie River, not in the pipeline corridor. No snow geese were recorded during the June surveys. Islands in the Mackenzie River between Little Chicago and Fort Good Hope and near Norman Wells are important spring staging areas for snow geese (Alexander et al. 1991).

Scaup

Field Results

Greater scaup and lesser scaup are difficult to distinguish from the air, so most aerial survey sightings were recorded as unidentified scaup. Two greater scaup and 41 lesser scaup were identified in June ground-truthing surveys from 361 scaup counted at seven ground-truthing sites. Scaup were second only to scoters as the most numerous waterfowl observed during May aerial surveys of the pipeline corridor and Mackenzie River. Scaup were far more numerous along the pipeline corridor, i.e., 3,834 sightings, than on the Mackenzie River, i.e., 974 sightings. They were distributed fairly evenly along the pipeline route, with the largest concentration being 220 birds. Concentrations along the Mackenzie River were in areas with other waterfowl species concentrations, especially between Old Fort Point and the Redstone River. A density of 58.8 birds/100 km² was

determined for scaup along the pipeline corridor in June, making it the most numerous waterfowl during the June aerial surveys.

Modelling Results

Modelling results indicate that in the Sahtu Settlement Area RSA, 0% of the area is considered effective lesser scaup nesting habitat (see Table 10-155).

Table 10-155: Lesser Scaup Nesting Habitat Distribution – Sahtu Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	**Habitat** (%)
High	0	0
Moderate	0	0
Low	40,966	1
Very low to none	3,027,442	99
No data	0	0
Total	3,068,408	100

Peregrine Falcon

There are more than 50 records of peregrine falcon nest sites in the Sahtu Settlement Area. Most sites are along the Mackenzie River (RWED 2004).

Field Results

Five peregrine falcons were recorded along the pipeline route during the spring aerial surveys, and seven along the Mackenzie River.

Lesser Yellowlegs

Field Results

Lesser yellowlegs were recorded in low densities of 0.5 birds/100 km² during the June aerial surveys, although aerial surveys are not very suitable for detecting and identifying shorebirds.

Modelling Results

Modelling results indicate that in the Sahtu Settlement Area RSA, 10% of the area is considered effective lesser yellowlegs nesting habitat (see Table 10-156).

Table 10-156: Lesser Yellowlegs Nesting Habitat Distribution – Sahtu Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	25,493	1
Moderate	275,276	9
Low	829,017	27
Very low to none	1,938,622	63
No data	0	0
Total	3,068,408	100

Arctic Tern

Field Results

Only three Arctic terns were recorded during spring aerial surveys, and a density of 2 birds/100 km² was detected during June aerial surveys along the pipeline corridor in the Sahtu Settlement Area.

Boreal Chickadee

Field Results

No boreal chickadees were recorded during field surveys in the Sahtu Settlement Area.

Modelling Results

Modelling results indicate that in the Sahtu Settlement Area RSA, 18% of the area is considered effective boreal chickadee nesting habitat (see Table 10-157).

Table 10-157: Boreal Chickadee Nesting Habitat Distribution – Sahtu Settlement Area

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	40,804	1
Moderate	523,753	17
Low	1,037,323	34
Very low to none	1,466,528	48
No data	0	0
Total	3,068,408	100

10.4.4 Deh Cho Region

10.4.4.1 Modelling Results

Modelling results indicate that the RSA in the Deh Cho Region comprises the following effective habitat (see Table 10-158):

- 51% is woodland caribou winter forage habitat
- 50% is moose winter forage habitat
- 49% is northern interior grizzly bear fall forage habitat
- about 20% is northern interior grizzly bear denning habitat
- 89% is northern interior grizzly bear spring forage habitat
- 79% is marten habitat
- 89% is lynx habitat

Table 10-158: Valued Component Habitat for the Deh Cho Region

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Woodland caribou winter forage	Very high	321,421	10
	High	236,532	7
	Moderate	1,101,011	34
	Low	578,213	18
	Very low	218,187	7
	None	739,652	23
	No data	3,939	<1
Moose winter forage	Very high	321,442	10
	High	123,693	4
	Moderate	1,141,208	36
	Low	896,976	28
	Very low	138,852	4
	None	572,845	18
	No data	3,939	<1
Northern interior grizzly fall forage	Very high	321,516	10
	High	138,289	4
	Moderate	1,110,964	35
	Low	1,252,204	39
	Very low	219,217	7
	None	152,827	5
	No data	3,939	<1

Table 10-158: Valued Component Habitat for the Deh Cho Region (cont'd)

Model	Habitat Value	Regional Study Area	
		Habitat Area (ha)	Habitat (%)
Northern interior grizzly denning	Very high	152,310	11
	High	1,145	<1
	Moderate	128,219	9
	Low	108,245	8
	Very low	1,029,254	72
	None	2,591	<1
	No data	0	0
Northern interior grizzly spring forage	Very high	345,713	11
	High	938,492	29
	Moderate	1,551,810	49
	Low	65,010	2
	Very low	162,062	5
	None	131,929	4
	No data	3,939	<1
Marten	High	418,445	13
	Moderate	2,113,923	66
	Low	518,429	16
	None	144,218	5
	No data	3,939	<1
Lynx	High	514,211	16
	Moderate	2,335,116	73
	Low	205,495	6
	None	140,194	4
	No data	3,939	<1

10.4.4.2 Ungulates

Two ungulate VCs, moose and woodland caribou, were recorded during surveys in the Deh Cho Region.

Moose density in this region was estimated to be 0.06 moose/km^2 in 2002 and 0.01 moose/km^2 in 2003. These densities are low, but typical for most regions this far north (Benn 1999; Brackett et al. 1985; Marshal 1999; Stenhouse and Kutny 1988, Veitch 1998).

Moose tracks are most often found in mixedwood, deciduous and black spruce-tamarack or shrub habitat types, which have highly suitable browse species (see Figure 10-52 and Figure 10-53, shown previously).

Woodland caribou density was estimated to be 0.03 caribou/km^2 in 2003, which corresponds with density estimates that suggest one to three woodland caribou per 100 km^2 in the Northwest Territories (Olsen et al. 2001).

Most caribou were seen in relatively open habitats such as the black spruce-tamarack or shrub and black spruce lichen bog habitat types (see Figure 10-54 and Figure 10-55, shown previously). These areas can provide preferred grass and forb seasonal forage in summer and terrestrial and arboreal lichens in winter. Caribou sign was also recorded frequently in jack pine mixed conifer and mixedwood habitat types.

10.4.4.3 Large Carnivores

No grizzly bears have been recorded in the Deh Cho Region.

10.4.4.4 Furbearers

Four furbearer VCs were recorded during surveys in the Deh Cho Region:

- Canada lynx
- American marten
- snowshoe hare
- beaver

Canada lynx sign in the Deh Cho Region was recorded most often in deciduous forest habitat (see Figure 10-56, shown previously). This habitat provides a dense understorey that is effective as hunting cover (Pattie and Fisher 1999; Todd 1983).

Snowshoe hare sign was recorded most frequently in jack pine mixed conifer habitat (see Figure 10-57 and Figure 10-58, shown previously).

Shown previously in Figure 10-59, marten sign was most often seen in the black spruce-tamarack or shrub habitat type. This habitat provides winter hunting opportunities and a diversity of food in spring, summer and fall (Buskirk and Ruggiero 1994; Corn and Raphael 1992; Gwich'in Elders 1997).

Incidental observations of one semi-aquatic furbearer, beaver, were recorded in this region. Beaver sign was most often seen in the jack pine mixed conifer habitat type.

10.4.4.5 Birds

Snow Goose

Field Results

One flock of four snow geese was recorded during the spring aerial surveys in the Deh Cho Region.

Scaup

Field Results

Although few scaup were recorded during spring aerial surveys of the pipeline corridor, 570 were counted along the Mackenzie River. They were fairly evenly distributed, with concentrations north of the Willowlake River mouth and south of the Blackwater River. A density of 6 birds/100 km^2 was recorded during June transect surveys of the pipeline corridor, but very few were seen during transect surveys of the Mackenzie River.

Modelling Results

Modelling results indicate that in the Deh Cho Region RSA, 0% of the area is considered effective lesser scaup nesting habitat (see Table 10-159).

Table 10-159: Lesser Scaup Nesting Habitat Distribution – Deh Cho Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	0	0
Moderate	0	0
Low	17,454	1
Very low to none	3,181,470	99
No data	0	0
Total	3,198,924	100

Peregrine Falcon

There are no records of peregrine falcon nest sites in the Deh Cho Region (RWED 2004).

Field Results

No peregrine falcons were recorded on the field surveys.

Lesser Yellowlegs

Field Results

Few lesser yellowlegs were recorded along the pipeline corridor in the Deh Cho Region during aerial surveys. However, aerial surveys are not an effective means of surveying lesser yellowlegs nesting populations, and no ground-based bird surveys were undertaken in the Deh Cho Region.

Modelling Results

Modelling results indicate that in the Deh Cho Region RSA, 11% of the area is considered effective lesser yellowlegs nesting habitat (see Table 10-160).

Table 10-160: Lesser Yellowlegs Nesting Habitat Distribution – Deh Cho Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	58,723	2
Moderate	295,952	9
Low	296,376	9
Very low to none	2,547,872	80
No data	0	0
Total	3,198,924	100

Arctic Tern

Field Results

No Arctic terns were recorded during field surveys in the Deh Cho Region.

Boreal Chickadee

Field Results

No boreal chickadees were recorded during aerial surveys in the Deh Cho Region. Boreal chickadees do live there (Godfrey 1986), but it is very unlikely any would be detected during an aerial survey. No ground-based surveys were conducted in the Deh Cho Region.

Modelling Results

Modelling results indicate that in the Deh Cho Region RSA, 4% of the area is considered effective boreal chickadee nesting habitat (see Table 10-161).

Table 10-161: Boreal Chickadee Nesting Habitat Distribution – Deh Cho Region

Habitat Value	Regional Study Area	
	Habitat Area (ha)	Habitat (%)
High	138,298	4
Moderate	0	0
Low	1,571,913	49
Very low to none	1,488,713	47
No data	0	0
Total	3,198,924	100

10.4.5 Northwestern Alberta

10.4.5.1 Ungulates

Two ungulate VCs, moose and woodland caribou, were recorded during surveys in northwestern Alberta.

Moose sign was most often recorded in the black spruce-tamarack or shrub habitat type, which have suitable browse species (see Figure 10-53, shown previously).

Shown previously in Figure 10-55, most caribou sightings were in relatively open habitats such as the black spruce-tamarack or shrub habitat type. This habitat provides preferred seasonal grass and forb forage in summer and terrestrial and arboreal lichens in winter. Caribou sign was also recorded frequently in deciduous forest habitat.

10.4.5.2 Large Carnivores

No large carnivores were recorded during surveys in northwestern Alberta.

10.4.5.3 Furbearers

Three furbearer VCs were recorded during surveys in northwestern Alberta:

- American marten
- snowshoe hare
- beaver

Marten incidental sign was recorded infrequently in the mixedwood forest, black spruce-tamarack or shrub and disturbed habitat types.

Snowshoe hare sign was recorded in the mixedwood forest and black spruce-tamarack or shrub habitat types (see Figure 10-58, shown previously).

Incidental observations of one semi-aquatic furbearer, beaver, were recorded in the black spruce lichen bog and black spruce-tamarack or shrub habitat types.

10.4.5.4 Birds

No vegetation typing was prepared for northwestern Alberta, so no habitat modelling has been done for that region.

Snow Goose

No snow geese were recorded in northwestern Alberta during the field surveys.

Scaup

Scaup were relatively abundant during the Alberta surveys. Although only 12 birds were seen in May 2002, they were among the most abundant species with 33 sightings and an estimated 27 birds/100 km^2 during the June 2001 aerial surveys, and 119 sightings during the ground-truthing survey.

Peregrine Falcon

No peregrine falcons were recorded in northwestern Alberta during field surveys.

Lesser Yellowlegs

Two lesser yellowlegs were recorded during field surveys in northwestern Alberta.

Arctic Tern

No Arctic terns were recorded during field surveys in northwestern Alberta.

Boreal Chickadee

No boreal chickadees were recorded during field surveys in northwestern Alberta. However, most of the survey effort was by aerial survey, in which small passerines are not likely to be detected.

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