LOCAL KNOWLEDGE BASED MOOSE HABITAT SUITABILITY ASSESSMENT FOR THE SOUTH CANOL REGION, YUKON

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Yukon
Environment

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YUKON DEPARTMENT OF ENVIRONMENT

Fish and Wildlife Branch
MR-17-02

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Summary

- We conducted individual interviews with 17 Teslin and Whitehorse residents familiar with the South Canol area to collect information on moose habitat use.
- We asked about habitat use for three moose cohorts: bulls, cows, and cows with calf(s), in five functional seasons: calving, summer, rutting, early-winter, and late-winter.
- This information was used to identify key habitat elements for moose and to predict moose habitat suitability in the area using maps.
- Most habitat types were indicated as being of either no/low importance or of high importance; very few were of moderate importance.
- The importance of habitat type varied considerably among and between moose cohorts and functional seasons.
- Using results of the interviews, we created 15 maps indicating the importance of habitat for each moose cohort and each functional season.
- The early winter cow with calf, and the early winter bull, moose maps were validated using known moose location data. Results suggested both maps are likely good predictors of habitat suitability.
- This work reinforces the utility of using local knowledge to predict habitat use and suitability by moose. Results can inform species and resource management, land use planning, and environmental assessment.

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Introduction

Moose *(Alces alces)* have been harvested by First Nations in Yukon for thousands of years, providing essential materials for survival such as meat and skins. Moose harvest makes a significant contribution to the Yukon economy; resident hunters spend an average of $2.1 million per year on hunts and approximately two thirds of those are moose hunts (O'Donovan and Morrison 2010). Despite the essential role moose populations play culturally and economically in the north, few studies have been conducted on moose distribution, abundance or habitat use outside of the early winter months (November and early December; McCulley 2008).

It is difficult to make generalizations about moose habitat use because habitat selection patterns are complex and vary among populations, individuals, seasons, and sexes. Furthermore, habitat use by moose can vary depending on the type of land cover and the availability of resources in a particular area. This study aims to use local knowledge to provide a better understanding of moose habitat use and selection in southern Yukon.

We chose the South Canol region (Figure 1) for this study as it has a relatively high moose density compared to most of Yukon. Furthermore the area has relatively little development or disturbance and thus provides an opportunity to obtain baseline information about moose habitat needs.

Local knowledge is an important source of information to augment scientific data, to provide information where no scientific data exists, and most importantly, to provide a broader perspective on wildlife ecology. Local knowledge is obtained from people who are familiar with the study area due to extensive time spent on the land conducting activities such as hunting and trapping. Local people are often a wealth of first-hand information about patterns and changes in wildlife (Polfus 2010).

In early 2010, we conducted local knowledge interviews in Whitehorse and Teslin. Individuals familiar with the South Canol study area were asked to provide their expert opinion about moose in the area throughout the year. This information was used to identify key habitat elements for moose in order to characterize moose habitat selection in the South Canol area.

Methods

Study area

The study area is located in south-central Yukon, 130 km east of Whitehorse and 52 km west of Teslin (Figure 1). The study area is approximately 23,970 km^2 and occurs mainly within the traditional territory of the Teslin Tlingit, as well as small portions of the Ta'an Kwach'an and Kwanlin Dun First Nation traditional territories. The study area is within the Pelly Mountains and Yukon Southern Lakes ecoregions. It contains diverse landscape features including large rivers (Teslin, Nisutlin), lakes (Quiet, Big Salmon), several mountain ranges (Big Salmon, Englishman) and a portion of the

Yukon Plateau. Vegetation ranges from dry lichen heath in the alpine through willow and shrub birch subalpine shrublands to spruce, pine and mixed wood forests at lower elevations (Yukon Ecoregions Working Group 2004).

Interviews

We conducted local knowledge interviews in Whitehorse on 10 and 19 January, 2010 and in Teslin on 27 and 28 January and 26 March, 2010. We selected interview participants based on their familiarity with the study area. Interviews were one-on-one and participants included biologists, outfitters, and local hunters and trappers who had spent significant time on the land and had extensive knowledge about moose and moose habitat use in the study area throughout the year.

The interview process involved participants looking at a map of the study area and coloured reference photos of 11 different mapped habitat types (Appendix 1) thought to be important. Participants were asked to rate each habitat type for its importance to each of three different moose cohorts in each of five distinct functional seasons (i.e., season) of interest (see below).

We asked participants to evaluate the habitat as a habitat type only and to try to disregard their experience with that habitat in the context of the landscape. For example, a habitat was evaluated independent of whether it occurred adjacent to a lake, on a steep slope, next to a road, etc. We asked participants to rate habitats in seasons with which they had experience and felt knowledgeable about. For each participant we recorded the specific region within the study area and the particular season(s) with which they had most experience.

- The 11 habitat types considered were:
- Riparian
- Wetland
- Water
- Deciduous
- Mixed-wood
- Conifer
- Lowland shrub
- Lowland herbaceous
- Subalpine
- Alpine
- Lowland non-vegetated

The five functional seasons (and associated dates) considered were:

- Calving: 15 May to 30 June
- Summer: 1 July to 15 August
- Rut: 16 August to 31 October
- Early winter: 1 November to 31 December
- Late winter: 1 January to 14 May

The three moose cohorts considered were:

- Bulls
- Cows
- Cow with calf(s)

A 4-class habitat suitability ranking system was used for this exercise. The four classes were:

- 0 = Not Important
- 1 = May be Important
- 2 = Fairly Important
- 3 = Very Important

Mapping Process:

All interview participant rankings were weighted equally regardless of the level of experience the participant had in the study area. We calculated the modes (i.e., the most common value) of all rankings for each habitat type in each season for each moose cohort (Appendix 2). We then created 15 local knowledge-based habitat suitability (HSI) maps using these values in a geographical information system (GIS). We classified the study area into the 11 different habitat types using landcover classes identified in the 25 m resolution Earth Observation for Sustainable Development of Forests database (EOSD; Canadian Forest Service 2005). Each land cover polygon was assigned a suitability value (0 to 3) based on the modal interview suitability value for its habitat type.

Map Review:

Once the initial habitat suitability maps were created we held a second interview process. Participants were given a chance to review the maps, comment on the results of the project and suggest changes, and/or comment on areas where the outcome was not expected. Review of the maps was in an open-house format with participants arriving throughout the day and working in small groups. During the review, we recorded all comments made by participants and any suggested changes to the maps. We then made all suggested changes to the maps according to results of the community review, and generated the 15 final habitat suitability maps (Appendix 3).

Model Validation:

We used spatially-referenced moose location data to validate the early winter cow with calf and the early winter bull HSI maps created from our local knowledge interviews. To do this, we intersected moose location points (cow with calf: n=148; bull: n=58) with spatial predictions of the HSI models (i.e., the local knowledge-based interview maps; Appendix 3). We then calculated the number of locations that intersected with each of the 4 suitability classes. Values were normalized by the area of each class occurring in the study area, providing an area adjusted frequency of occurrence. We then conducted a Spearman's rank correlation to test the relationship between habitat suitability rank class and the area-adjusted frequency of moose locations. We expected models with high predictive ability to have a greater number of moose locations in high quality habitat (Boyce et al. 2002).

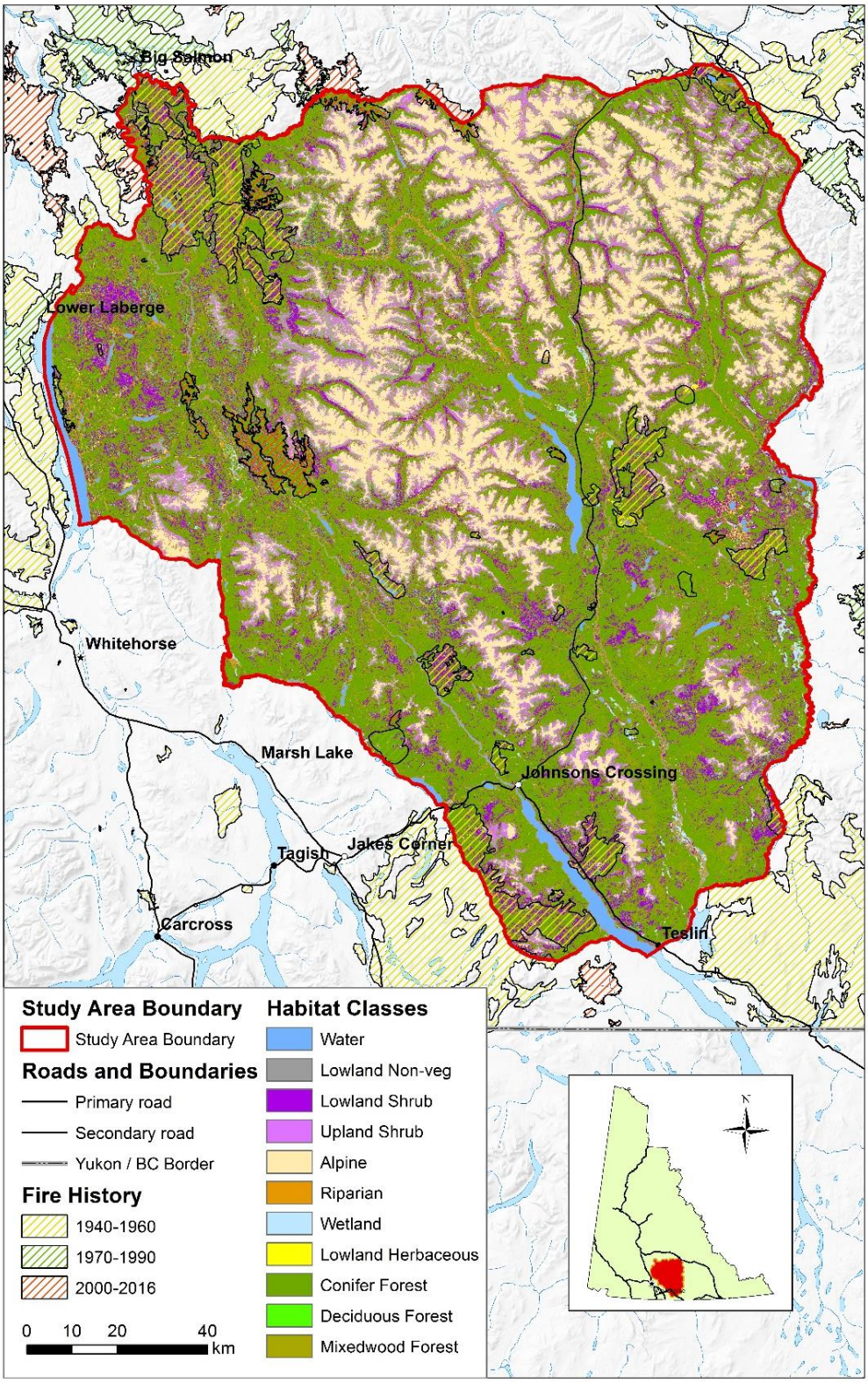

Figure 1. Study area overview. Habitat classes were derived from the Earth Observation for Sustainable Development of Forests database (EOSD). Wildfire locations from 1940 to present are displayed.

Results and Discussion

Interviews

Seventeen individuals participated in the local knowledge interviews; six in Whitehorse and 12 in Teslin. The majority of participants' experience in the area came from hunting and trapping activities, therefore they were more familiar with areas accessible by snowmachine or boat. Four participants were biologists who had flown aerial wildlife surveys in the area and two participants were familiar with the majority of the study area due to outfitting and guiding activities.

Mode values of responses showed that the majority of habitat types were ranked 1 (may be important). According to the interviewees, the highest used habitat types by cows and cows with calves are similar, and differ from the habitats used by bulls. There was also a lot of variability in the ranking of waterbody importance in all three moose cohorts in the calving, summer, and rutting seasons.

For a complete list of interview rankings, and mode values, refer to Appendix A. From these results 15 preliminary maps were created; one for each of the three cohorts in each of the five seasons.

Community Review

Ten of the 17 participants returned for the map review process. Review participants included hunters, trappers and biologists. All participants agreed the maps provided a good depiction of how moose select habitat in the South Canol area. All attendees agreed that there should be a change to the maps with respect to cow and cow with calf habitat use during the rutting season. Initially, conifer habitat was ranked 3 (very important) and there was a consensus that this value was too high and should be decreased to a rank of 2 (fairly important). This made the habitat selection by the three cohorts more similar during the rutting season, which all interviewees considered to be more accurate.

After these changes were made, final maps were produced (Appendix B). Table 1 provides a summary of the map results.

Model Validation

For early-winter bull and early-winter cow with calf HSI models, the area-adjusted frequency of moose locations was higher in higher suitability rank classes (Appendix B; Map 10 and 12). Both models were positively correlated with habitat suitability ranking (Spearman rank correlation, $r = 0.80$, $n = 4$), however, sample size was insufficient to determine the significance of this relationship. Nevertheless, the observed relationship suggests that models likely have high predictive ability.

Table 1. Summary of map results, by cohort, for each of the 5 seasons assessed.

		Ranking			
Cohort	***Season***	***High***	***Medium***	***Low***	***Zero***
BULL	Early Winter	Upland shrub, Lowland shrub	Riparian	Wetland, Deciduous, Mixedwood, Conifer	Water, Alpine, Lowland herb, Lowland non-veg
	Late Winter	Riparian, Wetland, Lowland shrub	Mixedwood	Deciduous, Conifer	Water, Alpine, Lowland herb, Lowland non-veg, Upland shrub
	Calving	Riparian, Wetland,	Upland shrub, Lowland shrub	Deciduous, Mixedwood, Conifer, Lowland herb	Water, Alpine, Lowland non-veg
	Summer	Riparian, Water, Wetland, Upland shrub, Lowland shrub		Deciduous, Mixedwood, Conifer, Lowland herb	Alpine, Lowland non-veg
	Rutting	Riparian, Wetland, Upland shrub, Mixedwood, Lowland shrub		Deciduous, Conifer, Lowland herb	Water, Alpine, Lowland non-veg
COW	Early Winter	Upland shrub, Lowland shrub	Riparian	Wetland, Deciduous, Mixedwood, Conifer	Water, Alpine, Lowland herb, Lowland non-veg
	Late Winter	Riparian, Wetland	Mixedwood, Lowland shrub	Upland shrub, Deciduous, Conifer	Water, Alpine, Lowland herb, Lowland non-veg
	Calving	Riparian, Water, Wetland, Mixedwood, Lowland shrub		Upland shrub, Deciduous, Conifer, Lowland herb	Alpine, Lowland non-veg
	Summer	Riparian, Water, Wetland	Upland shrub	Deciduous, Mixedwood, Conifer, Lowland shrub, Lowland herb	Alpine, Lowland non-veg
	Rutting	Riparian, Water, Wetland, Upland shrub, Mixedwood, Lowland shrub,	Conifer	Deciduous, Lowland herb	Alpine, Lowland non-veg
COW with CALF	Early Winter	Upland Shrub	Lowland shrub	Wetland, Deciduous, Mixedwood, Conifer, Riparian Deciduous, Conifers	Water, Alpine, Lowland herb, Lowland non-veg
	Late Winter	Riparian, Wetland, Mixwood, Lowland shrub		Deciduous, Conifers	Water, Alpine, Lowland herb, Lowland non-veg, Upland shrub, Alpine, Lowland non-veg
	Calving	Riparian, Water, Wetland, Mixedwood		Upland shrub, Deciduous, Conifer, Lowland shrub, Lowland herb	Alpine, Lowland non-veg
	Summer	Riparian, Water, Wetland, Mixedwood, Lowland shrub	Upland shrub	Deciduous, Conifer, Lowland herb	Alpine, Lowland non-veg
	Rutting	Riparian, Water, Wetland, Upland shrub, Lowland shrub	Mixedwood conifer	Deciduous, Lowland herb	Alpine, Lowland non-veg

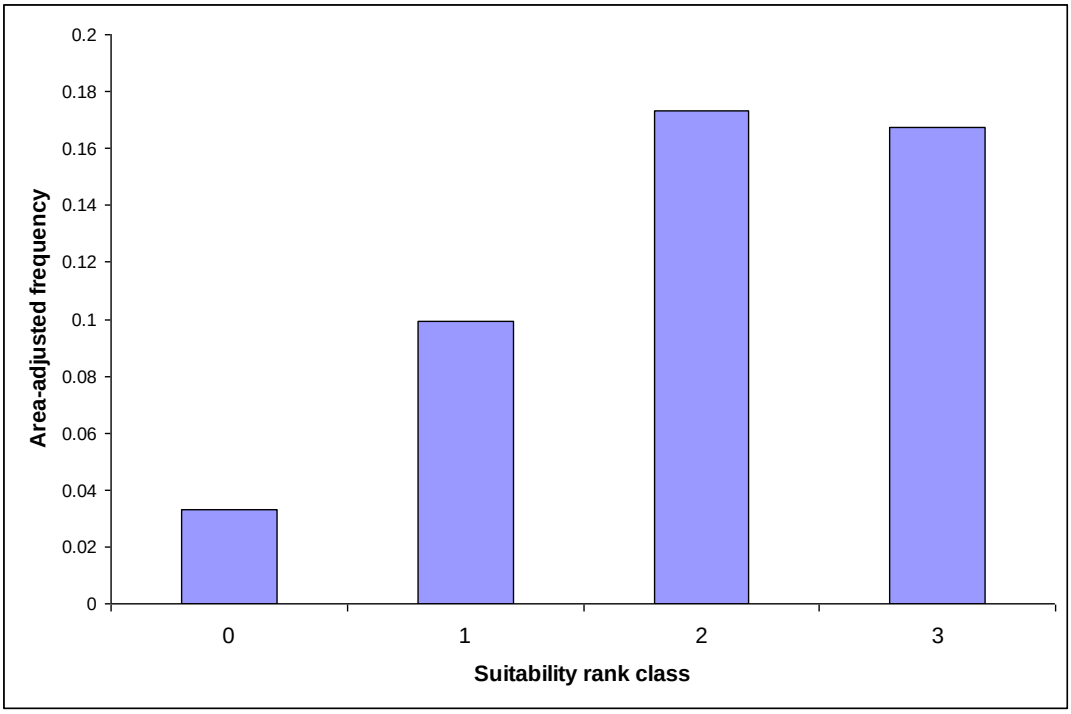

Figure 2. Area adjusted-frequency of early-winter cow with calf moose locations in each of four suitability rank classes in the early-winter cow with calf moose HSI model.

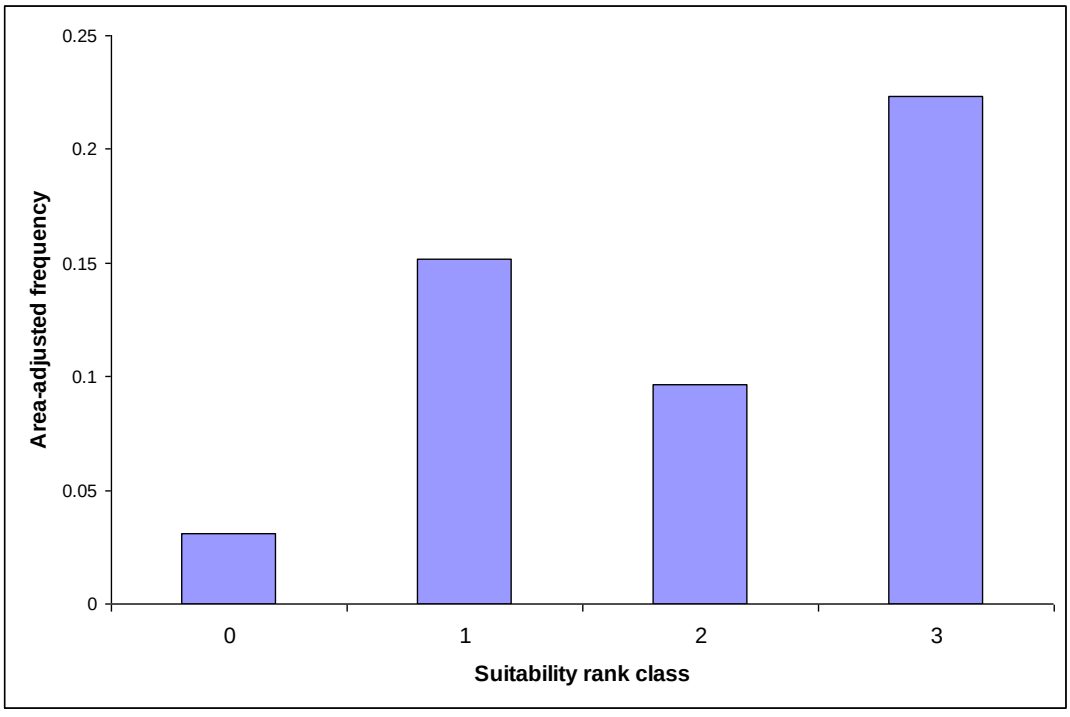

Figure 3. Area adjusted-frequency of early-winter bull moose locations in each of four suitability rank classes in the early-winter bull moose HSI model.

Considerations and Limitations

Certain limitations are associated with this project and should be considered when interpreting study results. First, the level of experience and knowledge among interview participants varied and was not accounted for in the results. This variability may make important patterns in habitat selection less apparent. Second, variability in the amount of experience interview participants had in the study area may have led to the extrapolation of information from a smaller area into the whole study area. Third, several participants found it difficult to assess each habitat type in isolation from its surrounding landscape context. This may have affected the level of certainty associated with participant responses and thus, the accuracy of overall habitat rankings.

The EOSD landcover used to describe habitat types across the study area has a degree of error associated with it; overall classification accuracy is estimated at 78%. Specifically, mixedwood forests are classified with the lowest degree of accuracy and are frequently misidentified as conifer (38%) or shrub (22%) habitats. Shrub habitats are also classified with a relatively low level of accuracy, often misclassified as deciduous forests (20%) or herbaceous areas (14%). While results should be interpreted with caution, it's important to note that the data collected in the local knowledge interviews could be re-used if a more accurate landcover classification or an ecosystem classification becomes available in the future.

Including local knowledge in habitat management planning is important in addressing existing information gaps, and increasing community members' participation in local management processes. Community members who have spent extensive amounts of time out on the land have a wealth of knowledge about the long-term, ecosystem-wide perspective of species-habitat relationships. During this study we were able to collect local knowledge to fill data gaps to gain a better understanding of moose ecology in southern Yukon for future use in management decisions.

Information collected throughout this study will also be used in comparing the differences in the predictive outcome of a habitat suitability model developed using local knowledge (i.e., this study) and one using survey data (Clarke, 2017).

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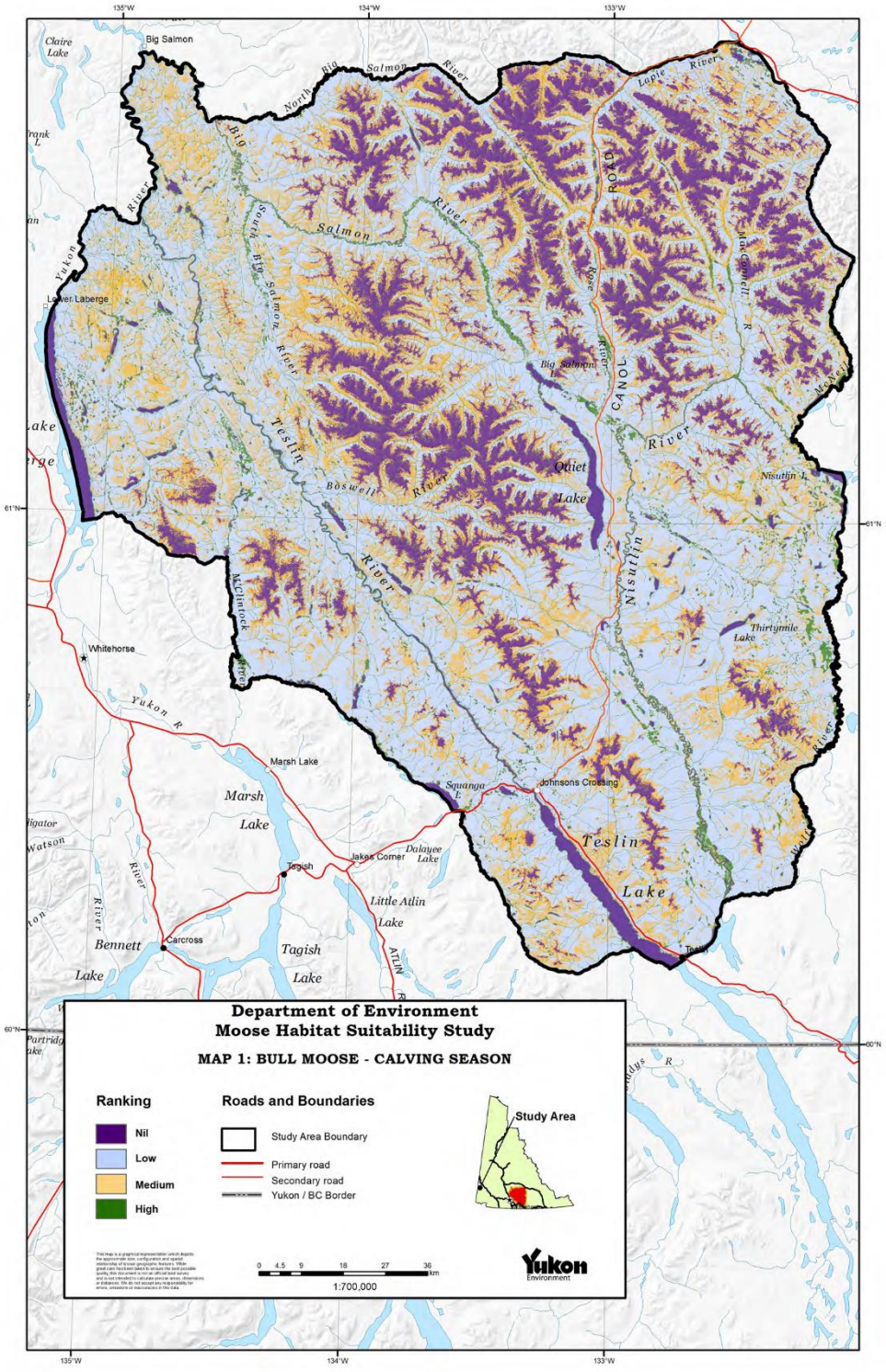
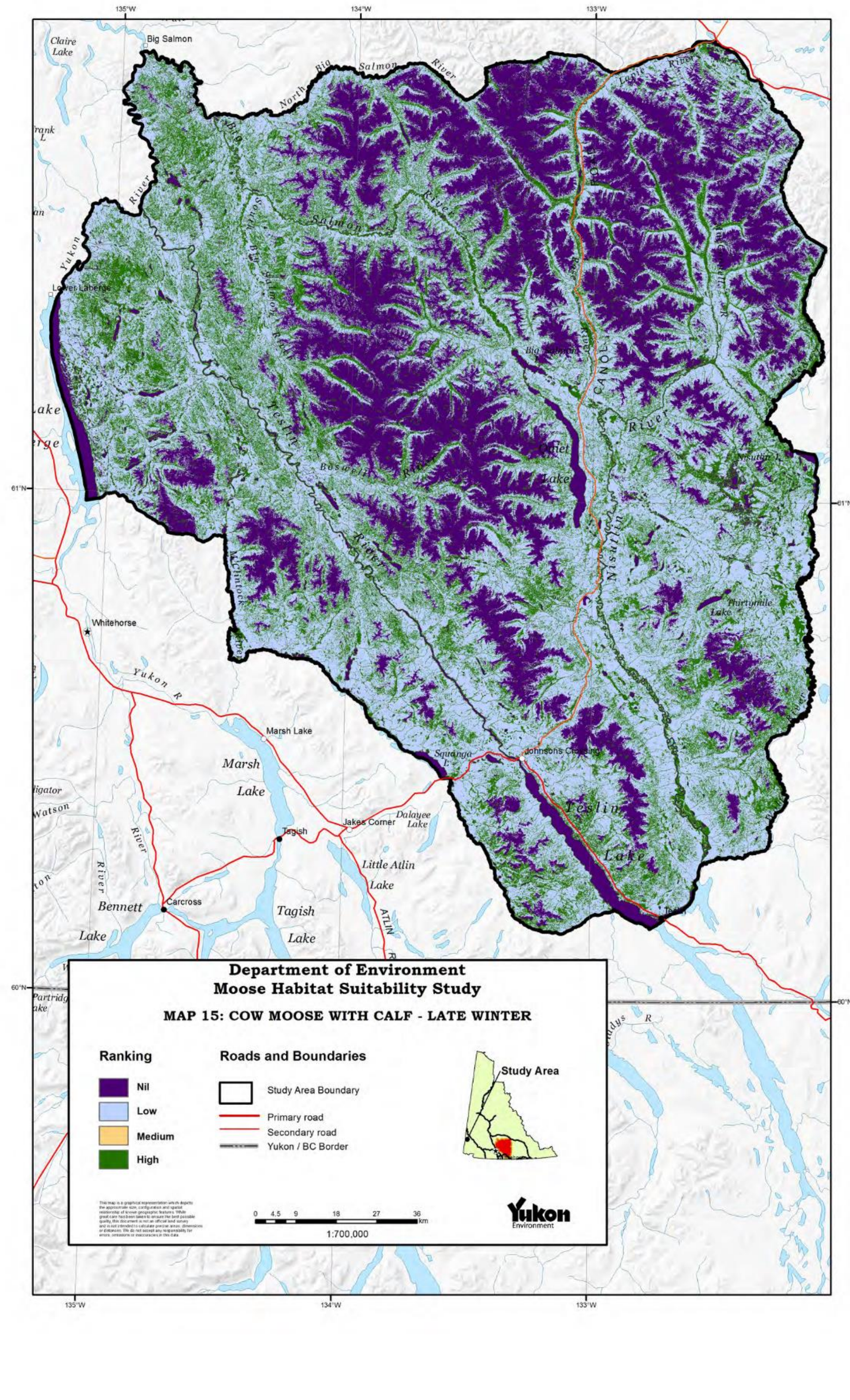
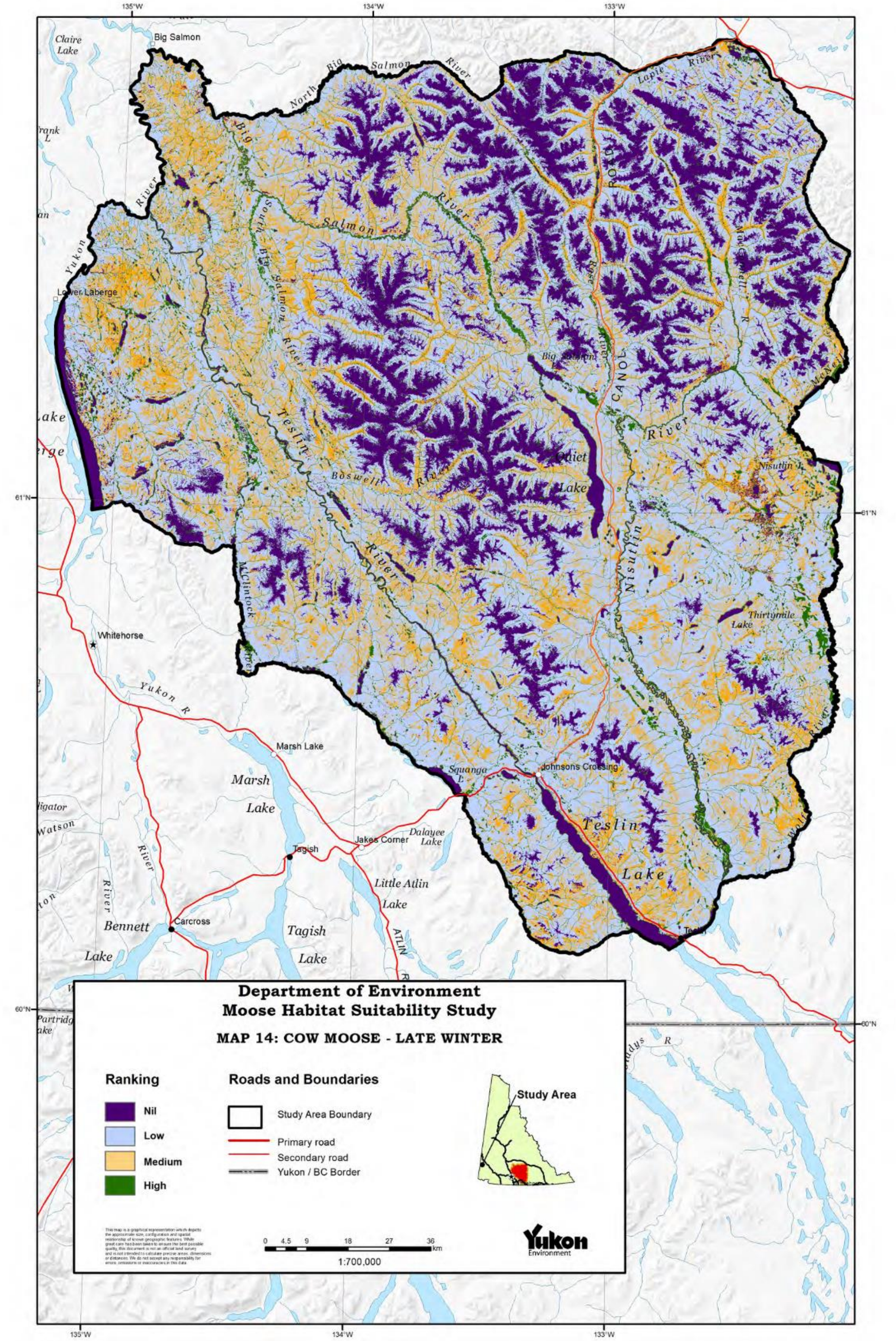
Appendix A: Final mode/variance results for bull, cow, and cow with calf moose by season and habitat. Mode value indicates map rank.

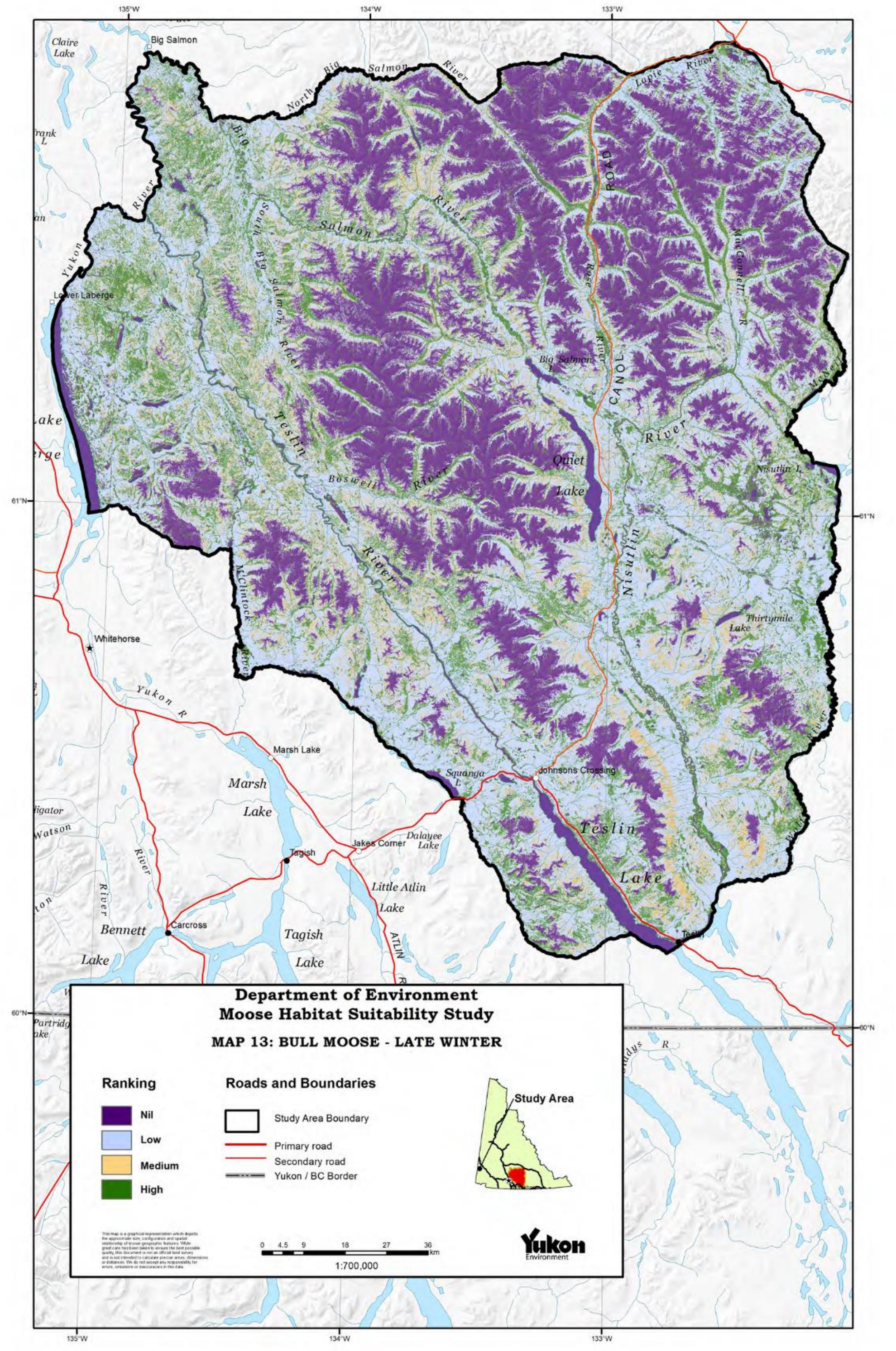
Cohort	Season	Habitat Type										
		Riparian	Wetland	Water	Deciduous	Mixedwood	Conifer	Lowland Shrub	Lowland Herbaceous	Subalpine	Alpine	Lowland Non-vegetated
Bull	Calving	3.00/0.53	3.00/0.90	0.00/1.64	1.00/0.70	1.00/1.05	1.00/0.92	2.00/0.96	1.00/0.83	2.00/1.10	0.00/0.20	0.00/0.15
	Summer	3.00/1.28	3.00/1.10	3.00/1.49	1.00/0.83	1.00/0.93	1.00/1.01	3.00/0.75	1.00/0.78	3.00/0.38	0.00/1.32	0.00/0.35
	Rut	3.00/0.51	3.00/0.88	0.00/1.76	1.00/0.60	3.00/0.81	1.00/0.98	3.00/0.32	1.00/0.83	3.00/0.88	0.00/0.88	0.00/0.15
	Early-winter	2.00/1.12	1.00/1.01	0.00/0.35	1.00/0.46	1.00/0.99	1.00/0.76	3.00/1.09	0.00/1.03	3.00/0.89	0.00/0.93	0.00/0.06
	Late-winter	3.00/0.74	3.00/1.32	0.00/0.38	1.00/0.36	2.00/0.47	1.00/0.93	3.00/0.06	0.00/1.05	0.00/1.47	0.00/0.30	0.00/0.06
Cow	Calving	3.00/0.47	3.00/0.64	3.00/1.47	1.00/0.65	3.00/1.05	1.00/0.92	3.00/1.01	0.00/0.79	1.00/1.10	0.00/0.20	0.00/0.15
	Summer	3.00/0.87	3.00/0.49	3.00/1.49	1.00/0.65	1.00/0.86	1.00/1.06	3.00/0.65	1.00/0.69	2.00/0.81	0.00/0.40	0.00/0.32
	Rut	3.00/0.51	3.00/0.64	3.00/1.62	1.00/0.43	3.00/0.81	2.00/1.02	3.00/0.38	1.00/0.73	3.00/0.97	0.00/1.00	0.00/0.15
	Early-winter	2.00/1.13	1.00/0.97	0.00/0.35	1.00/0.65	1.00/0.99	1.00/0.73	3.00/0.96	0.00/1.03	3.00/0.89	0.00/0.78	0.00/0.06
	Late-winter	3.00/0.74	3.00/1.35	0.00/0.38	1.00/0.36	2.00/0.47	1.00/0.88	2.00/1.01	0.00/1.05	1.00/1.37	0.00/0.25	0.00/0.06
Cow-calf	Calving	3.00/0.06	3.00/0.63	3.00/1.50	1.00/0.60	3.00/0.80	2.00/0.80	1.00/1.06	1.00/0.75	1.00/1.26	0.00/0.12	0.00/0.15
	Summer	3.00/0.62	3.00/0.11	3.00/1.18	1.00/0.65	3.00/0.81	1.00/0.97	3.00/0.81	1.00/0.73	3.00/1.07	0.00/0.35	0.00/0.32
	Rut	3.00/0.37	3.00/0.51	3.00/1.36	1.00/0.43	2.00/0.38	2.00/0.82	3.00/0.71	1.00/0.80	3.00/1.15	0.00/0.37	0.00/0.32
	Early-winter	1.00/1.14	1.00/0.97	0.00/0.49	1.00/0.65	1.00/0.87	1.00/0.74	2.00/0.91	0.00/0.86	3.00/1.31	0.00/0.30	0.00/0.06
	Late-winter	3.00/0.74	3.00/1.32	0.00/0.38	1.00/0.36	3.00/0.49	1.00/0.88	3.00/1.28	0.00/0.93	0.00/1.38	0.00/0.25	0.00/0.06

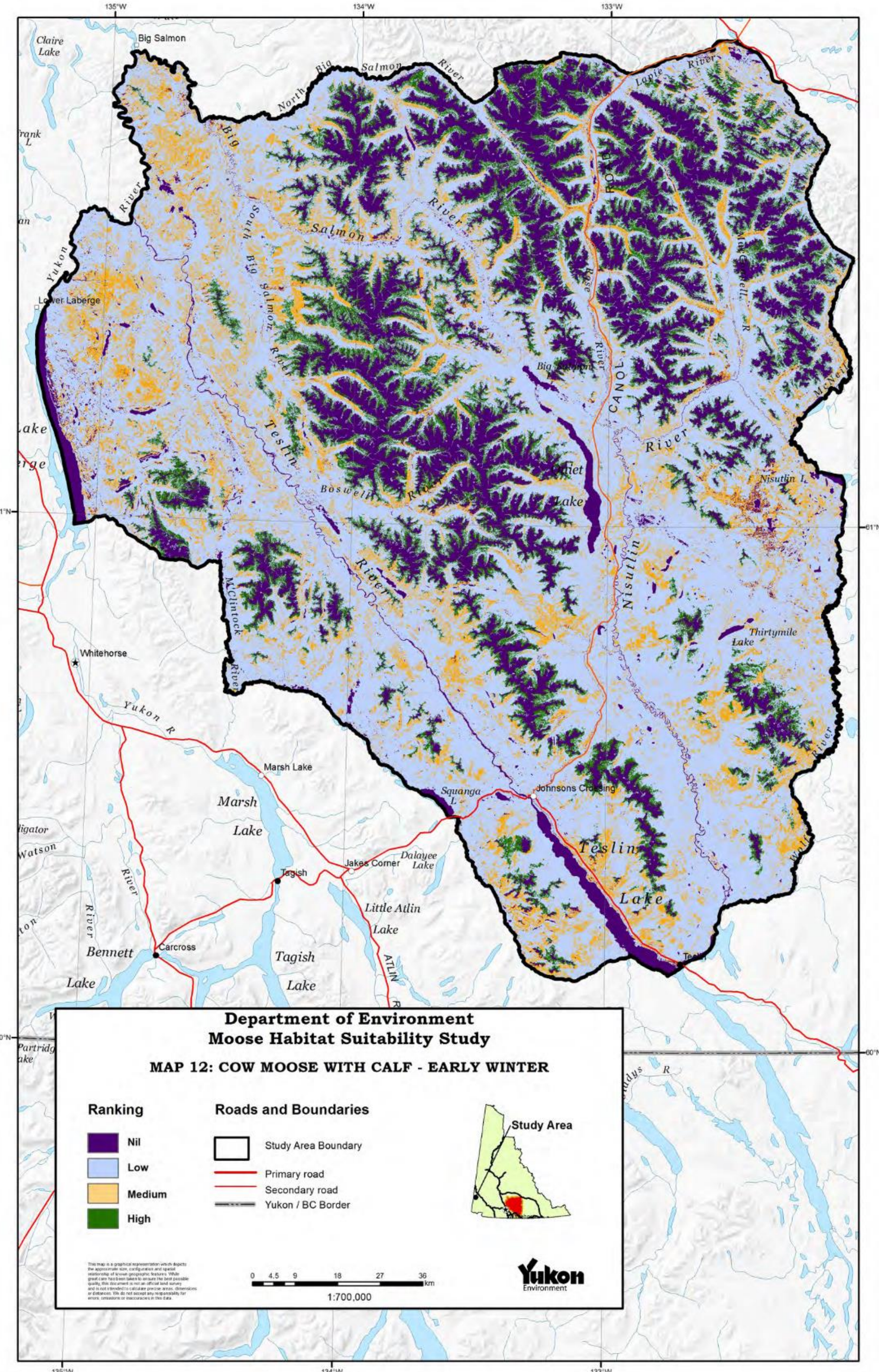
Appendix B: Habitat suitability maps, based on local knowledge interviews.

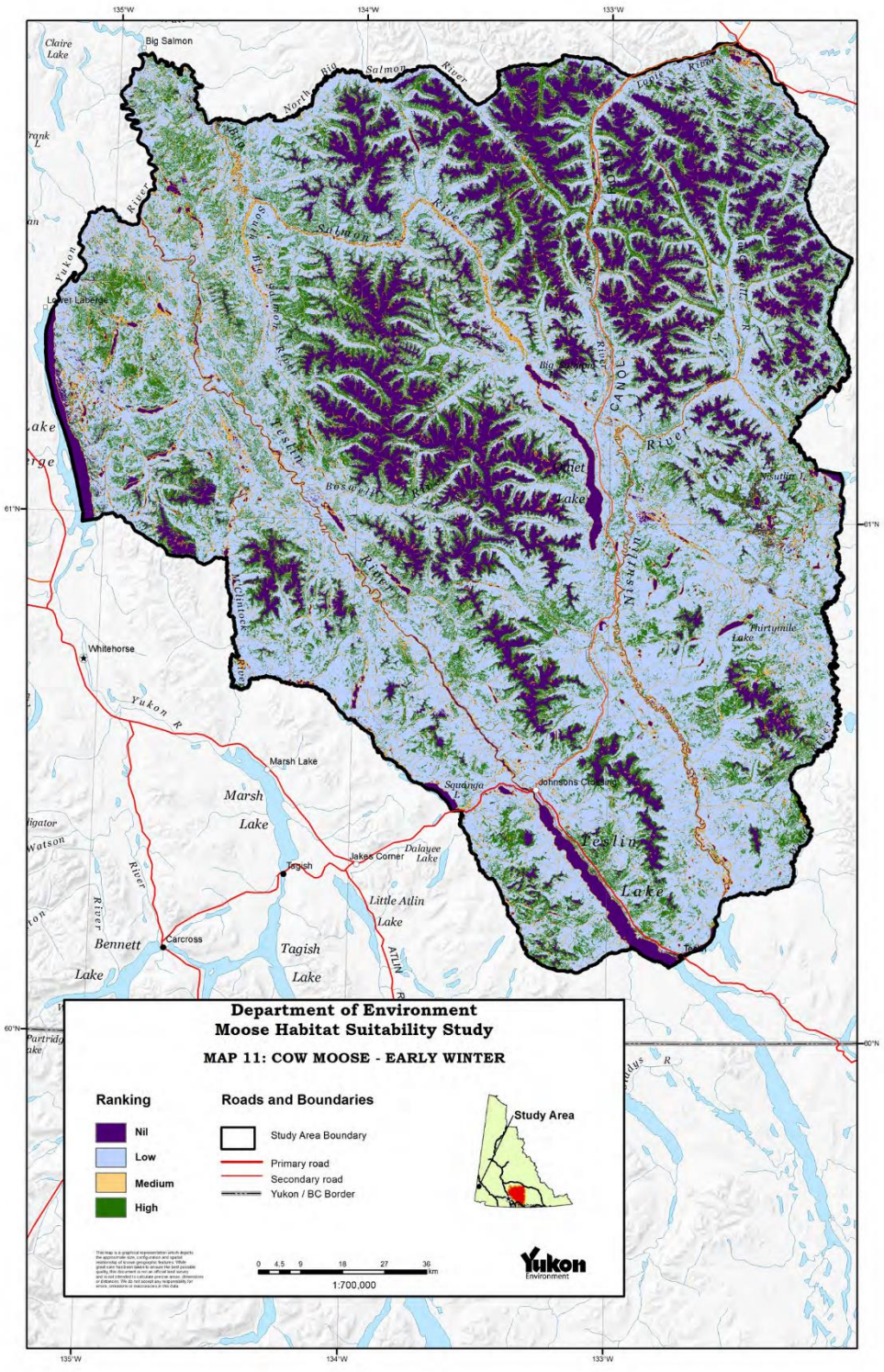


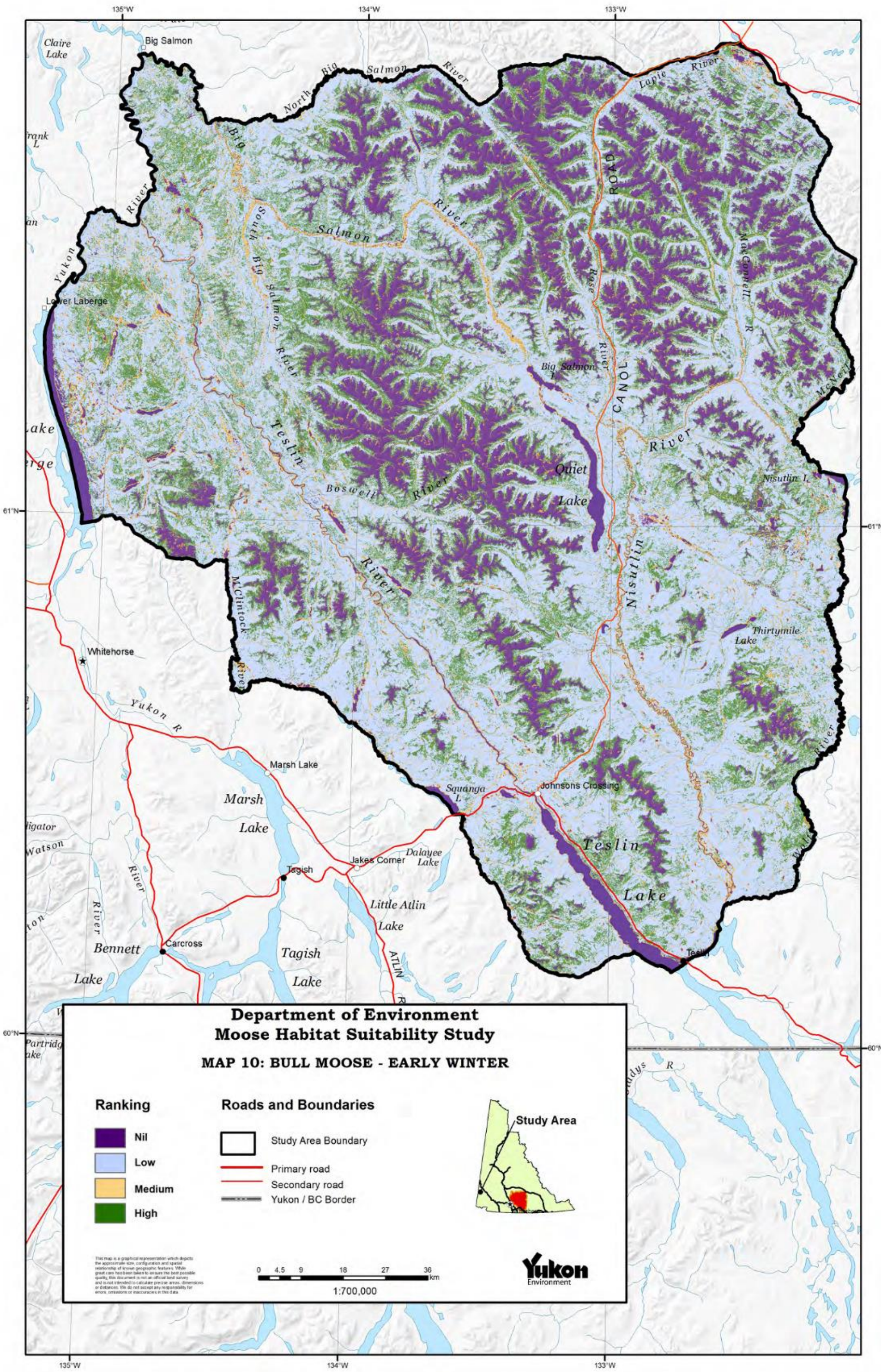

Department of Environment
Moose Habitat Suitability Study
MAP 15: COW MOOSE WITH CALF - LATE WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon
Environment
Whitehorse
Marsh Lake
Johnsons Crossing
Carcross
Tagish
Jakes Corner
Big Salmon

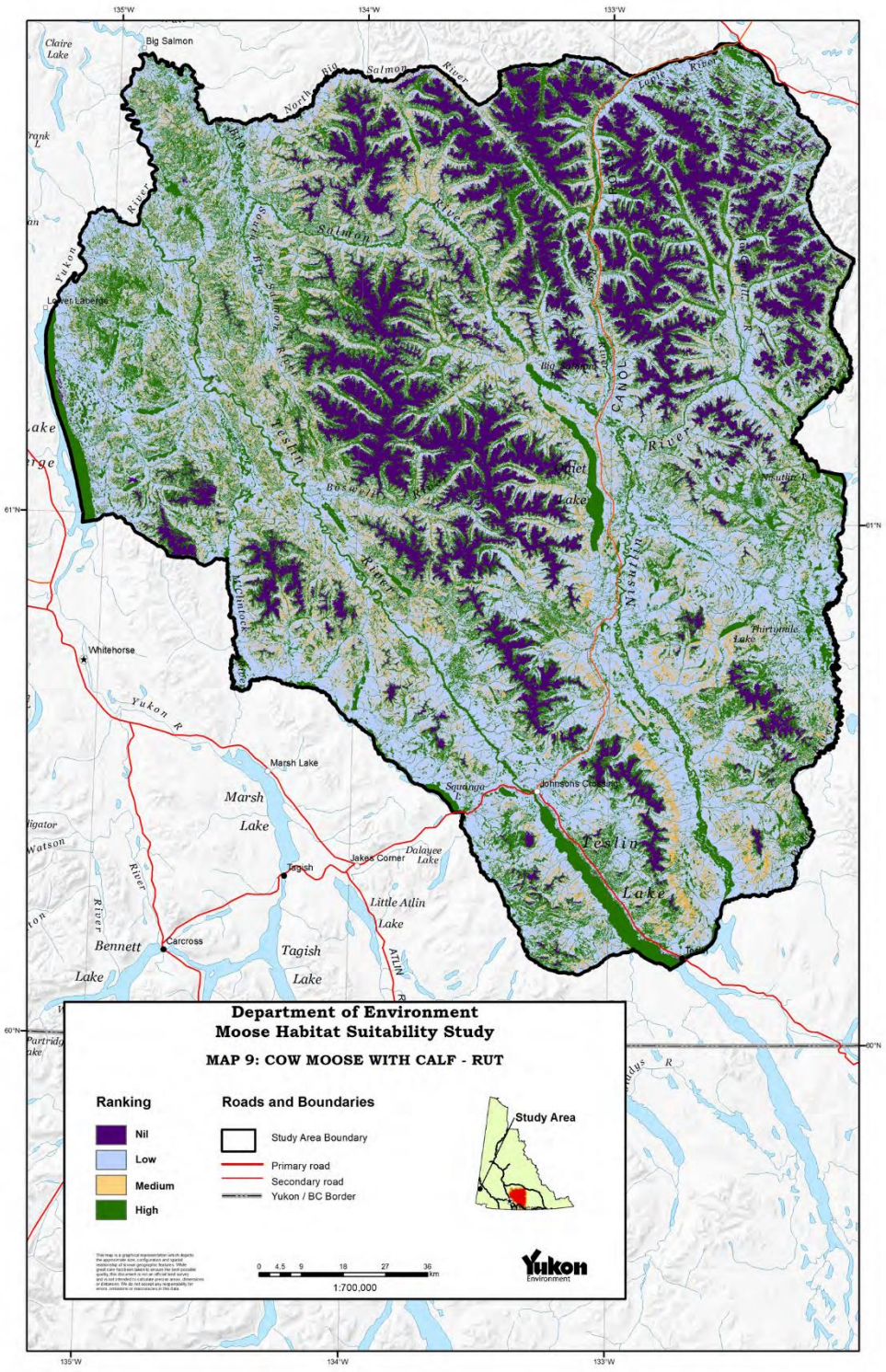

Department of Environment
Moose Habitat Suitability Study
MAP 14: COW MOOSE - LATE WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon
Environment
Whitehorse
Johnsons Crossing
Carcross
Tagish
Jakes Corner
Marsh Lake
Teslin Lake
Quiet Lake
Big Salmon
Lower Laberge

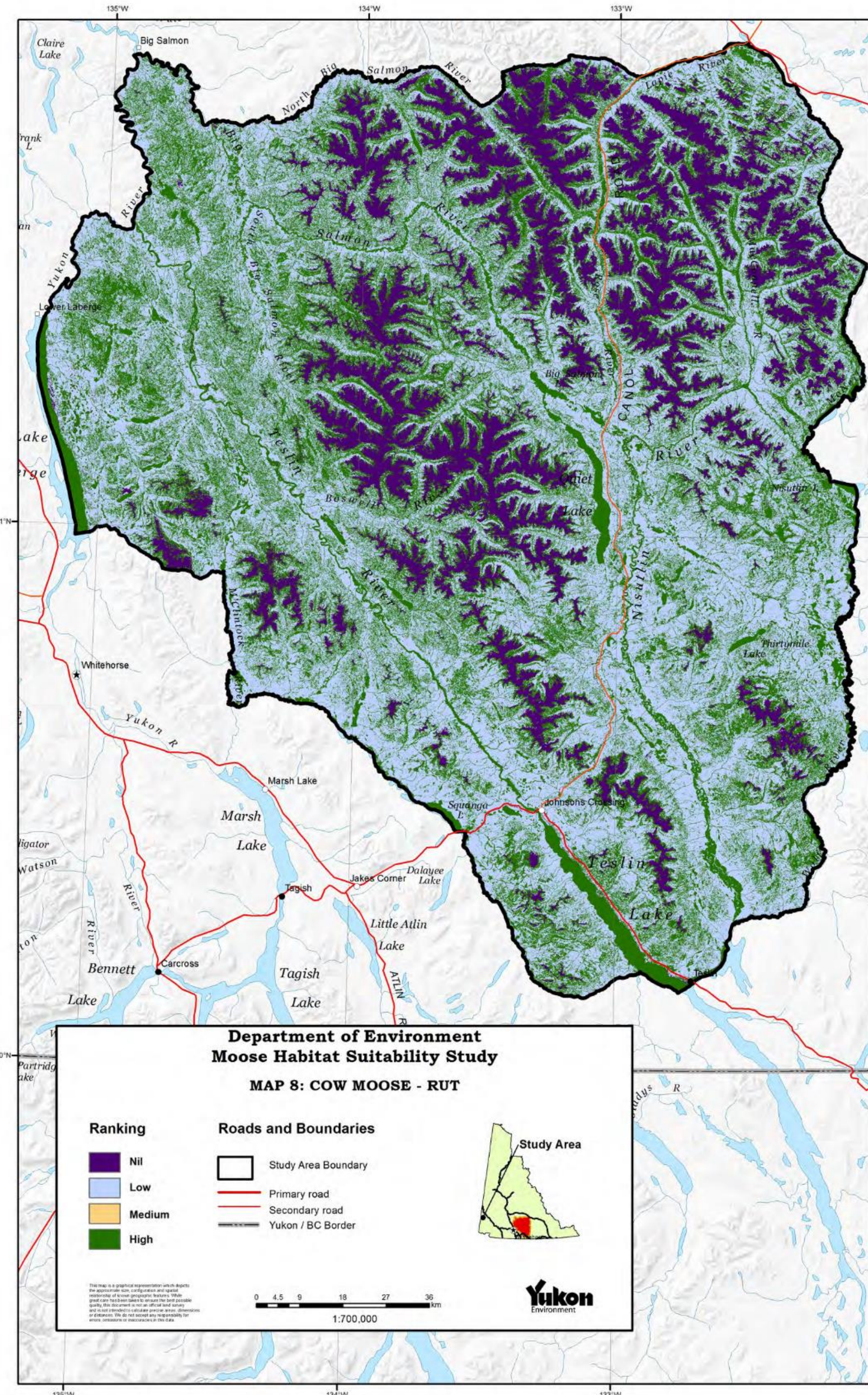

Department of Environment
Moose Habitat Suitability Study
MAP 13: BULL MOOSE - LATE WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
Whitehorse
Marsh Lake
Johnsons Crossing
Carcross
Tagish
Jakes Corner
Big Salmon
Lower Laberge
Teslin
Quiet Lake
Teslin Lake
Tagish Lake
Bennett Lake
Little Atlin Lake
CANOL ROAD

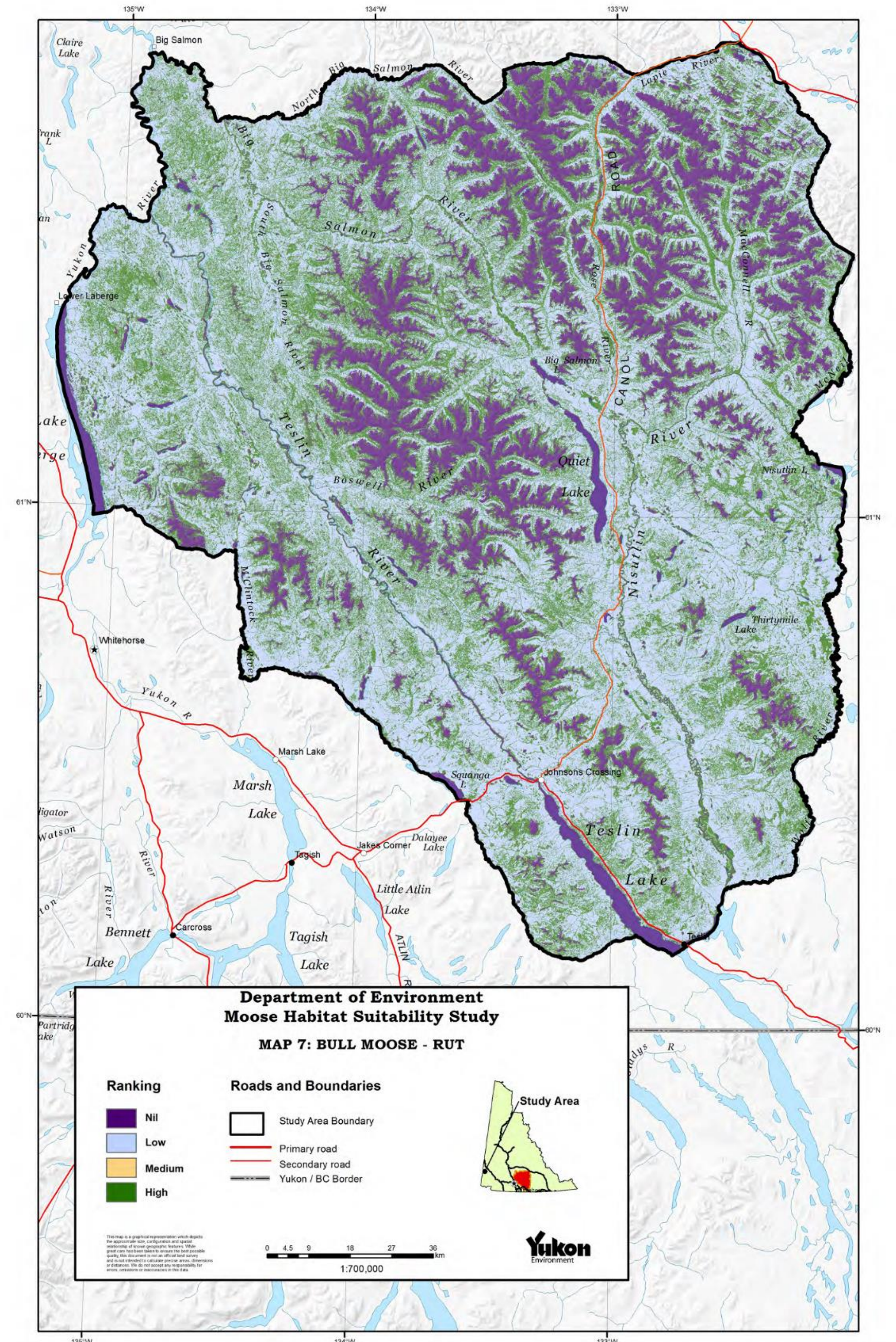

Department of Environment
Moose Habitat Suitability Study
MAP 12: COW MOOSE WITH CALF - EARLY WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
135°W
134°W
133°W
61°N
60°N
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Marsh Lake
Tagish
Jakes Corner
Carcross
Johnsons Crossing
Teslin
Dalayee Lake
Little Atlin Lake
Bennett Lake
Tagish Lake
Marsh Lake
Teslin Lake
Thirtymile Lake
Nisutlin
Squanga L.
Quiet Lake
CANOL ROAD
Nisutlin
Boswell R.
McClintock River
Yukon R.
Teslin River
South Big Salmon River
North Big Salmon River

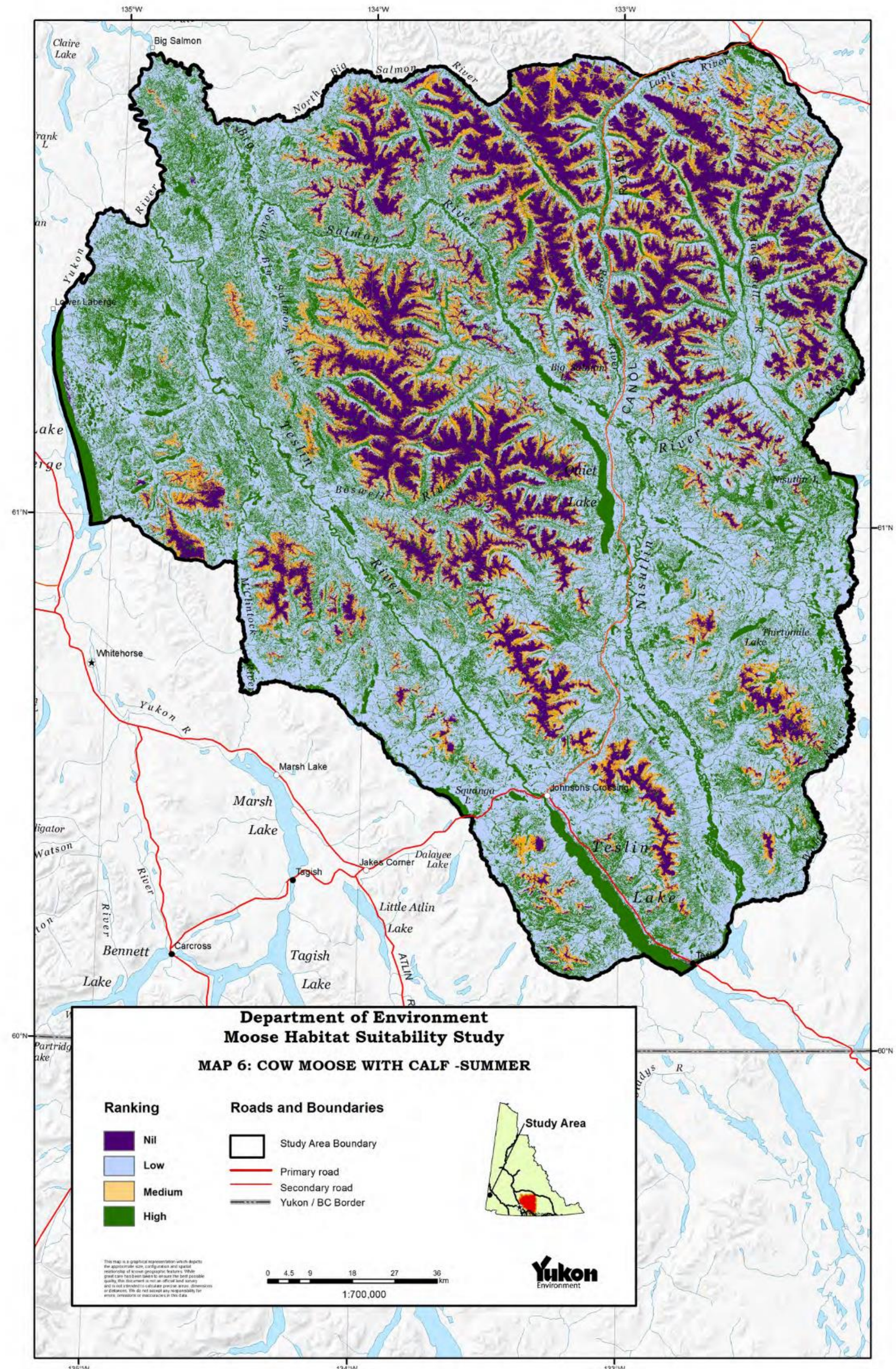

Department of Environment
Moose Habitat Suitability Study
MAP 11: COW MOOSE - EARLY WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon
Environment
Big Salmon
Lower Laberge
Whitehorse
Marsh Lake
Marsh Lake
Tagish
Jakes Corner
Dalayee Lake
Carcross
Bennett Lake
Tagish Lake
Little Atlin Lake
Squanga L.
Johnsons Crossing
Teslin Lake
Thirtymile Lake
Yukon R
Teslin River
Nisutlin River
Big Salmon River
Swift River
Watson River
Partridge Lake
135°W
134°W
133°W
61°N
60°N

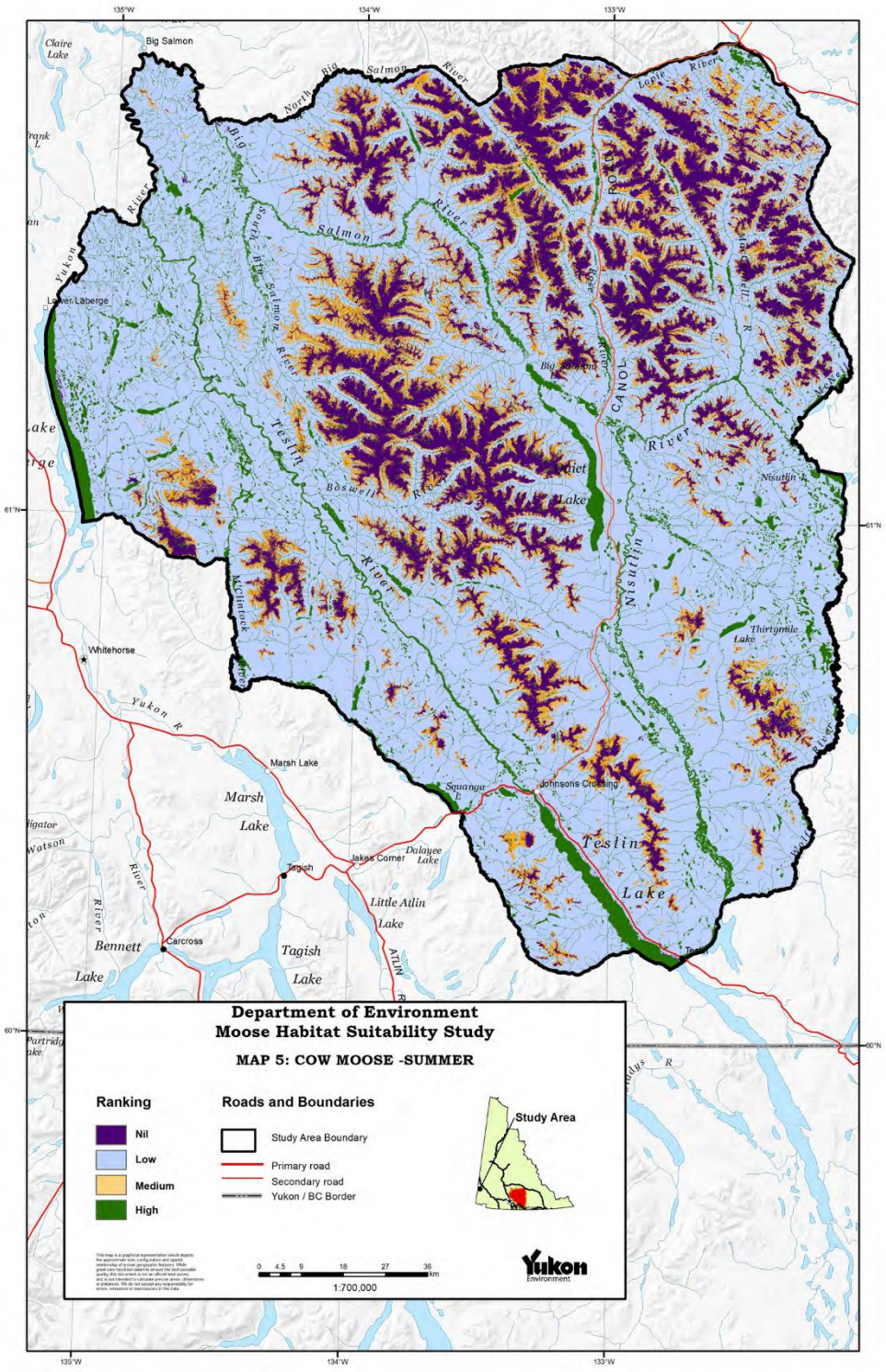

Department of Environment
Moose Habitat Suitability Study
MAP 10: BULL MOOSE - EARLY WINTER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
135°W
134°W
133°W
61°N
60°N
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Marsh Lake
Johnsons Crossing
Squanga L.
Tagish
Jakes Corner
Dalayee Lake
Little Atlin Lake
Carcross
Bennett Lake
Tagish Lake
Teslin Lake
Teslin
Quiet Lake
Nisutlin L.
Thirtymile Lake
North Big Salmon River
South Big Salmon River
Big Salmon River
Teslin River
Boswell River
M'Clintock River
Nisutlin River
CANOL ROAD
Lapie River
Yukon R
ATLIN

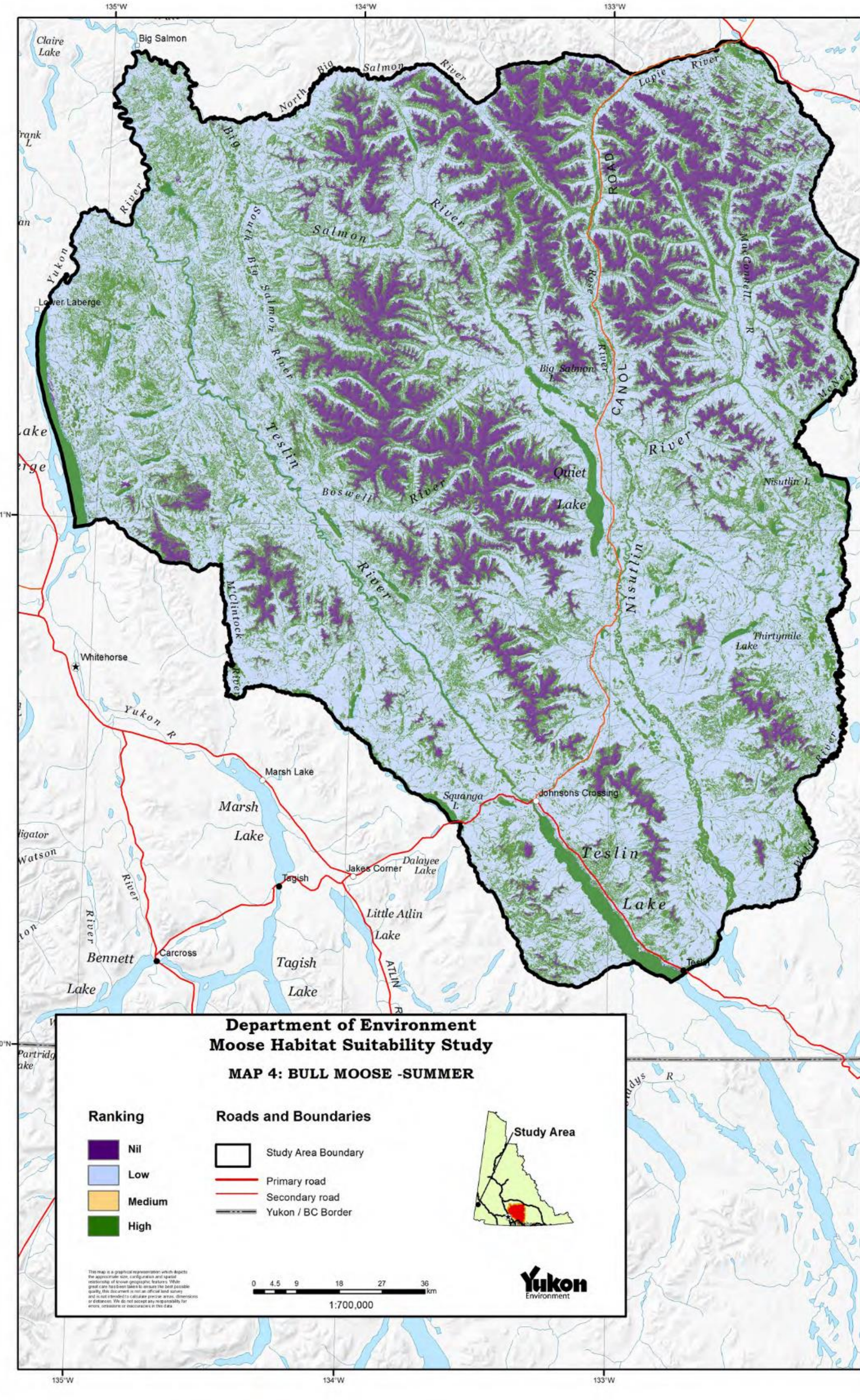

Department of Environment
Moose Habitat Suitability Study
MAP 9: COW MOOSE WITH CALF - RUT
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon
Environment
Big Salmon
Lower Laberge
Whitehorse
Marsh Lake
Marsh Lake
Tagish
Carcross
Bennett Lake
Tagish Lake
Little Atlin Lake
Jakes Corner
Dalayee Lake
Johnsons Crossing
Squanga L.
Teslin Lake
Nisutlin
Partridge Lake
Yukon R
Teslin River
Nisutlin River
Big Salmon River
Swift River
Watson River
Atlin
135°W
134°W
133°W
61°N
60°N

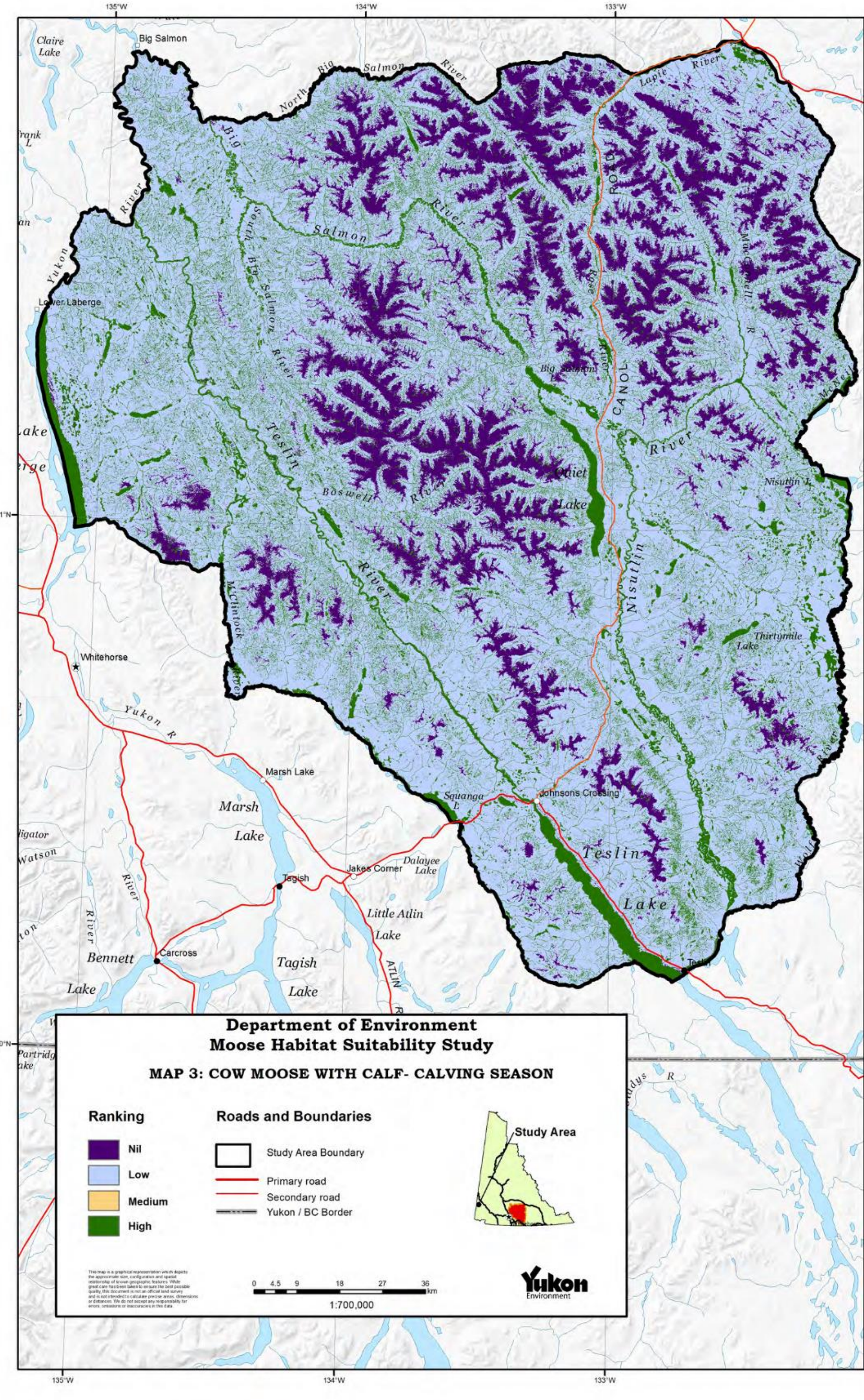

Department of Environment
Moose Habitat Suitability Study
MAP 8: COW MOOSE - RUT
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon
Environment
135°W
134°W
133°W
61°N
60°N
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Yukon R
Marsh Lake
Marsh
Lake
Tagish
Jakes Corner
Dalayee Lake
Little Atlin
Lake
Carcross
Bennett
Lake
Tagish
Lake
Johnsons Crossing
Teslin
Lake
Quiet
Lake
Big Salmon
Nisutlin
River
CANOL
Thirtymile Lake

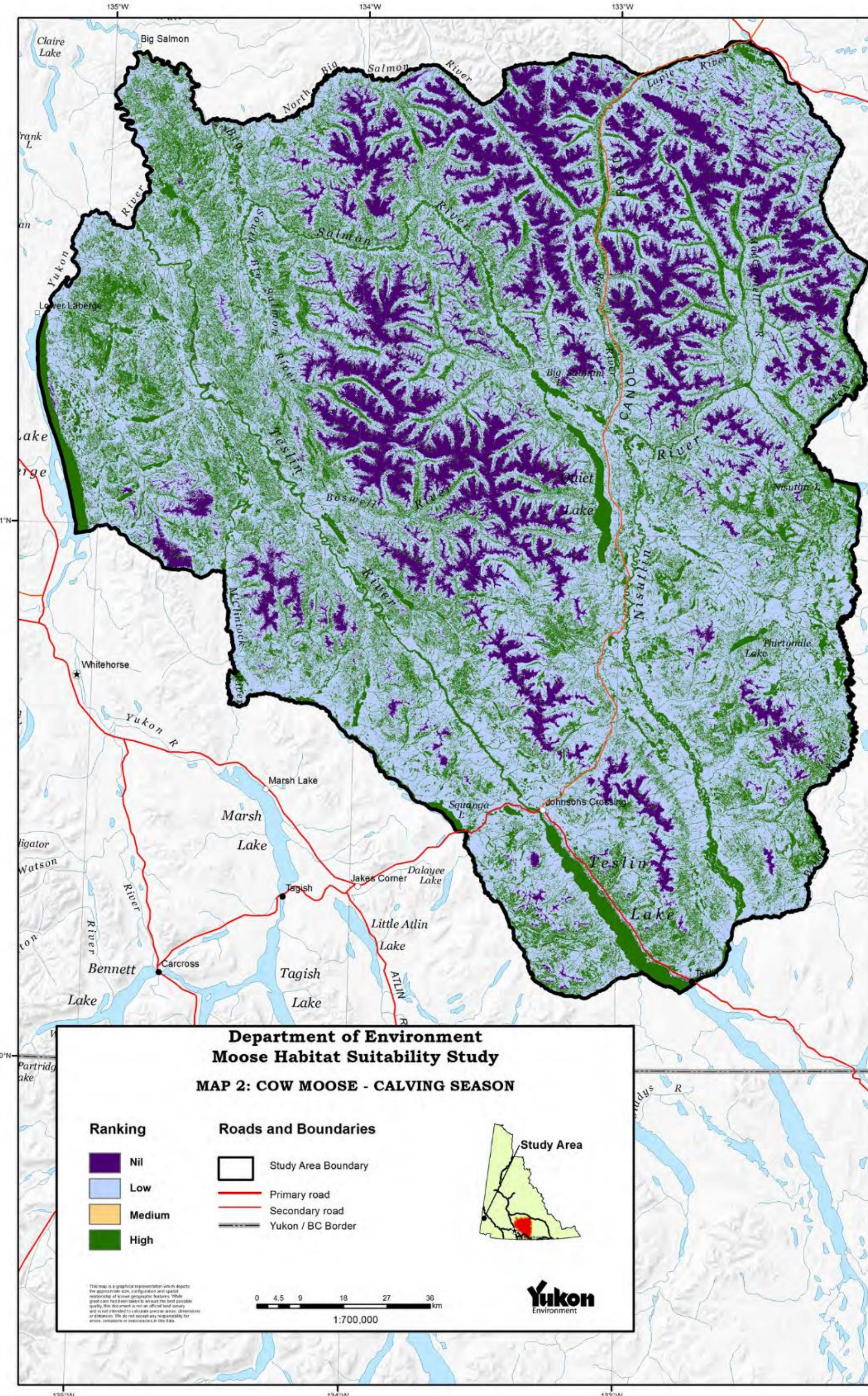

Department of Environment
Moose Habitat Suitability Study
MAP 7: BULL MOOSE - RUT
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Marsh Lake
Marsh Lake
Johnsons Crossing
Squanga L.
Tagish
Jakes Corner
Dalayee Lake
Little Atlin Lake
Carcross
Bennett Lake
Tagish Lake
Teslin Lake
Quiet Lake
Thirtymile Lake
Nisutlin L.
CANOL ROAD
Teslin River
Nisutlin
Yukon R
135°W
134°W
133°W
61°N
60°N


Department of Environment
Moose Habitat Suitability Study
MAP 6: COW MOOSE WITH CALF -SUMMER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon Environment


Department of Environment
Moose Habitat Suitability Study
MAP 5: COW MOOSE -SUMMER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Yukon
Environment
Big Salmon
Lower Laberge
Whitehorse
Marsh Lake
Marsh
Lake
Tagish
Jakes Corner
Dalayee
Lake
Carcross
Bennett
Lake
Tagish
Lake
Little Atlin
Lake
Johnsons Crossing
Squanga
Lake
Teslin
Lake
Nisutlin
River
Thirtymile
Lake
Big Salmon
River
Teslin
River
Boswell
River
McClintock
River
Yukon R
Watson
River
ATLIN
ROAD
CANOL
135°W
134°W
133°W
61°N
60°N


Department of Environment
Moose Habitat Suitability Study
MAP 4: BULL MOOSE -SUMMER
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
135°W
134°W
133°W
61°N
60°N
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Marsh Lake
Marsh Lake
Tagish
Jakes Corner
Dalayee Lake
Little Atlin Lake
Carcross
Bennett Lake
Tagish Lake
Squanga L
Johnsons Crossing
Teslin Lake
Teslin
Quiet Lake
Nisutlin R
Thirtymile Lake
Big Salmon
North Big Salmon River
South Big Salmon River
Teslin River
Boswell River
Nisutlin River
McClintock River
CANOL ROAD
Yukon R
Lapie River


Department of Environment
Moose Habitat Suitability Study
MAP 3: COW MOOSE WITH CALF- CALVING SEASON
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
0 4.5 9 18 27 36 km
1:700,000
Yukon Environment
135°W
134°W
133°W
61°N
60°N
Big Salmon
Claire Lake
Lower Laberge
Whitehorse
Marsh Lake
Marsh Lake
Tagish
Jakes Corner
Dalayee Lake
Little Atlin Lake
Carcross
Bennett Lake
Tagish Lake
Squanga L.
Johnsons Crossing
Teslin Lake
Teslin
Quiet Lake
Nisutlin L.
Thirtymile Lake
CANOL ROAD
ATLIN
North Big Salmon River
South Big Salmon River
Big Salmon River
Teslin River
Boswell River
Nisutlin River
Lapie River
Yukon River



Department of Environment
Moose Habitat Suitability Study
MAP 2: COW MOOSE - CALVING SEASON
Ranking
Nil
Low
Medium
High
Roads and Boundaries
Study Area Boundary
Primary road
Secondary road
Yukon / BC Border
Study Area
1:700,000
Whitehorse
Marsh Lake
Johnsons Crossing
Jakes Corner
Tagish
Carcross
Big Salmon
Lower Laberge