ECOLOGICALLY SUSTAINABLE CARRYING CAPACITY FOR ELK (CERVUS ELAPHUS)

BRAEBURN HERD RANGE, YUKON

Prepared by:
Heather Clarke

Yukon Environment

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Copies available from:
Yukon Department of Environment
Fish and Wildlife Branch, V-5A
Box 2703, Whitehorse, Yukon Y1A 2C6
Phone (867) 667-5721, Fax (867) 393-6263
Email: environmentyukon@gov.yk.ca

Also available online at www.env.gov.yk.ca

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Summary

Over the past 20 years, the Braeburn elk herd size is reported to have increased, potentially leading to an increase in conflict with agriculturalists, resource competition with moose, and the rate of collisions with vehicles. In response, a key recommendation from the 2008 Yukon Elk Management Plan was to identify the ecologically-sustainable carrying capacity of the Braeburn elk range. Simply stated, this refers to the number of individual elk the Braeburn range can support without causing destruction to the habitat. This value was determined across a significant portion of the range (the entire range could not be assessed) using several steps; these included the identification of:

1) the major habitat types present;

2) the distribution of elk forage; and

3) differences in the amount of elk forage among the major habitat types.

Using this information, a series of calculations were used to determine the carrying capacity of the portion of the range studied under various scenarios, including an ecologically sustainable one.

Key findings

- During the winter, when resources are most limiting, this carrying capacity is 3,782 individuals.
- The highest carrying capacity is in the spring, when the study area can support up to 5,094 individuals.
- These values should be interpreted with caution:

  1) there remains uncertainty regarding the preference of certain vegetation in the study area to elk,

  2) non-forage factors that may affect consumption ability were not considered, and

  3) error exists in the land cover data used.

Any management recommendations based on these study results should strongly consider these factors.

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Background

In the early 1950s, 49 elk (*Cervus elaphus*) were introduced to southern Yukon from Elk Island National Park, Alberta. The goal of this introduction was to provide increased hunting opportunities for Yukon residents in order to reduce hunting pressure on other native big-game species (McCandless 1985). Following their introduction, and a major wildfire in 1958, the elk formed 2 distinct populations situated between Whitehorse and Haines Junction (east to west), and Carmacks and Whitehorse (north to south). These populations, known as the Takhini Valley Herd and the Braeburn Herd respectively, were augmented in the early 1990s when an additional 119 elk were released in the area (Yukon Elk Management Planning Team 2008). As of the most recent census (2007), the Braeburn Elk Herd population was estimated between 50 and 75 individuals (Environment Yukon 2007). For further information on the history of elk in Yukon, see Chambers (2010).

Management plans for both herds were developed in 1990; however, population size and distribution of the herds have since changed. Populations are reported to have increased and individuals are thought to make seasonal excursions outside of their historical ranges. This has led to increased conflict with agriculturalists, concerns about increased resource competition with moose, and the potential for a higher rate of vehicle-caused mortality. In response to these concerns, in 2004, the Yukon Fish and Wildlife Management Board requested that Environment Yukon review the original elk management plans. As part of this review, the need to understand the location, quantity, and quality of key habitats for elk, and to determine the carrying capacity of each elk herd, was identified. In 2008, a new management plan was released, with a key recommendation being to identify an ecologically-sustainable carrying capacity of both herds.

While carrying capacity in general refers to the number of individuals an area can sustain given the habitat, ecologically-sustainable carrying capacity is based on an “ecologically sustainable stocking rate” (Alberta Sustainable Resource Development 2004). Simply stated, this refers to the number of individuals an area can sustain without degradation of the habitat. Carrying capacity for the Takhini Valley Elk Herd has previously been assessed by Florkiewicz (1994) and Chambers (2010); however, only the later study considered an ecologically-sustainable carrying capacity. The goal of the current study was to apply the same methods as Chambers (2010), insofar as possible, to assess carrying capacity for the Braeburn Elk Herd.

Elk are generalists, and although most often considered grazers, their diet can consist of a large amount of forbs and shrubs (80 to 90%), depending on forage availability (Cook 2002, Merrill 1994). Graminoids are consumed year-round with preferred species

including *Calamagrostis* spp. (reedgrasses), *Bromus* spp. (bromes), *Poa* spp. (bluegrasses), and *Carex* spp. (sedges) (Hobbs et al. 1981). Forb intake is highest in summer when availability is at a peak. Common forb species eaten include *Aster* spp. (asters), *Aquilegia* spp. (columbine), and *Chamerion angustifolium* (fireweed) (Cook 2002). Browse consumption is positively related to snow depth (i.e. more browse with deeper snow), and generally increases throughout the winter months (Cook 2002). Typically, browsing includes eating leaves and twigs from trees and shrubs 1 to 2 m above the ground (Rounds 1979); however, leaves fallen to the ground from species such as *Populus tremuloides* (trembling aspen), *Salix* spp. (willows), and *Dasiphora fruticosa* (shrubby cinquefoil), are also consumed (Chambers 2010). For further information on elk foraging behaviour, see Chambers (2010) and Cook (2002).

The primary objectives of this study were to determine (within the Braeburn Elk Herd range):

1. The major habitat classes;
2. The distribution of elk forage biomass;
3. Differences in elk forage biomass among the major habitat classes; and
4. The ecologically-sustainable carrying capacity.

This report outlines the approaches taken to meet these objectives and presents results of these objectives. Differences between results from this study and that of Chambers (2010) are also discussed. Wherever possible, study methodologies were the same as those applied by Chambers (2010); any exceptions are clearly noted. Should discrepancies arise, details in this report shall be considered relevant for the current analysis. Chambers (2010) investigated certain aspects of elk habitat use (e.g. forage quality and habitat selection) that were not addressed in this study due to a lack of adequate data. This information was not necessary to meet the study objectives.

Methods

The following approach was used to address the primary objectives of the study:

1. Identify and characterize the project study area
2. Define the major habitat classes
    a. Conduct detailed habitat assessments
    b. Reclassify site and habitat classes
3. Calculate the distribution of elk forage biomass
    a. Sample biomass
    b. Calculate forage preference ratings
    c. Calculate forage index values
4. Calculate carrying capacity under different scenarios, including an ecologically-sustainable one. Details on each step are provided below.

Study Area

The study area represents a significant portion of the estimated Braeburn Elk Herd range. It is located on either side of the North Klondike Highway approximately 70 km northwest of Whitehorse and extends from approximately the middle of Fox Lake on its southern boundary north to about 8 km south of Carmacks (Figure 1). It covers 552 km^2 with its centre situated at 61° 34' N and 135° 49' W. The width of the area ranges from 1 km at its narrowest to 13 km at the widest part. The area is within the Traditional Territories of the Little Salmon/Carmacks, Kwanlin Dun, Ta'an Kwach'an, and Champagne and Aishihik First Nations.

The study area falls within the Yukon Plateau – Central ecoregion, which is characterized by broad valleys with numerous lakes, streams, and wetlands (Yukon Ecoregions Working Group 2004). The area includes several large lakes (Little Fox, Braeburn, Little Braeburn, and Twin lakes). Klusha Creek is the major drainage channel and small ponds and wetlands are relatively common throughout. From the waterbodies on the west side of the study area the landscape rises to rolling hills and low mountains with outcrops of sandstone and conglomerate rocks. Regional elevations range from 539 m to 1347 m (Conglomerate Mountain).

The climate of the study area is semi-arid with precipitation ranging from 250 to 300 mm annually. Forest fires are a major agent of change in the ecoregion and thus much of the forest is successional. The most recent fire, in 1998 (Fox Lake Burn), affected the southern quarter of the study area. This area is currently dominated by willows and young aspen with low ground cover and abundant snags and coarse woody debris. Mixed young trembling aspen/white spruce (*Populus tremuloides/Picea glauca*) stands dominate the valley bottoms and gentle to moderate slopes with a southerly aspect; evidence of fire is common in these stands. *Betula neoalaskana* (Alaska paper birch) replaces aspen in mixedwood forests on north-facing slopes. Mature, relatively closed canopy forests in the valley bottom and lower slopes are mainly white spruce/feathermoss with low cover of shrubs, including *Rosa acicularis* (rose), *Salix* spp. (willows), and *Shepherdia canadensis* (soapberry), and a variety of herbs and lichen occurring at low cover. Although *Pinus contorta* (lodgepole pine) occurs in the ecoregion, it is rare in the study area.

One of the notable features of this landscape is the grasslands which occur on relatively steep, south-facing slopes. These are generally xeric habitats with bare ground or crustose lichens often comprising 25 to 50% cover. *Artemisia frigida* (prairie sagewort) occurs frequently in these grasslands but graminoid species are variable with *Calamagrostis purpurascens* (purple reed grass) and several small sedge species (*Carex obtusata, C. duriuscula)* being most common. A variety of forbs

also occur including *Potentilla* spp. (cinquefoil), *Pulsatilla ludoviciana* (prairie crocus), and *Penstemon gormanii* (Gorman's beardtongue).

For a list of bird and mammal species known or expected to occur in this ecoregion, see the Yukon Ecoregions Working Group (2004).

Habitat Assessments

In the summers of 2007, 2008, and 2010 habitat across the study area was assessed in 98 sites representing 13 classes identified *a priori*. These classes were defined based on the Earth and Observation for Sustainable Development of Forest land cover [1] (EOSD; Canadian Forest Service 2005) and included: burned/exposed land, herbaceous wetland, shrub wetland, treed wetland, herbaceous, low shrub, tall shrub, mixedwood sparse, mixedwood open, mixedwood dense, broadleaf sparse, broadleaf open, conifer sparse, conifer open, and roadside right-of-way (ROW) (Figure 2).

All sites were situated within 1 km of a road and were selected randomly, stratified across all 13 classes. Attempts were made to sample equally among all habitat classes. However, this was not always possible due to variation in the abundance and accessibility of different classes across the study area, and thus the number of sample sites varied among classes. Sites were described in a GIS (ArcGIS 9.3.1; ESRI Inc. 2009) using the EOSD, the National Road Network, CanVec (Natural Resources Canada) surface water data, and Yukon Fire History data. Burned sites were defined as those within the boundary of the most recent fire, which occurred in 1998. Roadside ROW habitat was defined as the area within 15 m on either side of the Klondike Highway, where the vegetation was maintained in a non-forested state. No other roads were used in classifying ROW habitat since they are much less-traveled and are not subjected to the same mowing regime as the Klondike Highway. Herbaceous, shrub, and forest wetland classes defined in the EOSD were extended by including herbaceous, shrubby, and forested habitat, respectively, that occurred within 50 m of a waterbody, and had a slope of 2 degrees or less.

[1] Chambers (2010) interpreted aerial photos to classify habitat types.

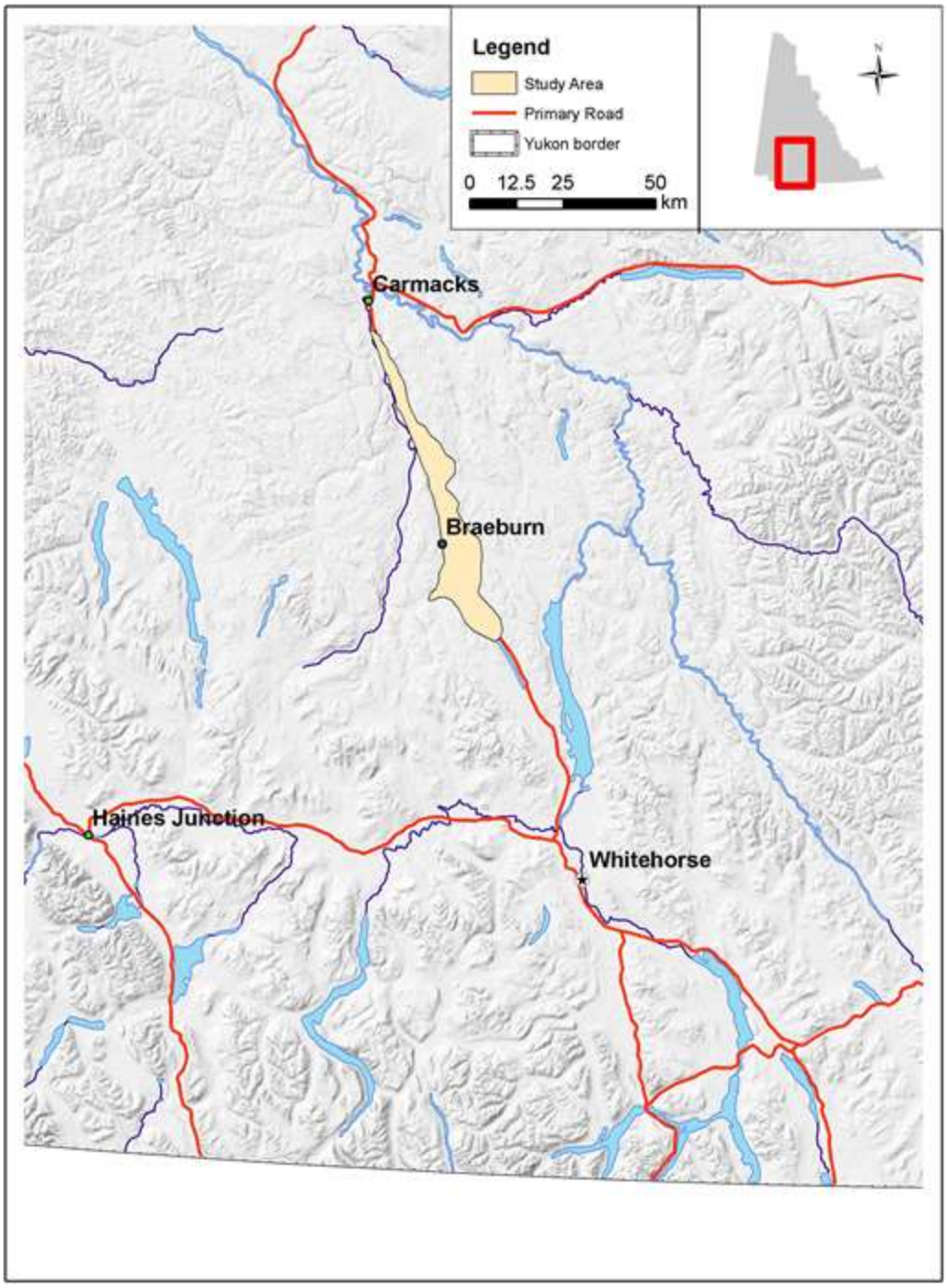

Figure 1. Location of Study Area within Yukon.

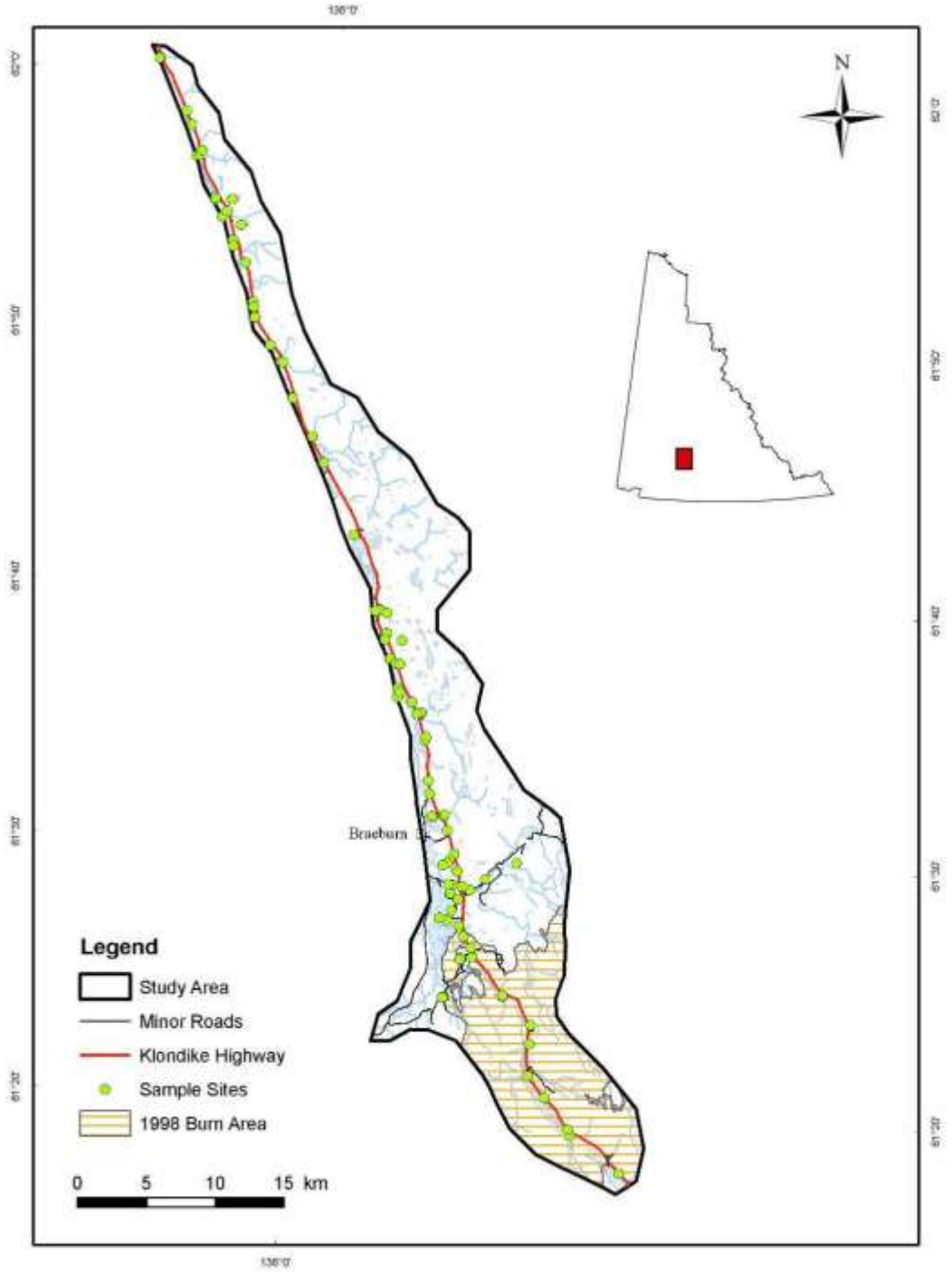

Figure 2. Location of sites assessed in study area in 2007, 2008, and 2010 (n=98).

In each site, vegetation composition and abundance were measured to describe habitat conditions and to provide data to calculate Forage Index Values for each habitat class. Vegetation sampling followed the design by Redburn et al. (2008). Random points within the entire habitat classes were generated using GIS techniques and a selection of these within 1 km of road or trail access were selected for sampling. In the field, sample plots were established at these points and were laid out in a direction where the vegetation was most homogeneous and representative of the cover type. Sample plots were 30 m long and 20 m wide (Figures 3 and 4). Within each sample plot, percent canopy cover of plants >2.5 m tall (tree/tall shrub stratum) was estimated for each species present. Based on their height and diameter at breast height (dbh), woody plants were stratified as tall tree (>5 m tall and >7 cm dbh), low tree (2.5 – 5 m tall and >7 cm dbh), or tall shrub (>2.5 m and ≤7 cm dbh). To measure all other vegetation, a transect was run lengthwise through the center of the plot, along which a 2.5 m x 2.5 m quadrat was placed at each 5 m interval, starting at the 5 m mark (Figures 3 and 5). Within each of these 5 quadrats, the percent cover of plants 1– 2.5 m tall (medium shrub stratum) was estimated by species. Within each quadrat, a smaller 1 m x 1 m quadrat was established and percent cover of plants <1 m tall (low shrub/herb stratum) was estimated by species (Figures 3 and 6). Percent cover for each species within the medium shrub and the low shrub/herb stratum plots were combined to determine mean percent cover by species. In all broadleaf forest sites, three 38 cm-wide, 41 cm-long, and 25 cm-tall boxes were placed at 10 m intervals along the transect, to collect leaf litter.

Site Re-classification

Using ground data from site assessments, each site was independently classified as one of the 13 *a priori* habitat classes. Discrepancies were common between the EOSD classification and the ground data classification. Excluding roadside and burned/exposed classes, classification based on ground data matched the EOSD classification in only 28% of sites. In particular, broadleaf forest was often misclassified as low shrub habitat. This was likely because: 1) deciduous shrub and deciduous tree have a similar spectral response with the Landsat 7 ETM+ sensor, and as a result can be hard to differentiate, and/or 2) the EOSD is based on older satellite imagery (circa 2000) and what was low shrub habitat at that time may have since developed into forest. This second explanation is less likely however, since the amount of time that has elapsed is small and any observed differences would be minimal. Due to this error, site re-classifications based on ground data were retained and used in all subsequent analysis. It should be noted however, that because the accuracy of the EOSD classification at the scale of this study is relatively low and results are based on

extrapolation across the study area, results should be interpreted with caution[2].

Habitat Reclassification

Certain *a priori* habitat classes were not well-represented across the study area and sample sizes were very low (i.e. 1– 3 sites). Therefore, some classes were rolled up into more general classes and these were used for all subsequent analyses. To determine the final set of habitat classes, a cluster analysis was performed on vegetation community data from all 98 sites to identify similar characteristics among sites from different habitat classes. Results were assessed qualitatively without defining a specific grouping error break-point. Classes with high species similarity were combined to decrease the overall number of habitat classes and to increase the number of representative sites per class. Treed and nontreed sites were analyzed separately to avoid grouping them together and to simplify comparisons among groups. Each cluster analysis was conducted using PC-ORD 4.20 (McCune and Mefford 1999), a relative Euclidean distance measure, and Ward's linkage method.

Biomass Sampling

To determine the overall amount of forage present in each habitat class (and eventually across the study area) seasonally, elk forage vegetation was collected in the field and quantified.

Peak biomass was sampled in 40 sites, all of which had been previously sampled for species composition (Figure 7). Biomass sampling occurred from 9 August to 13 August 2010, and sites represented all 10 habitat classes. For rare habitat classes, the maximum number of sites available were sampled while in more common classes, up to 8 sites were sampled. The number of sites sampled in each habitat class is summarized in Table 1. In each site, species known to be elk forage (Table 2) and 2–250 cm tall were clipped from five 0.5 m x 1 m quadrats. These quadrats were situated at 5 m intervals along a 30 m-long transect situated in approximately the same location as in the vegetation sampling plots. Graminoids, forbs, and shrubs were collected separately and placed in paper bags. In broadleaf forest sites, leaf litter was collected from boxes and placed in a separate paper bag. All samples were air dried for several days and subsequently placed in a drying oven at 30˚C for 24–48 hours. Samples were weighed using a Sartorius MC1 Laboratory LC 6200D balance with a precision of 0.01 g.

[2] Chambers (2010) ground-truthed a significant portion of the study area resulting in a lower classification error than the present study.

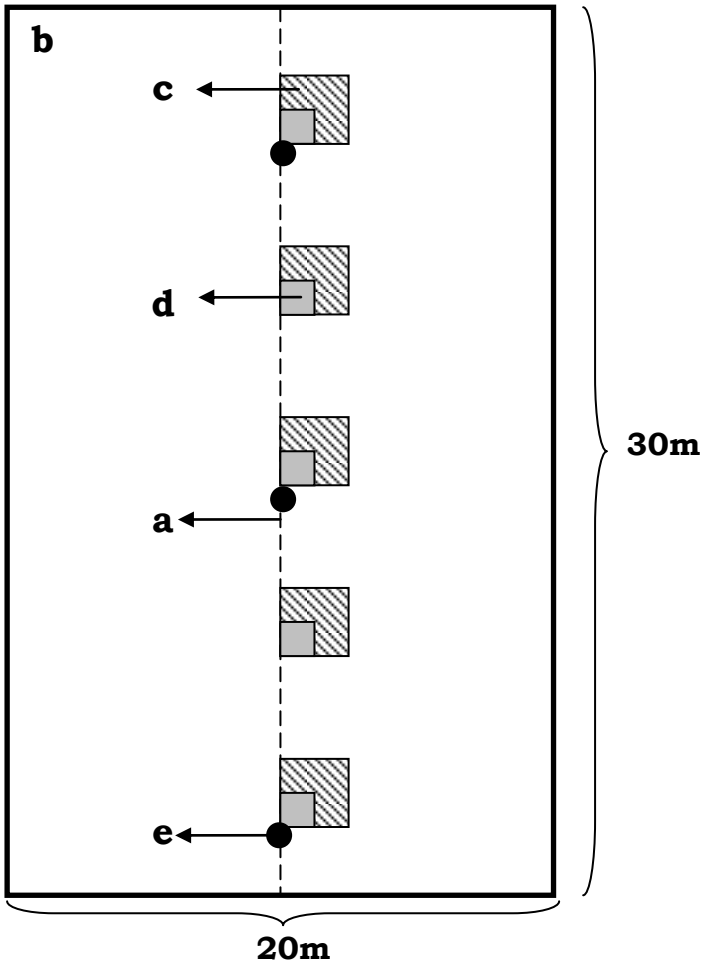

Figure 3. Schematic of a site sample plot including the 30 m transect (a), tree stratum plot area (b), medium shrub stratum quadrat area (c), low shrub and herb stratum quadrat area (d), and leaf litter collection boxes (e).

Figure 4. Example of a sample plot with the 30 m-long transects line (a) running through the center.

Figure 5. Example of a medium shrub stratum quadrat. White rope (a) shows quadrat boundaries.

Figure 6. Example of a low shrub/herb stratum quadrat.

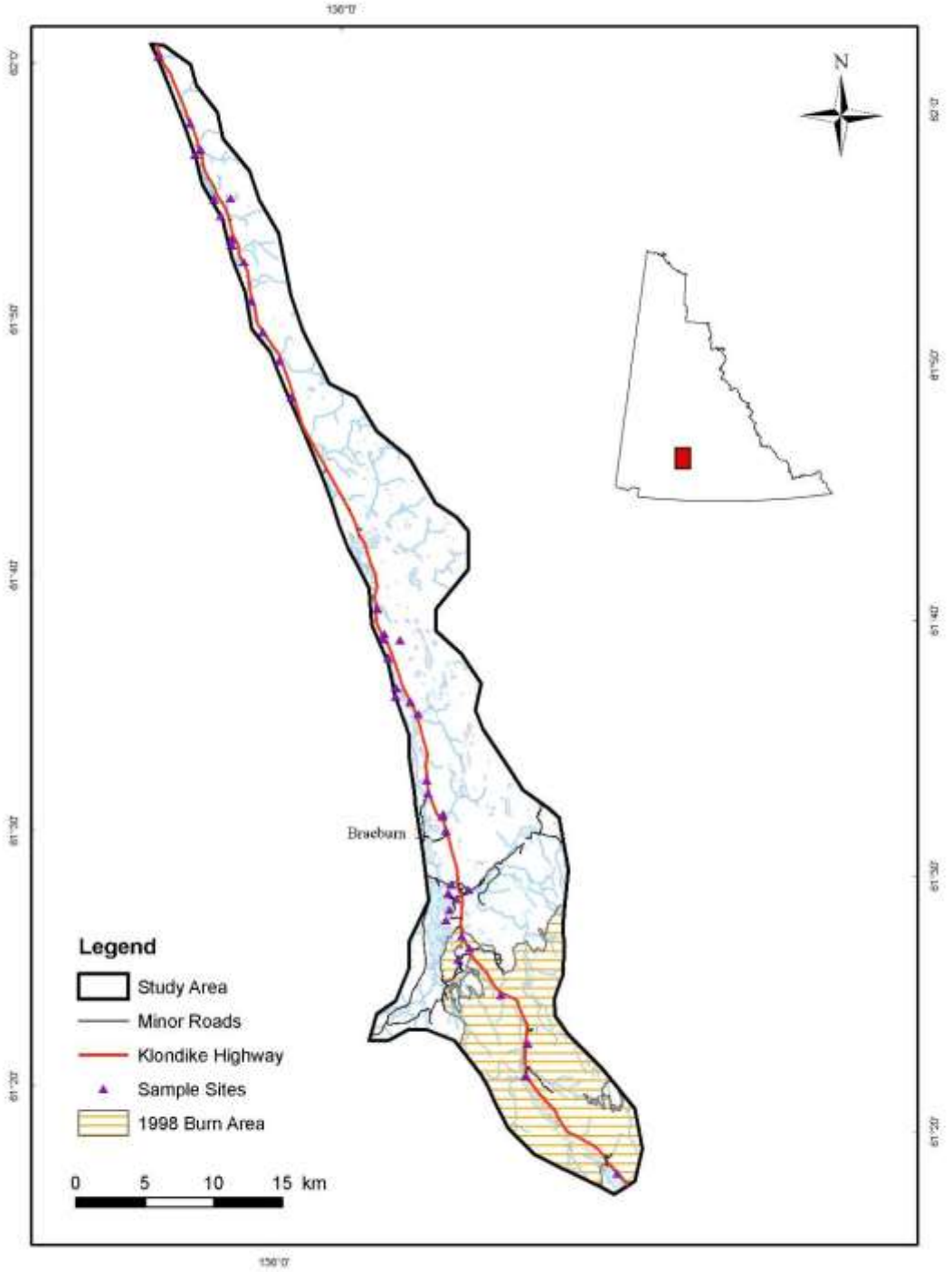

Figure 7. Location of biomass sample sites in the study area (n=40).

Table 1. Number of Sites Sampled for Biomass in each habitat class.

Habitat Class	Number of Sites Sampled
Low Shrub	1
Tall Shrub	1
Shrub/Treed Wetland	2
Herbaceous Wetland	2
Herbaceous	8
Conifer Forest	7
Broadleaf Forest	2
Mixedwood Forest	7
Burned/Exposed Land	3
Roadside	7

Biomass (kg/ha) was calculated for each habitat class in each season for the peak period (i.e. late summer), the fall, and the winter. Peak biomass was equal to the sum of all biomass for shrubs, forbs, and graminoids. Fall biomass excluded forbs (due to senescence) and was calculated as the total of shrub, graminoid, and leaf litter biomass. Winter biomass was the sum of coniferous shrub, deciduous twig, and graminoid biomass. Deciduous leaf biomass was excluded as it is senesced during this period and unavailable as forage.

Forage Preference Ratings

All species observed in vegetation plots were ranked according to their preference as elk forage (Table 2). An exception were species with <1% cover as their presence was assumed to have no effect on habitat quality and thus on overall range carrying capacity. Where possible, forage preference ratings were taken from Chambers (2010). For species/genera not identified by Chambers (2010), ratings were assigned based on Kufeld (1973) and Cook (2002) and discussed with R. Florkiewicz (Environment Yukon). If a preference rating for a particular species was unknown, but there was a value for the plant's genus, the genus value was assigned. All species/genera lacking a preference rating were assigned a value of 0 to provide a conservative estimate of forage quality.

Ratings are described as follows:

- >2 – *Most preferred*: species/genera are consumed in excess of their proportional occurrence in the vegetation, or are a major part of the diet.
- 1–2 – *Preferred*: species/genera are sought and consumed, but not to the extent of more preferred species, or are a moderate part of the diet
- <1 – *Least preferred*: species/genera are consumed in smaller proportions than their occurrence or are a minor part of the diet

Table 2. Elk forage preference ratings for species/genera occurring in vegetation sampling plots.

Taxa	Winter	Spring	Summer	Fall
Astragulus spp.	1.5	0	3	2
Achillea millefolium	1.3	0	1	1
Alnus spp.	0	0	0	0
Androsace septentrionalis	0	0	0	0
Anemone multifida	0	0	0	0
Antennaria microphylla	1	1	1	1
Antennaria rosea	1	0	0	0
Arctostaphylos rubra	0	0	0	0
Arctostaphylos uva-ursi	1	1	0	1.7
Artemisia frigida	2	2	0	0
Betula glandulosa	2	0	3	0
Betula neoalaskana	0	0	0	0
Bromus spp.	1	0	1.7	0
Bupleurum americanum	0	0	0	0
Calamagrostis canadensis	2.5	0	0	0
Calamagrostis lapponica	0	0	0	0
Calamagrostis purpurascens	2	3	3	1.5
Calamagrostis spp.	0	0	0	0
Calamagrostis stricta	0	0	0	0
Carex spp.	2	1	1.7	2.3
Chamaerhodos erecta	0	0	0	0
Chameron angustifolium	0	0	2	0
Deschampsia caepitosa	2	2	3	0
Equisetum spp.	1	0	1	1
Erigeron spp.	0	2	1.5	2
Eriocaulon spp.	0	0	0	0
Festuca brachyphylla	0	2	3	2
Festuca saximontana	0	2	3	2
Festuca spp.	0	2	3	2
Fragaria virginiana	1.5	2	1	1
Galium boreale	1	0	0	0
Geocaulon lividum	0	0	0	0
Graminoid spp.	0	0	0	0
Hedysarum alpinum	0	0	0	0
Hedysarum boreale	0	0	0	0
Hieracium spp.	0	0	0	0
Hippuris vulgaris	0	0	0	0
Juncus spp.	0	0	0	0

Table 2. Continued.

Taxa	Winter	Spring	Summer	Fall
Ledum groenlandicum	2	0	0	0
Linnaea borealis	1	0	0	0
Lupinus arcticus	0	2	1	2
Melilotus alba	0	0	0	0
Oxytropis campestris	0	2	1	0
Oxytropis deflexa	0	2	1	0
Oxytropis splendens	0	1	0	0
Parnassia palustris	0	0	0	0
Pedicularis sudetica	0	0	0	0
Penstemon gormanii	1	1.5	1	0
Penstemon procerus	0	0	1	0
Picea glauca	1	0	0	0
Poa glauca	1.7	2.4	1.9	2.5
Poa spp.	2	2.7	2	2.5
Polygonum amphibium	0	0	0	0
Populus balsamifera	2	0	0	0
Populus tremuloides	2.3	2.3	1.7	2.5
Potentilla pensylvanica	0	1.4	1.3	1.5
Potentilla spp.	0	1.3	1.3	1.5
Pulsatilla ludoviciana	1	3	1	0
Pyrola asarifolia	0	0	0	0
Rosa acicularis	1	2	3	3
Rubus spp.	0	0	0	1
Rumex spp.	0	0	0	0
Salix bebbiana	2.1	2	1.8	2.3
Salix glauca	2.1	2	1.8	2.3
Salix planifolia	2	1.5	1	2
Salix scouleriana	3	2	0	0
Salix spp.	2.1	2	1.7	2.3
Shepherdia canadensis	2	0	1	1.5
Solidago simplex	1	0	0	0
Solidago spp.	1	0	0	0
Stipa comata	0	0	0	3
Taraxacum officinale	1	1.8	2.2	2
Utricularia minor	0	0	0	0
Vaccinium vitis-idaea	2	0	1	1
Viburnum edule	0	0	0	0

Forage Index Values

A forage index value (FI) similar to that used by Sachro et al. (2005) and Redburn et al. (2008) was calculated for each habitat class during each season: winter, spring, summer, and fall. This single value represented both the quality and quantity of forage habitat. These data were used to incorporate forage preference into the carrying capacity estimates. All tree data collected were excluded from calculations because forage on trees was too high and generally unavailable to elk (i.e. > 2.5m). Forage index values were determined using the maximum number of sites available per habitat class, up to a maximum of 5. Values were calculated using forage preference ratings (Table 2) and percent canopy cover values:

$$\mathbf{FI}_{c} = \frac{\sum \mathbf{C}_{i}\mathbf{R}_{i}}{\sum \mathbf{C}_{i}}$$

Where:

FI_c = Forage Index Value

$_c$ = Based on percent cover

C_i = Percent cover of *i*th species

R_i = Forage preference rating (0-3) of *i*th species (Table 2)

Carrying Capacity Analysis

An initial carrying capacity of the study area was calculated based on peak biomass availability divided by the amount of biomass required by an elk per year. It was assumed that:

1. Ungulates consume 3% of their body weight in forage per day to maintain their physical condition (Kuzyk and Hudson 2007).
2. Elk average body weight is 320 kg for bulls, 225 kg for cows, and 135 kg for calves (Florkiewicz 1994).
3. The population distribution (bulls: cows: calves) is 40:100:20 (Florkiewicz et al. 2007).

Potential carrying capacity was then estimated for each season under 6 additional scenarios, each based on a series of cumulative assumptions (Chambers 2010). Scenarios are described in greater detail in the results section and are based on the following 8 assumptions[3]:

1. Biomass available by season is a proportion of peak forage abundance. Leaf litterfall is only available for consumption during fall.
2. Mule deer forage on many of the same species as elk, but rely on browse for 72% of their diet (Hansen and Clark 1977; Bartmann et al. 1982).
3. The average weight of a mule deer is 88 kg (Kuzyk and Hudson 2006; Environment Yukon 2008 unpublished data).

[3] Chambers (2010) additionally assumed that in winter, browse formed an average of 29% of an elk's diet and thus, forage requirements were reduced accordingly in the Takhini study. Because the amount of browse consumed can vary spatially, the current study included browse species with all other species in all seasons. A relatively higher forage preference rating in winter for certain browse species will reflect a higher level of consumption.

4. Twenty-five mule deer reside in the study area; there are no horses (T. Jung, Environment Yukon, 2010, personal communication).
5. A constant number of elk and mule deer remain within the study area at all times and consume all vegetation types equally.
6. Forage values for elk are weighted by forage index preference ratings.
7. Forbs are inaccessible or physically disintegrated during fall and winter.
8. Ecologically sustainable safe-use factors for grazing are 25% of the total biomass for treed areas and 50% for nontreed areas (Alberta Sustainable Resource Development 2004).

There is no evidence of elk in the Yukon consuming conifer species and thus there exists some speculation as to whether conifer species should be considered forage (R. Florkiewicz, Environment Yukon). In response to this, carrying capacity was estimated under an additional scenario where conifer species were excluded as available forage biomass.

Habitat Assessment

At least 136 vascular plant species (note: some species were only identified to family) were observed in the sample plots (Appendix 1). In addition, over 20 non-vascular species, including bryophytes, liverworts, lichens, and fungi were observed, although most non-vasculars were not identified to species. Based on site similarities determined by the cluster analyses (Figures 8 and 9), 10 habitat classes were identified, each falling into one of 2 categories: treed or non-treed. An exception to this included treed wetland, shrub wetland, and herbaceous wetland sites. Sites from all 3 of these classes were relatively similar, however only treed wetland and shrub wetland classes were combined while herbaceous wetland remained a stand-alone class. This was due to: 1) the rarity of treed wetlands and shrub wetlands in the study area compared to herbaceous wetlands, 2) the fact that treed wetlands and shrub wetlands were often confused with one another in the EOSD, and 3) the desire to keep treed and non-treed classes separate. Final habitat classes included: low shrub, tall shrub, shrub/treed wetland, herbaceous wetland, herbaceous, conifer forest, broadleaf forest, mixedwood forest, burned/exposed land, and roadside (Table 4).

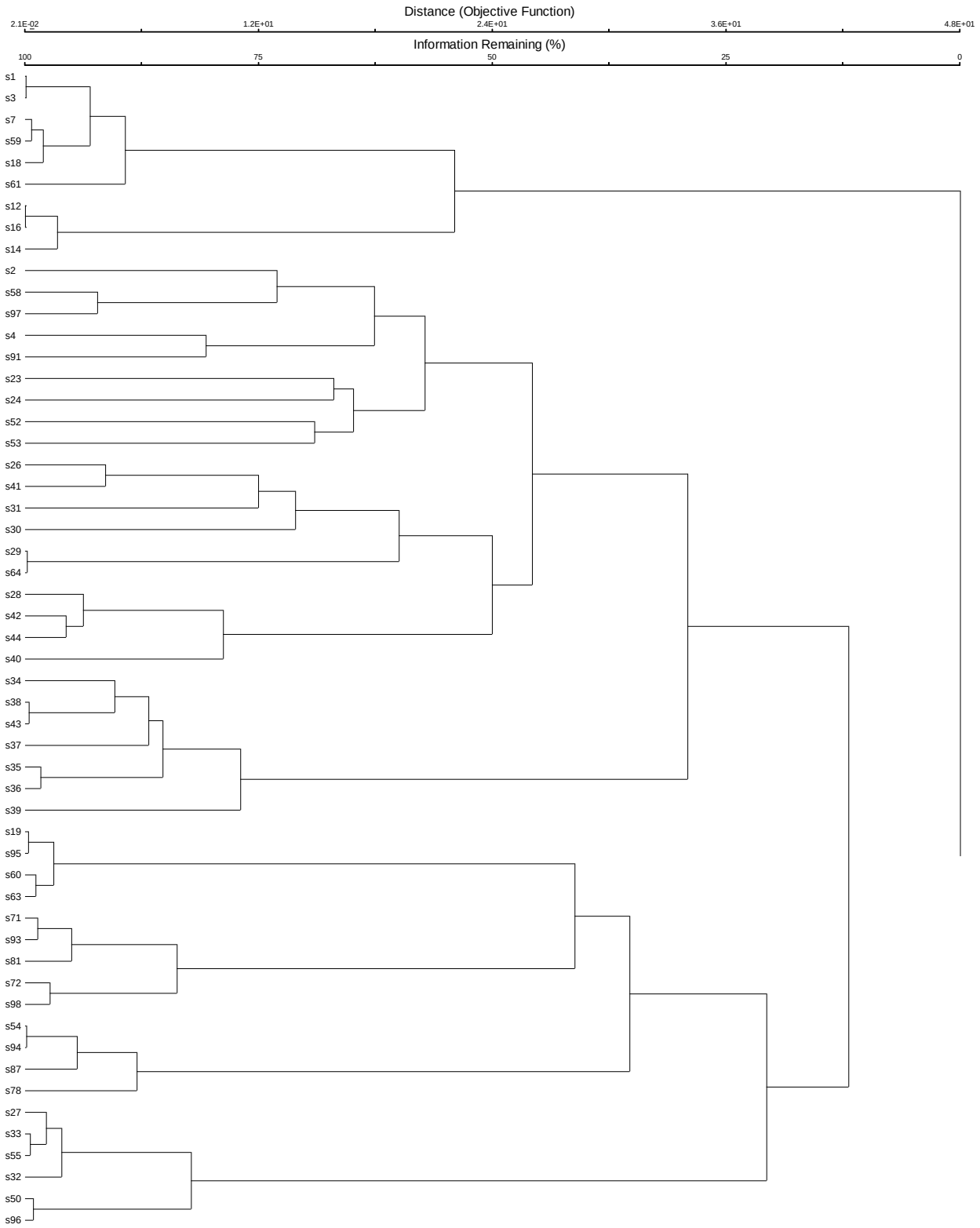

Figure 8. Dendrogram resulting from cluster analysis on nontreed sites (n=54). Sites clustered closer together have vegetation communities composed of similar species. For site habitat classes, see Table 3.

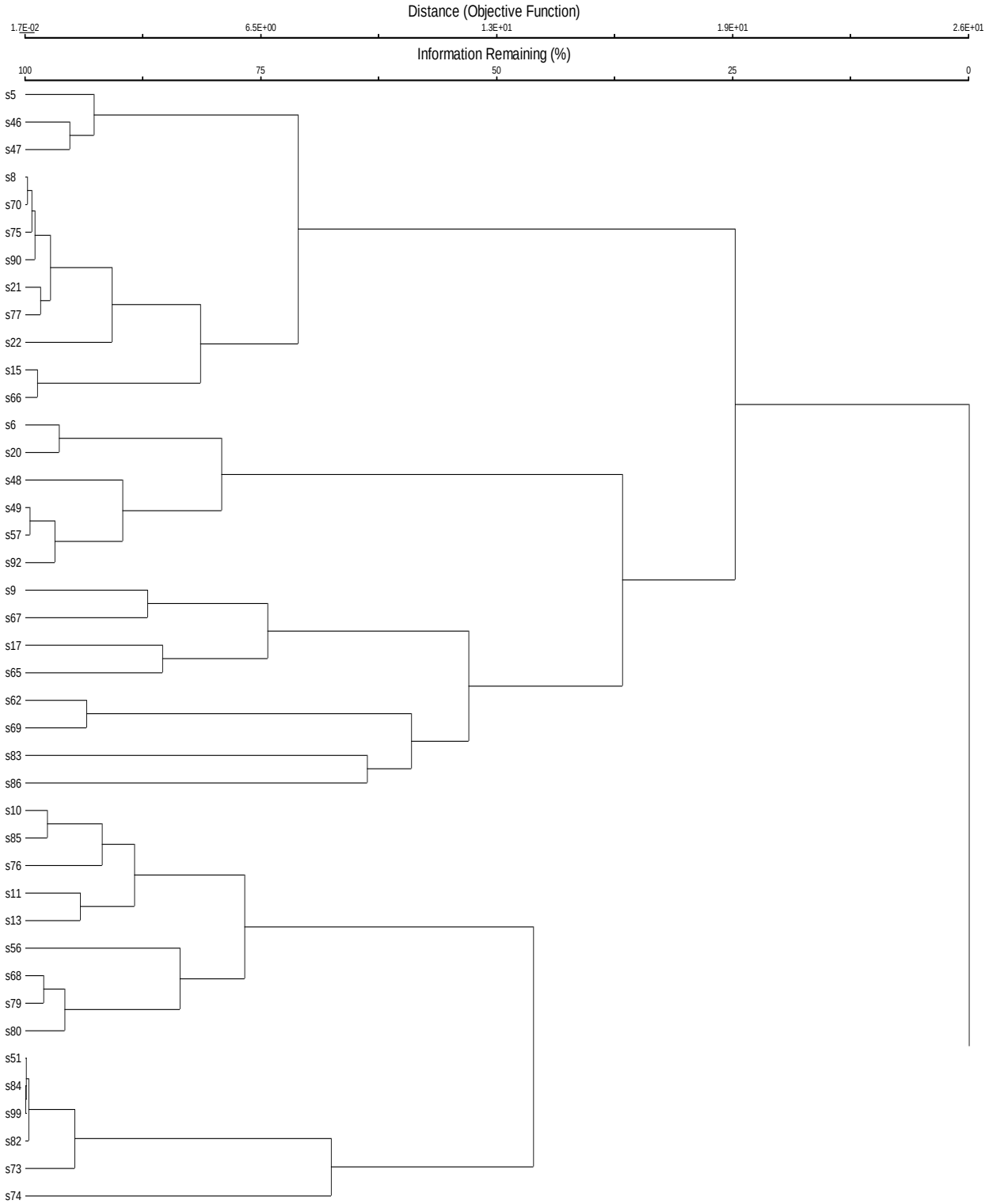

Figure 9. Dendrogram resulting from cluster analysis on treed sites (n=41). Sites clustered closer together have vegetation communities composed of similar species. For site habitat classes, see Table 3.

Based on the EOSD land cover map, of the 10 habitat classes, low shrub and conifer forest were the most abundant across the study area (Table 4; Figure 10). Aside from burned/exposed land, all other classes were relatively rare, with none covering more than 8% of the study area (Table 4; Figure 9). Low shrub was the most common habitat class in the region and was fairly evenly dispersed. Conifer forest was the second most common habitat class in the study area and was most abundant in the north and in the southwest. Tall shrub habitat was much less common than low shrub habitat, although it was similarly evenly-distributed. Herbaceous habitat was slightly more common in the northern portion of the study area, and occurred most often on relatively steep, south-facing slopes. For a detailed list of species composition by habitat class, see Appendix 1.

Table 3. Site habitat classification.

Site ID	Habitat Class
1	Herbaceous
2	Mixedwood Forest
3	Herbaceous
4	Herbaceous
5	Mixedwood Forest
6	Conifer Forest
7	Herbaceous
8	Broadleaf Forest
9	Herbaceous
10	Conifer Forest
11	Mixedwood Forest
12	Herbaceous
13	Conifer Forest
14	Herbaceous
15	Broadleaf Forest
16	Herbaceous
17	Mixedwood Forest
18	Herbaceous
19	Low Shrub
20	Mixedwood Forest
21	Broadleaf Forest
22	Burned/Exposed
23	Burned/Exposed
24	Burned/Exposed
25	Roadside
26	Roadside
27	Roadside
28	Roadside
29	Roadside
30	Roadside
31	Roadside
32	Roadside
33	Roadside
34	Roadside
35	Roadside
36	Roadside
37	Roadside
38	Roadside
39	Roadside
40	Herbaceous
41	Roadside
42	Roadside
43	Roadside
44	Roadside
46	Mixedwood Forest
47	Mixedwood Forest
48	Mixedwood Forest
49	Mixedwood Forest
50	Shrub/ Treed Wetland
51	Conifer Forest
52	Shrub/Treed Wetland
53	Herbaceous Wetland
54	Herbaceous Wetland
55	Shrub/Treed Wetland
56	Conifer Forest
57	Mixedwood Forest
58	Low Shrub
59	Burned/Exposed
60	Burned/Exposed
61	Herbaceous
62	Tall Shrub
63	Burned/Exposed
64	Burned/Exposed
65	Mixedwood Forest
66	Broadleaf Forest
67	Mixedwood Forest
68	Mixedwood Forest
69	Low Shrub
70	Broadleaf Forest
71	Herbaceous Wetland
72	Shrub/Treed Wetland
73	Conifer Forest
74	Mixedwood Forest
75	Broadleaf Forest
76	Conifer Forest
77	Mixedwood Forest
78	Herbaceous Wetland
79	Mixedwood Forest
80	Mixedwood Forest
81	Conifer Forest
82	Conifer Forest
83	Broadleaf Forest
84	Conifer Forest
85	Mixedwood Forest
86	Herbaceous Wetland
87	Herbaceous Wetland
90	Broadleaf Forest
91	Herbaceous
92	Broadleaf Forest
93	Herbaceous
94	Burned/Exposed
95	Burned/Exposed
96	Burned/Exposed
97	Burned/Exposed
98	Burned/Exposed
99	Conifer Forest
100	Roadside

Table 4. Description and overview statistics of the 10 habitat classes analyzed.

For representative examples of each habitat class, see Appendix 2.

Habitat Class	Description	Hectares	% of Study Area	Mean (se) Graminoid Biomass (kg/ha)	Mean (se) Forb Biomass (kg/ha)	Mean (se) Shrub Biomass (kg/ha)	Total (se) Mean Biomass (kg/ha)	Total (se) Biomass Abundance in Study Area (kg)
Low Shrub	Minimum 20% ground cover which is at least one-third shrub. Average shrub height < 2 m.	16,419	32	390.00(0.00)	0.00 (0.00)	1047.60 (0.00)	1437.60	23603954
Tall Shrub	Minimum 20% ground cover which is at least one-third shrub. Average shrub height ≥ 2m.	2,645	5	132.36 (132.04)	56.76 (54.84)	817 (550.00)	1006.12	2661187
Shrub/Treed Wetland	Land with a water table near, at, or above the soil surface long enough to promote wetland or aquatic processes. The majority of vegetation is shrub (tall, low, or a mixture of tall and low) OR tree.	438	1	377.66 (211.34)	34.20 (32.68)	2057.46 (150.66)	2469.32	1081562

Table 4. Continued.

Habitat Class	Description	Hectares	% of Study Area	Mean (se) Graminoid Biomass (kg/ha)	Mean (se) Forb Biomass (kg/ha)	Mean (se) Shrub Biomass (kg/ha)	Total (se) Mean Biomass (kg/ha)	Total (se) Biomass Abundance in Study Area (kg)
Herbaceous Wetland	Land with a water table near, at, or above the soil surface long enough to promote wetland or aquatic processes. The majority of vegetation is herb.	1,124	2	1896.6 (310.6)	41.16 (41.16)	7.9 (7.9)	1945.66	2186921
Herbaceous	Minimum of 20% of ground cover or one-third of the total vegetation must be herbaceous (i.e. vascular plant without a woody stem), i.e. forbs and graminoids.	4,232	8	269.37 (60.00)	12.64 (6.69)	467.79 (190.62)	749.79	3173111
Conifer Forest[4]	Coniferous trees comprise a minimum of 75% of the total basal area.	15, 708	31	35.83 (22.65)	19.27 (5.62)	1558.66 (511.53)	1613.76	25348942

[4] All conifer forest sampled was between 10% and 60% crown closure.

Table 4. Continued.

Habitat Class	Description	Hectares	% of Study Area	Mean (se) Graminoid Biomass (kg/ha)	Mean (se) Forb Biomass (kg/ha)	Mean (se) Shrub Biomass (kg/ha)	Total (se) Mean Biomass (kg/ha)	Total (se) Biomass Abundance in Study Area (kg)
Broadleaf Forest[5]	Broadleaf trees comprise a minimum of 75% of the total basal area.	992	2	27.58 (27.58)	61.56 (28.16)	358.82 (116.98)	447.96	444376
Mixedwood Forest[6]	Coniferous and broadleaf trees present with neither accounting for 75% or more of the total basal area.	522	1	16.99 (14.05)	19.99 (9.07)	2035.24 (1021.59)	2072.22	1081698
Burned/ Exposed Land	Areas exposed to the 1998 wildfire or otherwise unvegetated.	8,363	17	93.76 (53.82)	523.24 (410.47)	1078.01 (722.93)	1695.01	14175368
Roadside	Area within 15 m on either side of the Klondike Hwy. Typically characterized by herbaceous and/or shrubby vegetation.	278	1	184.56 (82.11)	129.90 (40.89)	1721.03 (913.13)	2035.38	565835

[5] All broadleaf forest present was between 26% and 60% crown closure.

[6] All mixedwood forest present was between 10% and 60% crown closure .

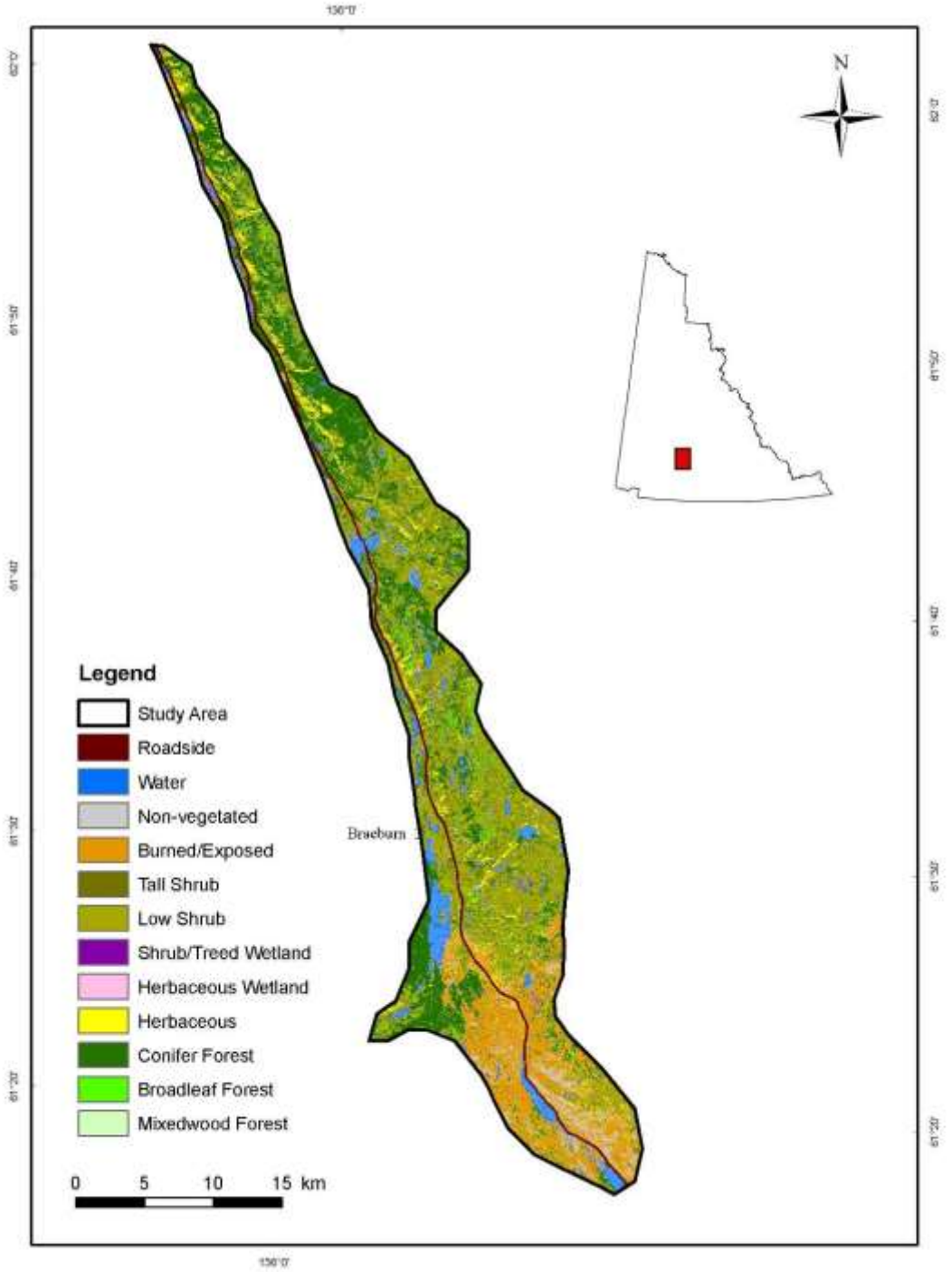

Figure 10. Distribution of habitat classes across the study area.

Biomass

Biomass totals are summarized in Table 5. Fall leaf litter biomass in broadleaf forest was 140 kg/ha (reflected in Table 5 value). Peak biomass was highest in mixedwood forest, shrub/treed wetland, and roadside habitat while lowest biomass values occurred in herbaceous habitat and broadleaf forests (Table 5; Figure 14). Vegetation biomass varied both within and among habitat classes (Figures 11–13). Among classes, mean graminoid biomass ranged from 14 to 1896 kg/ha, forb biomass ranged from 0 to 523 kg/ha, and shrub biomass ranged from 8 to 2057 kg/ha. Differences in both graminoid and forb biomass were significant among habitat classes (Kruskal Wallis test, $p<0.05$) while those for shrub biomass were not (Table 6). Mean graminoid biomass was significantly higher in herbaceous wetlands compared to all other habitat classes (Tukey's test, $p<0.0001$; Table 7; Figure 11). No significant differences were found in graminoid biomass among any other classes (Table 7; Figure 11). Despite a high degree of variation in mean forb biomass in burned/exposed land (Figure 12), it was significantly higher than in herbaceous, conifer forest, and mixedwood forest habitat classes (Tukey's test, $p<0.05$; Table 7; Figure 12). Overall, biomass values were highest for shrubs (Figure 13).

Table 5. Total mean biomass (kg/ha) for each habitat class during the peak season, fall, and winter.

Habitat Class	Peak Biomass	Fall Biomass	Winter Biomass
Low Shrub	1438	1438	914
Tall Shrub	1006	949	541
Shrub/Treed Wetland	2469	2435	1653
Herbaceous Wetland	1946	1905	1901
Herbaceous	750	737	503
Conifer Forest	1614	1594	1594
Broadleaf Forest	448	527	207
Mixedwood Forest	2072	2052	1543
Burned/Exposed	1695	1172	633
Roadside	2035	1905	1045
TOTAL	**74322959**	**69411156**	**53063930**

Table 6. Results from Kruskal Wallis test for differences in mean graminoid, forb, and shrub biomass among 10 habitat classes (n=40).

Vegetation Class	Kruskal-Wallis Test Statistic	p-value[7]
Graminoid	21.790	0.010
Forb	17.015	0.048
Shrub	12.017	0.212

[7] assumes Chi-square Distribution with 9 df

Table 7. Results from Tukey's honest significance test for differences in mean graminoid and forb biomass among 10 habitat classes (n=40).

Vegetation class	Habitat Class Difference	Difference value	p-value[1]
Graminoid	Herbaceous Wetland >Mixedwood Forest	1879.61	0.000
	Herbaceous Wetland >Broadleaf Forest	1869.02	0.000
	Herbaceous Wetland >Conifer Forest	1860.77	0.000
	Herbaceous Wetland > Burned/Exposed	1802.84	0.000
	Herbaceous Wetland > Tall Shrub	1764.24	0.000
	Herbaceous Wetland > Roadside	1712.14	0.000
	Herbaceous Wetland > Herbaceous	1627.24	0.000
	Herbaceous Wetland >Shrub Wetland	1518.94	0.000
	Herbaceous Wetland > Low Shrub	1506.60	0.000
Forb	Burned/Exposed >Herbaceous	511.98	0.015
	Burned/Exposed > Conifer Forest	501.71	0.021
	Burned/Exposed >Mixedwood Forest	489.53	0.033

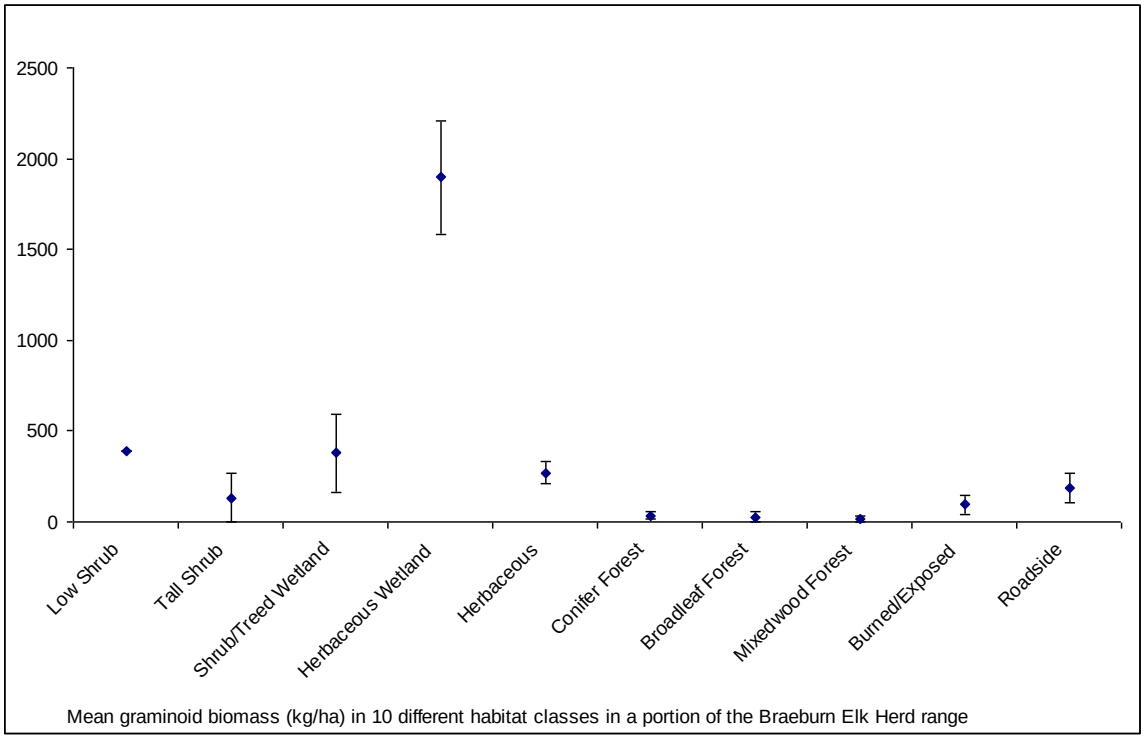

Figure 11. Mean (±se) graminoid biomass (kg/ha) in each of 10 habitat classes in the study area.

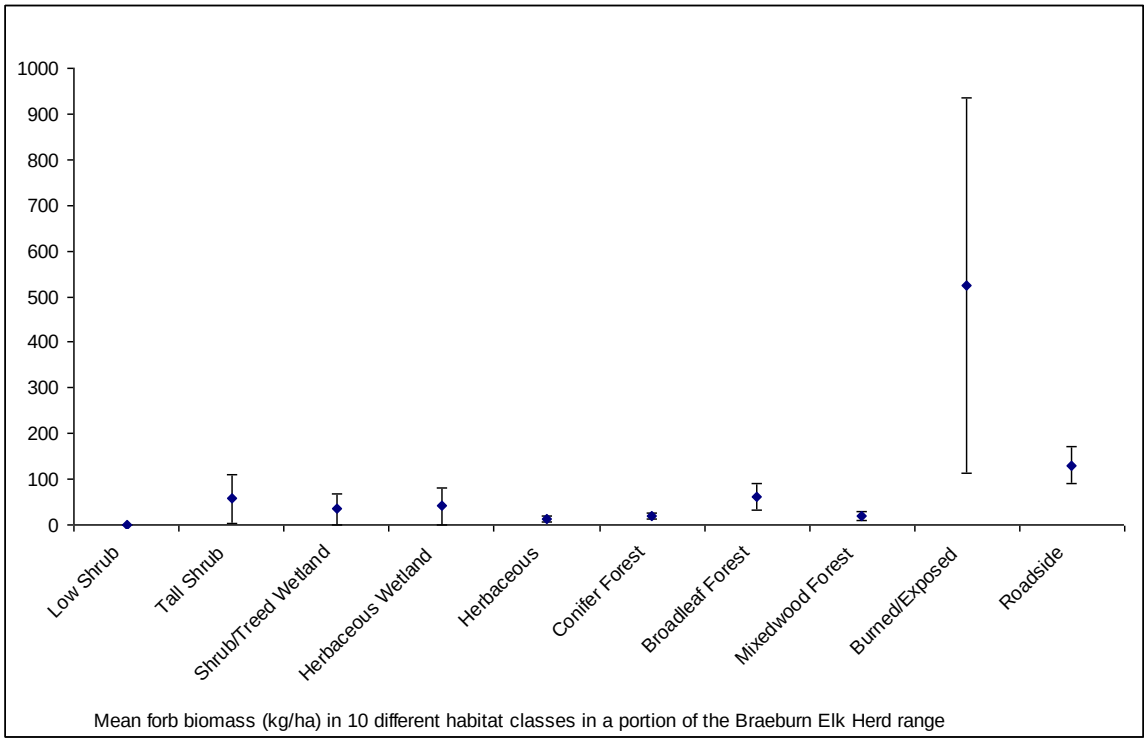

Figure 12. Mean (±se) forb biomass (kg/ha) in each of 10 habitat classes in the study area.

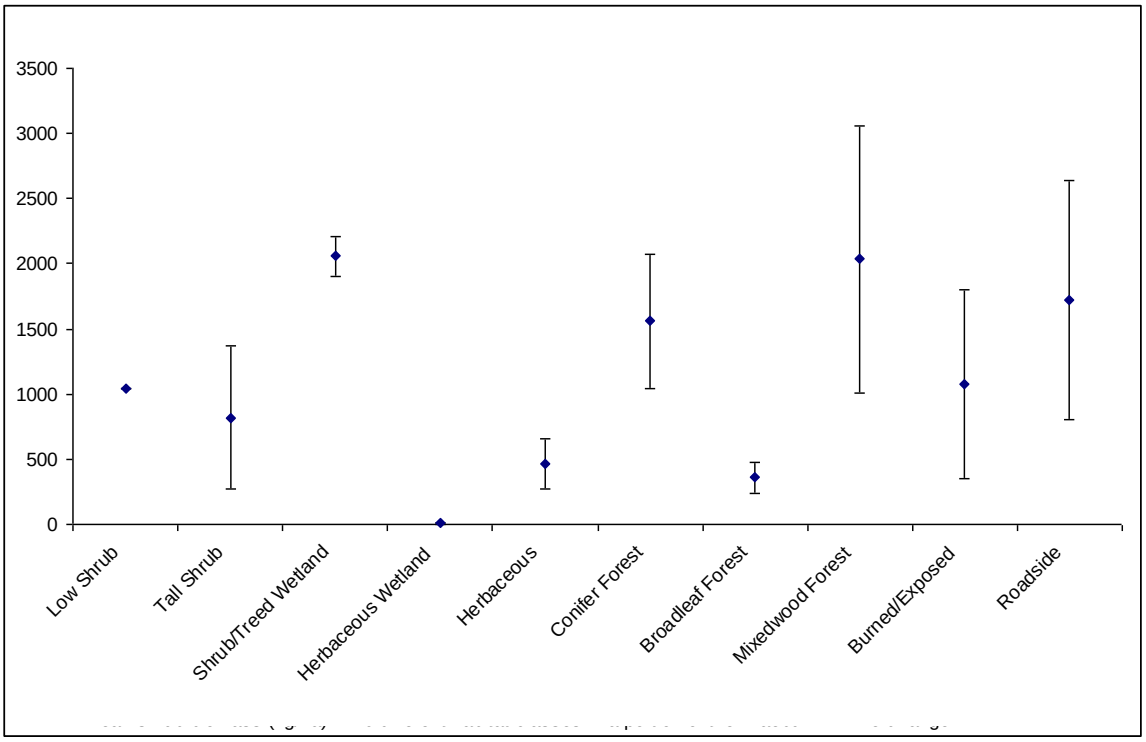

Figure 13. Mean (±se) shrub biomass (kg/ha) in each of 10 habitat classes in the study area.

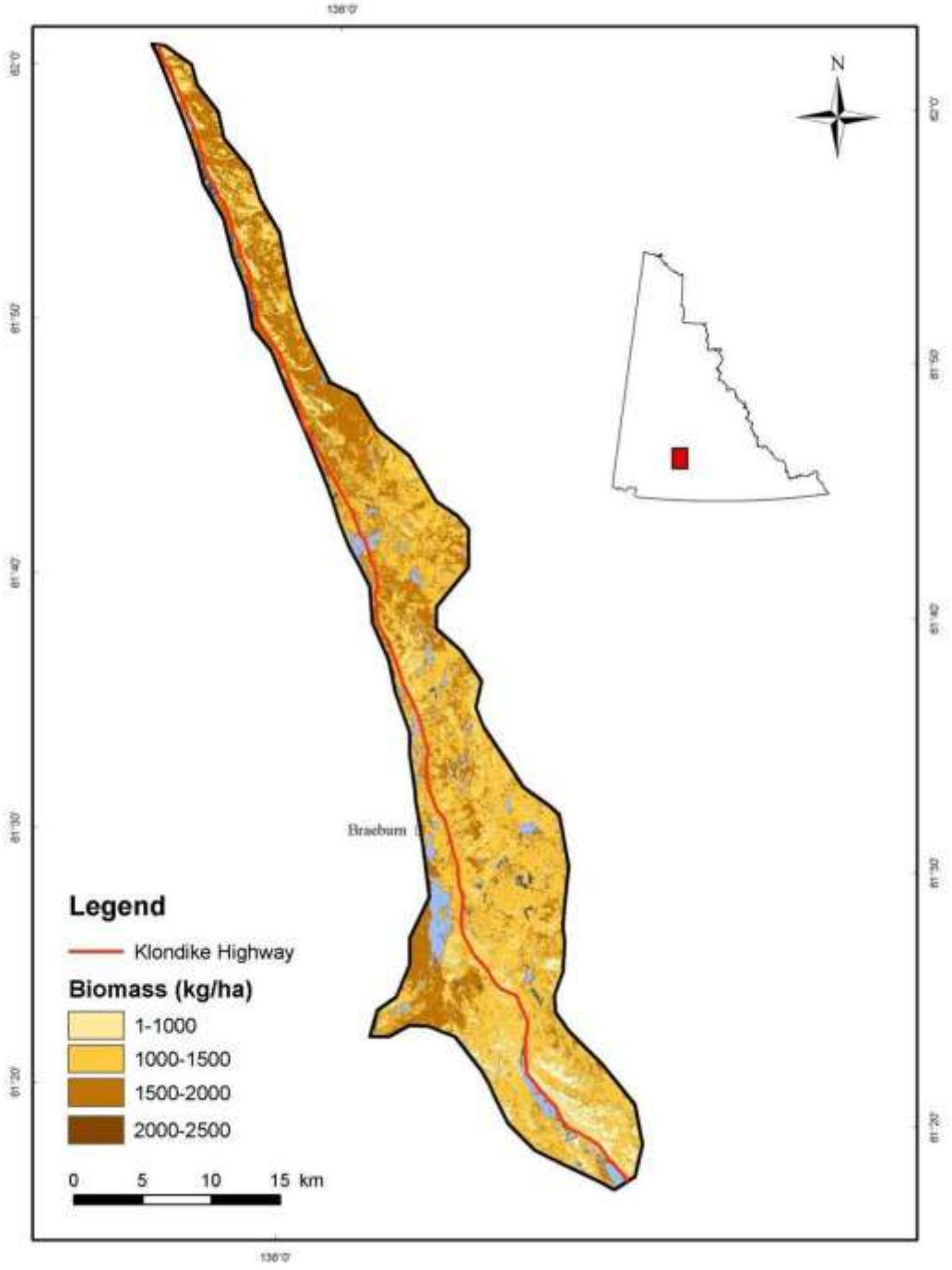

Figure 14. Mean peak forage biomass (kg/ha) in the Braeburn study area (by habitat class).

Forage Index Values

Forage index values >2 are considered to represent good foraging areas. Values >2 occurred only during winter and fall, and included low shrub habitat in the former, and herbaceous wetlands, low shrub habitat, and tall shrub habitat in the latter (Table 8). Winter forage index values ranged from 0.54 in herbaceous wetlands to 2.06 in low shrub habitat while spring values ranged from 0.32 in conifer forest to 1.87 in low shrub habitat (Figures 15 and 16; Table 8). Summer forage index values ranged from 0.39 in conifer forest to 1.78 in tall shrub habitat and fall values ranged from 0.36 in conifer forest to 2.14 in herbaceous wetlands (Figures 17 and 18; Table 8). The highest class of forage index values (1.9–2.2) covered the greatest areal extent during the fall (Figure 18; Table 9) while during the summer, none of the study area was characterized by the highest class (Figure 17; Table 9). The lowest class of forage index values (0.1-1) had the greatest extent coverage of the study area in both summer and fall (Figures 17 and 18; Table 9).

Table 8. Seasonal forage index values (FIc) by habitat class within the study area. Values are based on species cover and elk forage preference values.

Habitat Class	Winter	Spring	Summer	Fall
Mixedwood Forest	1.14	0.62	0.72	0.66
Broadleaf Forest	1.13	1.23	1.37	1.51
Conifer Forest	1.05	0.32	0.39	0.36
Herbaceous	1.52	1.44	0.95	0.87
Herbaceous Wetland	0.54	0.93	1.53	2.14
Shrub/Treed Wetland	1.87	1.71	1.63	1.97
Low Shrub	2.06	1.87	1.63	2.04
Tall Shrub	2	2	1.78	2.02
Burned/Exposed	1.78	1.69	1.64	1.82
Roadside	0.83	1.33	1.01	0.77

Table 9. Areal extent (ha) (% of study area) of forage index values by class and season.

FIc value class	Winter	Spring	Summer	Fall
0.1-1.0	1114 (2)	17386 (34)	20606 (41)	20606 (40)
1.0-1.5	17298 (34)	5294(11)	993 (2)	9548 (19)
1.5-1.9	13295 (26)	25486 (50)	29219 (57)	0 (0)
1.9-2.2	19145 (38)	2654 (5)	0 (0)	20665 (41)

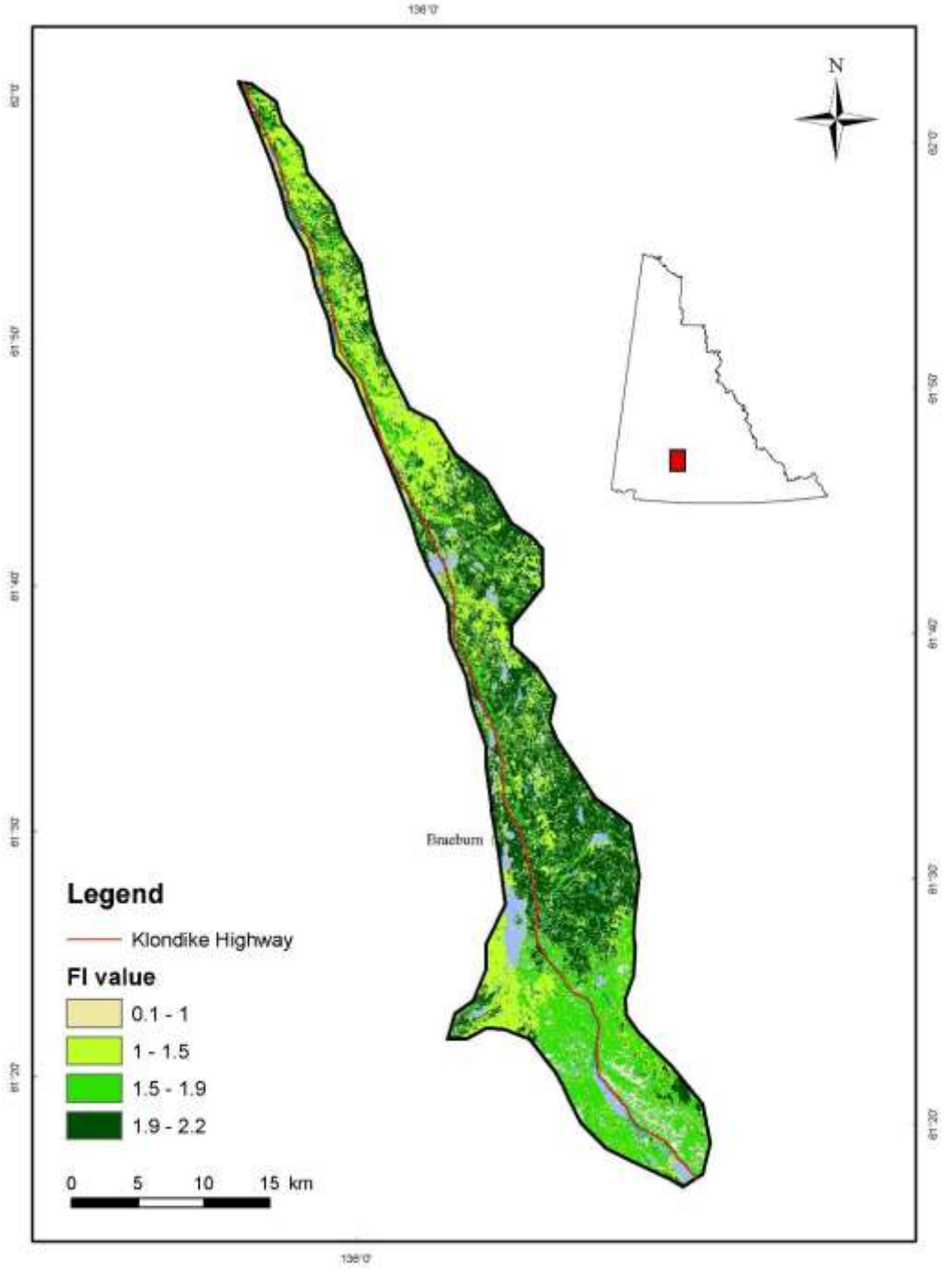

Figure 15. Winter forage index (FI) values by habitat class within the Braeburn study area. Maximum possible FI value is 3.

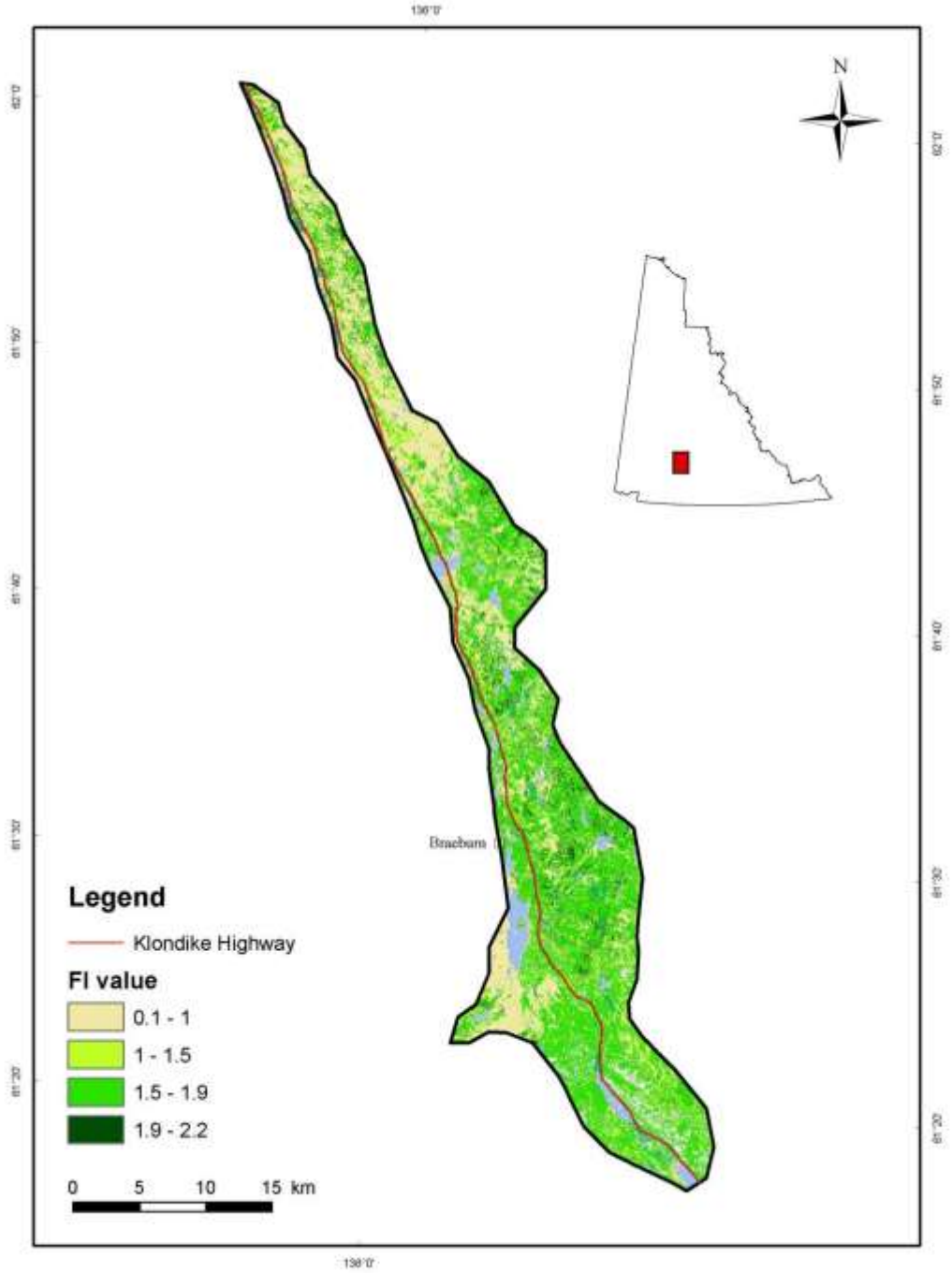

Figure 16. Spring forage index (FI) values by habitat class within the Braeburn study area.

Maximum possible FI value is 3.

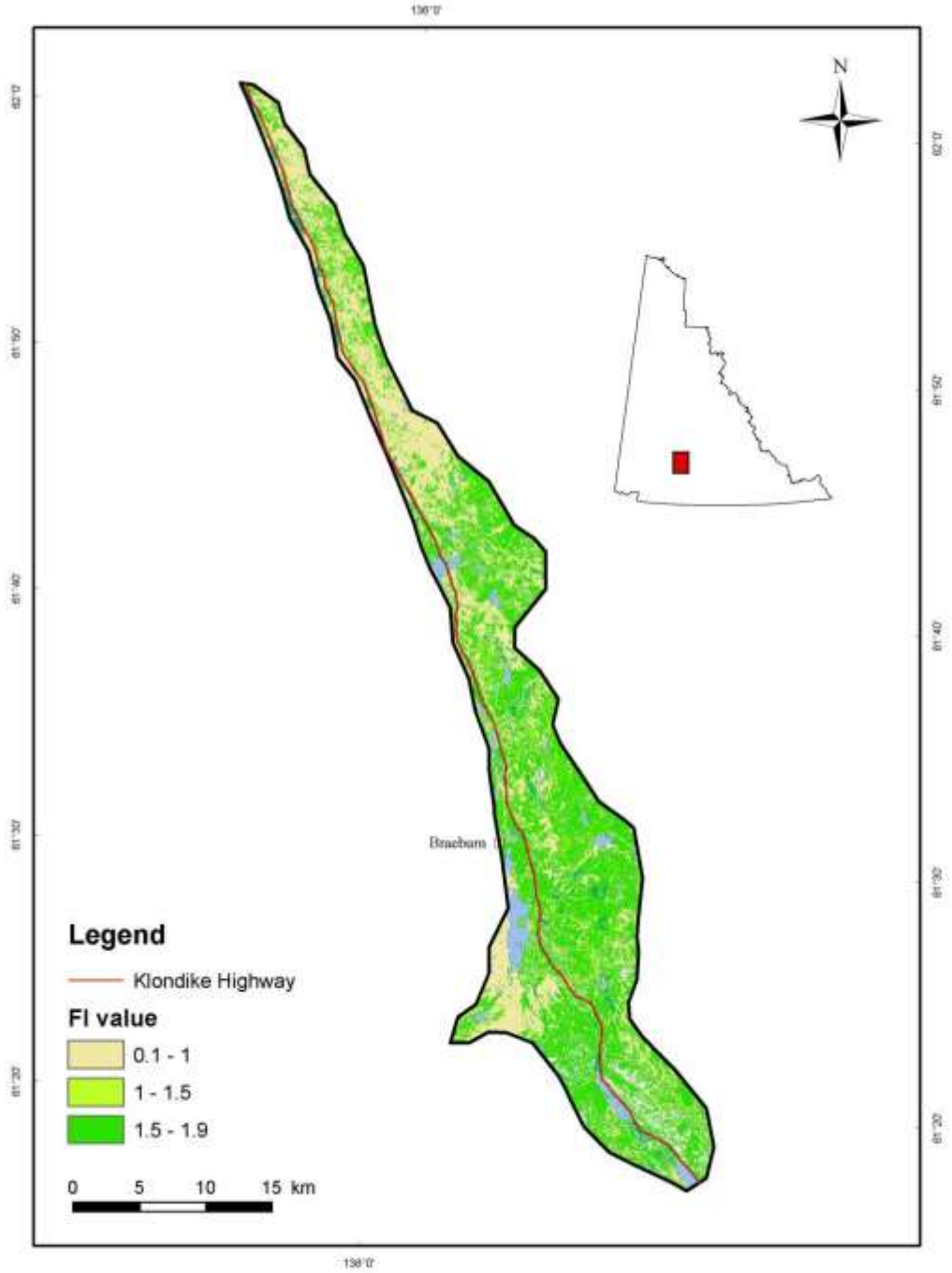

Figure 17. Summer forage index (FI) values by habitat class within the Braeburn study area.

Maximum possible FI value is 3.

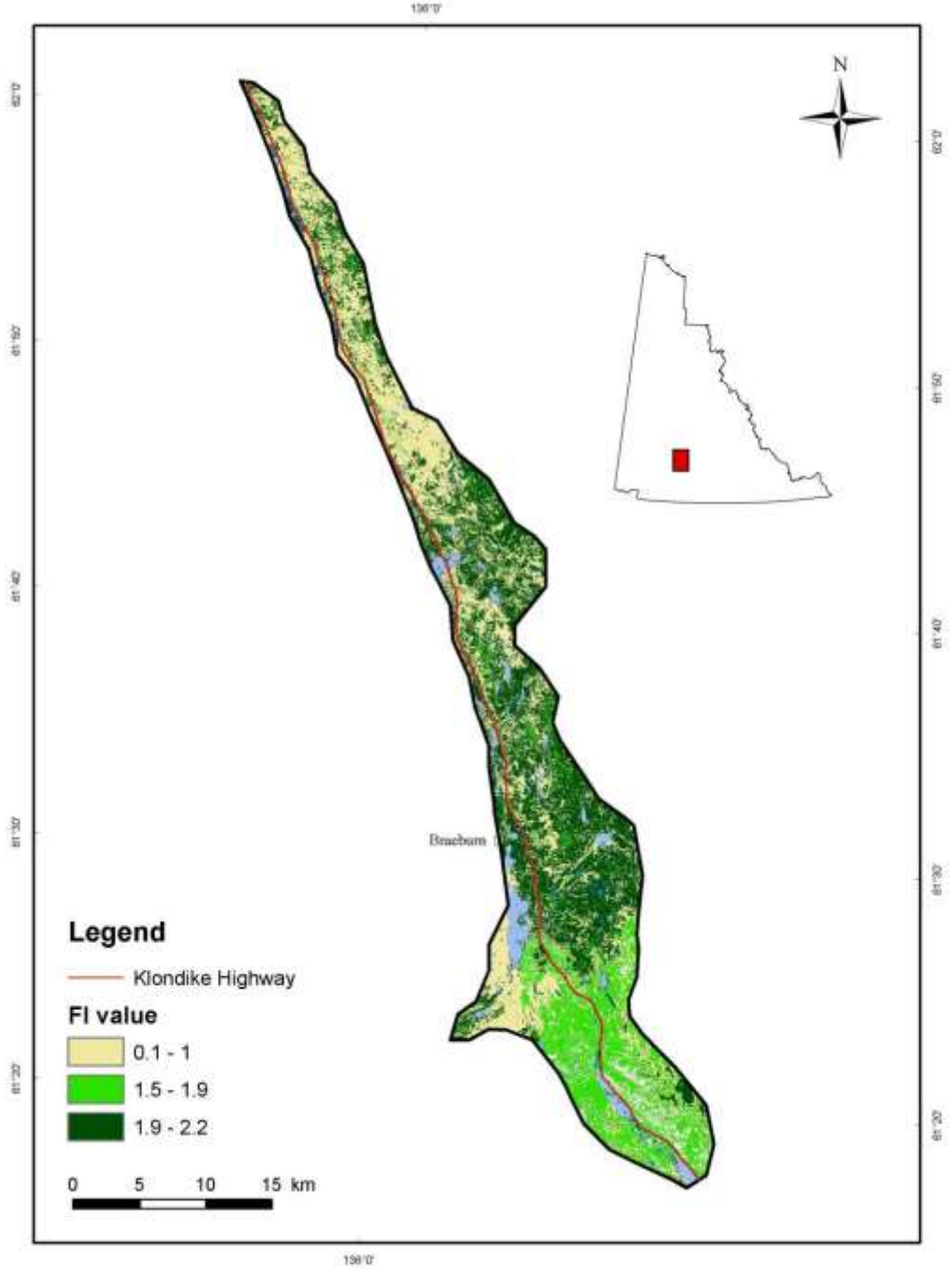

Figure 18. Fall forage index (FI) values by habitat class within the Braeburn study area.

Maximum possible FI value is 3.

Carrying Capacity

Carrying capacity for the study area was estimated for each season under 8 different scenarios, each based on a series of cumulative assumptions. Assumptions were cumulative in that each new scenario included those assumptions made in all previous scenarios, in addition to any new assumption(s). Peak forage biomass was divided proportionately among seasons (i.e. based on the number of days per season) while leaf litter biomass was included only in the fall biomass calculations. Results for all 8 scenarios are outlined below; see Appendix 3 for detailed carrying capacity calculations.

Scenario 1: Maximum carrying capacity

Assumptions:

1. 74,323 tonnes of forage is available annually for elk consumption, excluding leaf litterfall (this is only available for consumption during the fall).
2. Healthy elk consume 3% of their body mass in forage daily (Kuzyk et al. 2006).
3. Elk weigh 238 kg (calculated based on assumed average body weight and population distribution; Florkiewicz 1994).
4. All elk and mule deer remain within the study area and use all vegetation types equally.

Number of elk without deer (all seasons) 28,519

Scenario 2: Seasonally weighted carrying capacity

Assumptions:

1. Deciduous trees produce 140 kg/ha of leaf litterfall biomass per year.
2. Seasons of unequal length occur.
3. Seasonal forage availability is a proportion of peak biomass.
4. Fall forage availability is the total of peak biomass and leaf litterfall biomass.
5. A total of 25 mule deer are part of the study area; there are no horses (T. Jung, Environment Yukon, 2010, personal communication).
6. Mule deer weigh 88 kg (Kuzyk and Hudson 2007; Environment Yukon, unpublished data, 2008) and require 3% of their body mass in forage per day (Kuzyk and Hudson 2007).
7. All elk and deer remain within the study area and use all vegetation types equally in proportion to the abundance of forage.

Table 10. Scenario 2: Seasonally weighted carrying capacity.

Number of elk	Winter	Spring	Summer	Fall
Without deer	28,519	28,519	28,519	159,368
With deer	28,510	18,859	18,622	159,359

Scenario 3: Adjustment for diet similarities between mule deer and elk diets

Assumption:

1. Mule deer forage intake was weighted by similarity to elk diets. Mule deer diet composition is not known and therefore forage intake was reduced by 72% (Bartmann et al. 1992; Hansen and Clark 1977).

Table 11. Scenario 3: Carrying capacity for elk, adjusted for diet similarities between mule deer and elk diets.

Number of elk	Winter	Spring	Summer	Fall
Without deer	28,519	28,519	28,519	159,368
With deer	28,517	28,517	28,517	159,366

Scenario 4: Adjustment for seasonal forage availability

Assumption

1. Forbs were excluded from fall and winter forage use as they are inaccessible or physically disintegrated.

Table 12. Scenario 4: Carrying capacity for elk, adjusted for seasonal forage availability.

Number of elk	Winter	Spring	Summer	Fall
Without deer	49,218	28,519	28,519	159,368
With deer	49,216	28,517	28,517	159,366

Scenario 5: Adjustment for forage preference and availability

Assumption

1. Forage biomass per season was adjusted by relative forage index values (Table 8).

Table 13. Scenario 5: Carrying capacity for elk, adjusted for forage preference.

Number of elk	Winter	Spring	Summer	Fall
Without deer	14,273	19,183	19,045	16,340
With deer	14,271	19,181	19,044	16,338

Scenario 6: Application of ecologically sustainable safe-use factors

Assumption

1. Ecologically sustainable safe-use factors were applied, 25% of seasonal forage biomass for treed and 50% for nontreed habitat classes (Alberta Sustainable Resource Development 2004).

Table 14. Scenario 6: Carrying capacity for elk, with the application of ecologically sustainable safe-use factors.

Number of elk	Winter	Spring	Summer	Fall
Without deer	3,784	5,094	5,031	4,429
With deer	3,782	5,093	5,030	4,428

Scenario 7: Klondike Highway right-of-way biomass excluded

Assumption

1. Forage biomass within the Klondike Highway right –of-way was excluded.

Table 15. Scenario 7: Carrying capacity for elk, with the Klondike Highway right-of-way biomass excluded.

Number of elk	Winter	Spring	Summer	Fall
Without deer	3,761	5,017	4,970	4,393
With deer	3,760	5,016	4,968	4,391

Scenario 8: Conifer species excluded as forage

Assumption

1. Conifer species are not consumed by elk.

***Note –** Klondike Highway right-of-way included in these calculations

Table 16. Scenario 8: Carrying capacity for elk, with conifer species excluded as forage.

Number of elk	Winter	Spring	Summer	Fall
Without deer	2,509	4,640	4,462	3,987
With deer	2,507	4,638	4,461	3,986

Discussion

Carrying Capacity

A series of carrying capacities ranging from liberal (Scenario 1 – 100% forage consumption) to highly conservative (Scenario 7 – highway right-of-way exclusion; Scenario 8 – conifer species excluded) was determined for a significant portion of the Braeburn Elk range. The ecologically-sustainable carrying capacity (Scenario 6) was the most conservative scenario applied (while retaining the highway ROW and all conifer species) and values are easily compared to those of Chambers (2010); therefore, it will be the primary focus of this discussion. In contrast to a traditional carrying-capacity, an ecologically-sustainable carrying capacity uses the application of "safe-use" factors (i.e. % biomass available for consumption) to ensure range health and ecosystem sustainability. During the winter, when resources are most limiting, this carrying capacity is 3,782 individuals. In the absence of deer, it increases only slightly, to 3,784 individuals. The highest carrying capacity is in the spring, when the study area can support up to 5,094 individuals.

Overall carrying capacity values for all seasons were considerably higher in the Braeburn range than in the Takhini range (Table 10; Chambers 2010). In general, values in the Braeburn area were 20 to 30 times higher than in the Takhini area. An exception was in the fall, when Braeburn values were only approximately twice as high as those of the Takhini study. This was due to a higher abundance of leaf litter in the fall in the Takhini area than the Braeburn area, resulting in greater forage resources.

Table 17. Ecologically-sustainable carrying capacity values (# of elk) by season in the Braeburn and the Takhini elk range.

Values are presented for 2 scenarios (with and without horses/deer).

	Braeburn				Takhini			
	Winter	**Spring**	**Summer**	**Fall**	**Winter**	**Spring**	**Summer**	**Fall**
Without horses/deer	3784	5094	5031	4429	124	225	195	2058
With horses/deer	3782	5093	5030	4428	82	192	165	2029

The observed differences in values between the 2 studies can be attributed to multiple factors. First, the study areas differed considerably in size, with the Braeburn area covering 552 km^2 and the Takhini range extending only 95 km^2. In the absence of any other factors, if the 2 studies were carried out under identical assumptions and regional habitat conditions were the same, carrying capacity values would have been approximately 5.8 times higher in the Braeburn area than in the Takhini range simply because of this size difference.

Second, habitat conditions differed markedly between the 2 study areas, thus altering total biomass and forage index values. Specifically, the Braeburn range was dominated by conifer forest and low shrub habitat while the Takhini range was predominantly deciduous forest. Chambers (2010) did not directly measure available twig biomass in the Takhini range, but rather made the assumption that during the winter elk consume 29% browse; this was based on a previous study by Christianson and Creel (2007). However, browse consumption can vary considerably with forage availability, snow depth, and predation risk (Kufeld 1973, Florkiewicz 1994, Christianson and Creel 2007), and thus, in the current study, available twig biomass was measured and included in calculations of carrying capacity for all seasons. The inclusion of browse year-round, along with a greater relative abundance of conifer forest in the Braeburn study area compared to the Takhini range, may have contributed to higher overall carrying capacity values for the Braeburn area. Furthermore, wetlands were numerous in the Braeburn area and were included as 2 distinct habitat classes, while in the Takhini study, although less abundant, they were unaccounted for. Wetlands and associated riparian habitat provide important forage species for elk and are a key component of their ecosystem (Vallentine 2001, Boyd 2009). In the Takhini study, any forage resources they offered were not included in biomass calculations, potentially decreasing carrying capacity values.

Another factor possibly contributing to higher carrying capacity values in the current study is the presence of the large, fairly recent burn. The Fox Lake Burn (1998) was characterized by a high abundance of several species identified as preferred elk forage (e.g. *Populus tremuloides*, *Calamagrostis purpurascens*, *Artemisia frigida*, *Salix* spp.). The abundance of these species would have increased forage biomass and could have led to higher overall carrying capacities.

Finally, horses were assumed absent in the Braeburn study area while Takhini carrying capacity values were based on the presence of 15 horses. The absence of horses in the Braeburn study would have increased carrying capacity values due to reduced interspecific resource competition for the elk.

It is important to note that due to uncertainty surrounding the extent of conifer consumption by elk in the Yukon, carrying capacity values derived from Scenario 8 (conifer exclusion) may be more realistic than those including conifer (Scenario 6). Fall carrying capacity when conifer is excluded decreases approximately 34% (3,782 individuals to 2,507 individuals). These values provide a more conservative and appropriate measure upon which to set management goals and guidelines.

Caveats

The results of this study, specifically carrying capacity values, should be interpreted with caution. This study assumes that conifer trees and deciduous shrub and tree twigs provide an abundant forage resource year-round, becoming particularly important during the winter months. While these resources are commonly recognized as forage, they are often less palatable than leaves, forbs, and graminoids, and there may be a limit to the extent they are consumed. If indeed a limit to their consumption exists, it has not been factored into the calculations, and doing so may result in carrying capacity values that are lower than those reported.

Furthermore, this study assumes that elk are able to forage equally throughout the study area. This may not be the case as certain regions may be unavailable due to the presence of movement barriers, resource competitors, or predators. In addition, behavioural habitat requirements (e.g. calving sites) may prevent foraging in preferred habitat during certain times of the year. If certain areas are not available or selected, forage biomass would be less and carrying capacity vales would be lower than calculated.

Finally, as previously noted, the error associated with the land cover classification used in this study was high, with only 28% agreement with ground data collected for this study. This error likely results in a relatively high degree of error in predictions of forage distribution and available biomass across the study area and additional uncertainty in the reported carrying capacity values. Management recommendations derived from this study should acknowledge this uncertainty and strongly consider the potential conservation implications.

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APPENDIX 1 – Vascular plant species composition by plot.

Values are percent cover and are the sum of all vegetation strata measured. Remainder of plot was composed of non-vascular plants and non-living vegetation (i.e. litter, coarse woody debris) or was non-vegetated.

	Burned/exposed												*Tall Shrub*	*Low Shrub*			*Treed/shrub wetland*				*Herbaceous wetland*					
	22	23	24	59	60	63	64	94	95	96	97	98	62	19	58	69	50	52	55	72	53	54	71	78	86	87
Achillea millefolium	0.12	0	0	0	0	0	0	0	0	0	0.2	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0
Alnus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androsace septentrionalis	0	0	0	1.34	0	0	0	0	0	0	0	0	0	0	0.0002	0	0	0	0	0	0	0	0	0	0	0
Anemone multifida	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone narcissiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria rosea	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria spp.	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos uva-ursi	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0
Arnica angustifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arnica sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia frigida	0	3.7	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster alpinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster sibiricus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster spp.	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus adsurgens	0	0	0	4.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus bodinii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus eucosmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus tenellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula glandulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.6	0	0	0	0	0	0	0
Betula neoalaskana	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus ciliatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryophyte spp.	32.2	0	71.2	2.8	17	21.4	0	5	7	10	18	27	14	8	0.4	22	6	12.2	4.4	24.4	0	0	8	2	10	9
Bupleurum americanum	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis lapponica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.8	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Burned/exposed												*Tall Shrub*	*Low Shrub*			*Treed/shrub wetland*				*Herbaceous wetland*					
	22	23	24	59	60	63	64	94	95	96	97	98	62	19	58	69	50	52	55	72	53	54	71	78	86	87
Calamagrostis purpurascens	1.2	2.8	0	2.4	4.2	0	0	0	0	0	13	0	11.8	0	19	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis spp.	0	0	0	0	0	0	0	0	2.42	1.8	0	0	0	0	0	0	0	0	0	4.2	0	0	0	0	0	0
Calamagrostis stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0
Carex aquatilis	0	0	0	0	0	0	0	18	0	0.2	0	0	0	0	0	0	0	0	1.6	2	0	33.6	5.6	16	22	8.4
Carex atherodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41	0	0	0	0	0
Carex capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex concinna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex duriuscula	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex obtusata	0	0	0	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex spp.	0.1	0	0	0	0	0	0	0	0	0	0	0	0	5.6	0	2.4	1.6	4.4	0	0	0	0	0	0	0	0
Carex utriculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0
Castilleja raupii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamaerhodos erecta	0	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamerion angustifolium	4.1	0	1.9	0	0	8	0.8	0	0	0	0.2	1.8	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0
Conioselinum cnidiifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0
Crepis tectorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dasiphora fruticosa	0	0	0	0	0	0	0	0	0.42	1	0	0	0	0	0	0	7	0	0	0.7	0	0	0	0	0	0
Deschampsia caespitosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.6	0	0	0	0	0	0	0
Elymus trachycaulus	0	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum scirpoides	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum spp.	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron compositus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron glabellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriophorum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca altaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca brachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca saximontana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca trachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragaria virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fungi spp.	0.3	0	0.2	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0
Galium boreale	0	0	0	0	0	0	0	0	0	0	0.6	0	0.1	0	1.8	0	0	0	0	0	0	0	0	0	0	0
Gentiana propinqua	0.2	0	0	0	0	0	1.62	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Burned/exposed												*Tall Shrub*	*Low Shrub*			*Treed/shrub wetland*				*Herbaceous wetland*					
	22	23	24	59	60	63	64	94	95	96	97	98	62	19	58	69	50	52	55	72	53	54	71	78	86	87
Gentian sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentianella amarella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentianopsis detonsa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geocaulon lividum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Graminoid spp.	0.22	0	0.3	0	0	0	0	0	0	1	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0.2	0	0
Hedysarum alpinum	0	0	0	0	0	0	0	0	0.2	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0
Hedysarum boreale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hedysarum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hippuris vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0.4	0	0	0	0
Juncus balticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus castaneus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	7.7	0	0
Juniperus horizontalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kobresia myosuroides	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum decumbens	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Lichen spp.	2.4	0.1	0.5	0.4	0.6	5.2	0.4	0	0.2	0	15.9	9.4	27.6	0	4.4	0	0.4	0	0	0	0	0	0	0	0	0
Linnaea borealis	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Linum lewisii	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lupinus arcticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melilotus alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mertensia paniculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
Minuartia rubella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minuartia spp.	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0	0	0	0
Moneses uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orobanche fasciculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthilia secunda	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis campestris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0
Oxytropis deflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis nigrescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis splendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parnassia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.2	0	0
Pedicularis sudetica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0
Pedicularis verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon gormanii	0	1	0	3.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon procerus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petasites sagittatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0

Appendix 1 Continued

	Burned/exposed												*Tall Shrub*	*Low Shrub*			*Treed/shrub wetland*				*Herbaceous wetland*					
	22	23	24	59	60	63	64	94	95	96	97	98	62	19	58	69	50	52	55	72	53	54	71	78	86	87
Picea glauca	0.1	0	0	0	0	0.2	1.8	0	0.02	0	0	6.8	5.04	0.08	0	0	6.9	5	1	0.6	0	0	0	0	0	0
Platanthera hyperborea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platanthera sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polemonium pulcherrimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum amphibium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.2	1.8	0	0	0	0
Polygonum viviparum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus balsamifera	0	0	0	0	0	0	12.1	0	0	0	0	0.4	0	0	0	6.7	0	0	0	0	0	0	0	0	0	0
Populus tremuloides	50.2	0	2	0	14.5	0.4	0	0	0	0	14.4	2	5.2	0	41.4	0	0	0	0	0	0	0	0	0	0	0
Potamogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0
Potentilla arenosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arguta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla nivea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla pensylvanica	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla rubricaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Primula incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulsatilla ludoviciana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrola asarifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0
Pyrola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa acicularis	0	1.9	0	0	0	0	0	0	0	0	7.2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Rubus arcticus	0	0	0	0	0	0	0	0	0.62	0	0	0	0	0	0	0	0.1	5.8	0	0	0	0	0	0	0	0
Rumex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Salix bebbiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0
Salix glauca	0	0	5	0	0	0	0	0	0	23.8	0	0	0	0	0	0	55	0	47	0	0	0	0	0	0	0
Salix myrtillifolia	0	0	0	0	0	0	0	0	0	37	0	0.4	0	0	0	0	43.6	0	0	10	0	0	0	0	0	0
Salix planifolia	0	0	7	0	0	0	0	0	0	3	0	21.6	0	0	0	0	0	0	0	36.4	0	0	0	0	0	0
Salix pseudomonticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix pulchra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	0	0	2.4	0	0	0	0	0
Salix reticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix scouleriana	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix spp.	0.2	0	0	0	40.86	28	0	0	71	0	1	0	56	29	0.2	40	0	0	0	18.81	0	0	0	0	0	0.22
Saxifraga reflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lugens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0
Shepherdia canadensis	0	0	0.6	0	0	0	26	0	0	0	3	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0
Silene taimyrensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Burned/exposed												*Tall Shrub*	*Low Shrub*			*Treed/shrub wetland*				*Herbaceous wetland*					
	22	23	24	59	60	63	64	94	95	96	97	98	62	19	58	69	50	52	55	72	53	54	71	78	86	87
Sisyrinchium montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago multiradiata	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago simplex	0	0	0	0	0	0	0	0	0	0	0	0	3.4	0	4.4	0	0	0	0	0	0	0	0	0	0	0
Solidago spp.	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spiranthes romanzoffiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum spp.	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triglochan palustre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.004	0	0	0	0	0	0	0
Utricularia minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0	0	0
Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum edule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0
Zygadenus elegans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Herbaceous												Coniferous Forest									
	1	3	4	7	9	12	14	16	18	61	91	93	10	13	51	56	73	76	84	99	81	82
Achillea millefolium	0	0	0.2	0	0	0	0	0	0	0	0.18	0.8	0	0.1	0	0	0	0	0	0	0	0
Alnus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androsace septentrionalis	1.9	1.4	0.0006	0	0	0	0	0	0	0	0.002	0	0	0	0	0	0	0	0	0	0	0
Anemone multifida	0	0	0	0	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0
Anemone narcissiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0.02	0	0
Antennaria microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria rosea	0	0	5.7	0	0	0	0	0	0	0	25.2	0	0	0	0	0	0	0	0	0	0	0
Antennaria spp.	0	0	0	0	0	0.1	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis sp.	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos rubra	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	1.6	2	0	0	1	10	3.6
Arctostaphylos uva-ursi	0	0	30.6	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0
Arnica angustifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arnica sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia frigida	23	21	0	22	0	12	23.4	10.8	26	15	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia laciniata	0	0	0	0	6.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster alpinus	0	0.4	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster sibiricus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0
Astragulus adsurgens	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus americanus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus bodinii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus eucosmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus spp.	0.2	0	0	2.8	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0
Astragulus tenellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula glandulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0
Betula neoalaskana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0
Bromus ciliatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	0	0	0	0	0	0	0	0	0	0	6.8	0	0	0	0	0	0	0	0	0	0	0
Bryophyte spp.	0	0	0.5	0	0	0	0	0.2	0	0	0.2	32	23.62	9.1	60.1	45.8	35.5	15.8	51.2	48.2	42	48
Bupleurum americanum	0.4	0	2.1	0	0	0	0	0.4	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Calamagrostis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis lapponica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis purpurascens	3	0	13	3.4	12	17.6	21.6	16.4	7.8	0	0	0	0	3.8	0	0	0	0	0	0	0	0
Calamagrostis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0.4	0.2	0	0	0

Appendix 1 Continued

	Herbaceous												Coniferous Forest									
	1	3	4	7	9	12	14	16	18	61	91	93	10	13	51	56	73	76	84	99	81	82
Calamagrostis stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex aquatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex atherodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0
Carex concinna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.406	0	0	0	0	0	0
Carex duriuscula	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Carex filifolia	0	0	0	0	0	0	0	0	0	7.6	0	0	0	0	0	0	0	0	0	0	0	0
Carex obtusata	21	23	3.42	11	4	2.8	0	2.6	10.6	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex spp.	0	0	0	0	0	0	0	0	0	0	0	0	0.12	0.1	0	0	0.2	0	0	0	0.2	0.1
Carex utriculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Castilleja raupii	0	0	0.42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamaerhodos erecta	0	0	0	0	0	0	0	0	0	7.2	0	0	0	0	0	0	0	0	0	0	0	0
Chamerion angustifolium	0	0	0	0	0	0	0	0	0	0	0.6	14.6	0	0	1	0	0	0	0.2	0.2	0	0
Conioselinum cnidiifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis tectorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dasiphora fruticosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.402	0	0	0	0	2.6	0
Deschampsia caespitosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus trachycaulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Epilobium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum arvense	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	2.4	0	0	0	0	0	0
Equisetum scirpoides	0	0	0	0	0	0	0	0	0	0	0	2.2	2	0	0	0.444	0.46	0	0	0	0.6	8.9
Equisetum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0
Erigeron compositus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron glabellus	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.2	0
Eriophorum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca altaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca brachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca saximontana	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0.1	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0
Festuca trachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragaria virginiana	0	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0
Fungi spp.	0	0	0	0	0.12	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0
Galium boreale	0	0	0	0	0.4	0	0.6	0	0	0	0.2	0	0	0.1	0	0	0	0	0	0	0	0
Gentiana propinqua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentian sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentianella amarella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Herbaceous												*Coniferous Forest*									
	1	3	4	7	9	12	14	16	18	61	91	93	10	13	51	56	73	76	84	99	81	82
Gentianopsis detonsa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geocaulon lividum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.2	0	0.002	1	0	0.2	0	0
Graminoid spp.	0	0	0	0	0	0	0	0	0	0	0	5.2	0	0	0	0	0	0	0	0.06	0	0
Hedysarum alpinum	0	0	0.64	0	0	0	0	0	0	0	0	0	0	0	0	5.1	0.51	0	0	0	2.4	0
Hedysarum boreale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hedysarum sp.	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hippuris vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus balticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus castaneus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0
Juniperus horizontalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kobresia myosuroides	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0
Ledum decumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11.6	0	5	0	0
Lichen spp.	0.3	0.9	7.9	6.4	34.4	27.42	10.32	22.8	27.5	12.2	10.94	6.6	26.4	40.44	8	9.4	10.82	18.4	6.1	4.12	1.4	11.8
Linnaea borealis	0	0	0	0	0	0	0	0	0	0	0	0	1.04	0	0.8	0.3	0.02	0	0	4.62	0.02	1.2
Linum lewisii	0	0	0.02	0	0	0	1.24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lupinus arcticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0
Melilotus alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mertensia paniculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Minuartia rubella	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minuartia spp.	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0
Moneses uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Orobanche fasciculata	0	0	0	0	0	0	0.02	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthilia secunda	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.4	0.1
Oxytropis campestris	0	0	2.22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis deflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis nigrescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis splendens	1	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0
Oxytropis spp.	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parnassia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis sudetica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0
Pedicularis verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0
Penstemon gormanii	0	0.9	0	0.6	0	0	0.4	0.2	0	3.6	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon procerus	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0
Petasites sagittatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea glauca	0	0	0	0	0	0	0	0	0	0	0	0	38	28.522	42.1	51.22	8.602	25	3.2	40.46	27	38.5
Platanthera hyperborea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0

Appendix 1 Continued

	Herbaceous												Coniferous Forest									
	1	3	4	7	9	12	14	16	18	61	91	93	10	13	51	56	73	76	84	99	81	82
Platanthera sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0
Poa glauca	2.3	0.22	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa spp.	1	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polemonium pulcherrimum	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum amphibium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum viviparum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0
Populus balsamifera	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0
Populus tremuloides	0	0	0.4	0	6	0	0	0	0	0	0.6	0	0	2	0	0	0	0	0	5	0	0
Potamogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arenosa	0	1.8	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arguta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla nivea	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla pensylvanica	0	3.3	0	0	0	0	0	0	0	6.2	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla rubricaulis	0	0	0	0	0	1.6	1.4	0.3	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla spp.	1.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primula incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulsatilla ludoviciana	2.2	0.4	6.2	0	1.52	3.02	0.2	0	0.7	0	0	0	0	0.4	0	0	0	0	0	0	0	0
Pyrola asarifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0
Rosa acicularis	0	0	1.2	0	9	0	0	0.8	0	0	0	0	2.4	0	0	0.3	0	0	1	1.02	0	0
Rubus arcticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	0	0	0	0	0.02	0
Rumex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix bebbiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix glauca	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	0	0	0	0	0
Salix myrtillifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	4	0
Salix planifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix pseudomonticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix pulchra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix reticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0
Salix scouleriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4	0	0	0	3.4
Salix spp.	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	2.6	1.2	0.4	0	0.02	0	0.4
Saxifraga reflexa	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lugens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.26	0	0	0	0	0	0
Shepherdia canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.006	0	0	0	2.62	0.2	0
Silene taimyrensis	0	0	0	0	1.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium montanum	0	0	0	0	0	0	0	0	0	0.242	0	0	0	0	0	0	0	0	0	0	0	0
Solidago multiradiata	0	0	0	0	0.8	0.2	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Herbaceous												Coniferous Forest									
	1	3	4	7	9	12	14	16	18	61	91	93	10	13	51	56	73	76	84	99	81	82
Solidago simplex	0	0	1.2	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
Solidago spp.	0	0	0	0	0	0	0	0	0	0	0	1.5	0	0	0	0	0	0	0	0	0	0
Spiranthes romanzoffiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0.14	0	0	0	0	0	0	0.48	0	0	0	0	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	1.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triglochan palustre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utricularia minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	3	0	2.22	0	0
Viburnum edule	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0.4	0	0	0	0	0	0
Viola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygadenus elegans	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0

Appendix 1 Continued

	Broadleaf Forest										*Mixedwood Forest*																	
	83	6	8	15	21	66	70	75	90	92	2	57	74	5	11	17	46	47	48	49	67	68	77	79	80	85	20	65
Achillea millefolium	0	1.1	0.102	1.8	0	4	0	0	0	0	0	0.1	0	0.04	0	0	0	0.02	0	0.1	0	0.02	0.1	0	0	0	0.14	0
Alnus sp.	0	0	0	0	0	0	0	0	0	0	0	0	42.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androsace septentrionalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone multifida	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone narcissiflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anemone spp.	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria rosea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Arctostaphylos uva-ursi	0	34.7	4.4	13	0	0.8	5	4	0.6	36.2	0.8	34.6	0	0.1	0	2	0	0	21.2	24.2	10	0	0	0	0	0	40	0
Arnica angustifolia	0	0.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arnica sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0.4	0	0	0	0	0	0	0	0
Artemisia frigida	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster alpinus	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster sibiricus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster spp.	0	0	0	0	0	0.2	0	0.6	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0	0	0
Astragulus adsurgens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus americanus	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus bodinii	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus eucosmus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus tenellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula glandulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula neoalaskana	0	0	0	0	0	0	0	0	0	0	0	0	40.6	0	0	0	5	0	0	0	0	0	0	0	0	13.1	0	0
Bromus ciliatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus spp.	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryophyte spp.	0	0.2	0	0.02	8.1	0	0	0	0	0	1.02	0	21.6	0.02	26.4	7.72	4.42	1.4	0	0	0	0.1	1.1	2.2	1.1	7.8	0.3	0
Bupleurum americanum	0	0.6	0	0	0	0	0	0	0	0	0	0.56	0	0.3	0	0	0	0	1.14	0.7	0	0	0	0	0	0	0	0
Calamagrostis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.2	0	0	0	0	0	0
Calamagrostis lapponica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis purpurascens	0	3.6	0	14.2	0	18	0	2.4	0	5.24	0	4.2	0	13.8	1.5	0	0.1	1.14	0	9	5.3	0	9.6	0	0	0.4	4.6	13.2
Calamagrostis spp.	0	0	4.4	0	0	0	0.3	0	0	0	3.8	0	0	0	0	0	0	0	10.1	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Broadleaf Forest										*Mixedwood Forest*																	
	83	6	8	15	21	66	70	75	90	92	2	57	74	5	11	17	46	47	48	49	67	68	77	79	80	85	20	65
Calamagrostis stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex aquatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex atherodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex concinna	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.24	0	0	0	0	0	0	0	0	0	0
Carex duriuscula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex obtusata	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex spp.	0	0	0	0	0.4	0	0	0	0.1	0.02	0	0.4	0	0	0	0	0	0	0	0	0.1	0.4	0	0.22	0	0	0	0.64
Carex utriculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Castilleja raupii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamaerhodos erecta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamerion angustifolium	0	5.8	2.5	0	1.8	0	0.8	2.2	0	2.9	2.2	0.6	0.6	0.2	1.6	3.8	0.46	2.6	0.4	4.4	0.4	2.5	1.8	0	0	0	3.4	5
Conioselinum cnidiifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis tectorum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dasiphora fruticosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Deschampsia caespitosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus trachycaulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0.4	0	0	0	0	0	0	0
Epilobium sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0
Equisetum arvense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum scirpoides	0	0	0	0	0	0	0	0	0	0	0.122	0	0.022	0	0	0	0.04	0	0	0	0	0.02	0	0	0	1.9	0	0
Equisetum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron compositus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron glabellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eriophorum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca altaica	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Festuca brachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca saximontana	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca spp.	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca trachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragaria virginiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.5	0
Fungi spp.	0	0	0	0	0.22	0	0	0	0	0	0	0	0	0	0.1	0.3	0	0	0	0	0	0	0	0	0	0	0	0
Galium boreale	0	0.5	0	0.6	0	1.6	0.54	0.2	0	0	0	0.02	0	0.2	0	0	0	0	0.5	0.14	0	0	0.08	0	0	0	0.04	0
Gentiana propinqua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentian sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentianella amarella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3

Appendix 1 Continued

	Broadleaf Forest										*Mixedwood Forest*																	
	83	6	8	15	21	66	70	75	90	92	2	57	74	5	11	17	46	47	48	49	67	68	77	79	80	85	20	65
Gentianopsis detonsa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Geocaulon lividum	0	0	4.6	0	0	0	0	0	17.6	0	0	0	2.4	0	0.1	0	0	0	0	0	0	0	0.4	0	11	0	0	0
Graminoid spp.	0	0	0	0	0.2	0	0.8	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0
Hedysarum alpinum	0	0	0	0	0	0	0	8.8	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0.2	0	0	0	0	0.3
Hedysarum boreale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0
Hedysarum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hippuris vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus balticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus castaneus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniperus horizontalis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kobresia myosuroides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum decumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum groenlandicum	0	0	0	0	0	0	0	0	1.4	0	3.2	0	26	0	0	0	8.4	0	0	0	0	0	0	0	0	1	0	1.5
Lichen spp.	0	0	1.3	0	25.04	1.6	0	0	0	0.2	0.4	0	0.1	3.24	26.64	5.02	14	2.4	0	0	29	7.3	1	6.22	2.2	24.7	0.2	6.6
Linnaea borealis	0	0	0	0	0	0	0	5.2	0.142	0	6.2	0	0	0	0	2.7	5.62	12	0	0	0	2	3	0.02	1.8	0	10	0.2
Linum lewisii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lupinus arcticus	0	3	0	0	0	0	0	0	0	0	0.02	0	0	0.002	0	0	0	0	0	0	0	0	1	0	0	0	0.5	0.4
Melilotus alba	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mertensia paniculata	0	1.4	0	0	0	0	0	0.4	0	0	0.4	0	0.2	0	0	0	0	0	0	0	0	0	0.7	0	0	0	0	0
Minuartia rubella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minuartia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Moneses uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orobanche fasciculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthilia secunda	0	0	0	0	0	0	0	0	0.9	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis campestris	0	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.06	0	0	0	0	0	0	0	0
Oxytropis deflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis nigrescens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis splendens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Parnassia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis sudetica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon gormanii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon procerus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petasites sagittatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Picea glauca	15	6	6.002	0	8.102	1	7	1	0	2	0	21.2	14.4	20.602	37.406	8.102	28.6	16	20.8	14.8	16	33.5	10	27.22	35.1	34.5	6.02	7
Platanthera hyperborea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Broadleaf Forest										*Mixedwood Forest*																	
	83	6	8	15	21	66	70	75	90	92	2	57	74	5	11	17	46	47	48	49	67	68	77	79	80	85	20	65
Platanthera sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glauca	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa spp.	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polemonium pulcherrimum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum amphibium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum viviparum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus balsamifera	74	0	0	0	0	1.5	0	1	0	0	0	0	0	0	0	0.5	0	0.8	0	0	0	0	0	10	0	0	0	0
Populus tremuloides	0	37.2	46.2	35.4	60	33	51.7	50.2	55.4	30.4	3	53.5	2	28.2	10.1	34.6	25	25	11	25.2	20.2	10	35	10	0	0	10.8	12.2
Potamogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arenosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arguta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla nivea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla pensylvanica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla rubricaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primula incana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pulsatilla ludoviciana	0	1.4	0	0.2	0	0	0.04	0	0	0	0	0.1	0	0.32	0	0	0.2	0	1.04	0.6	0	0	0	0	0	0	1.3	0
Pyrola asarifolia	0	0	0	0	0	0	0	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa acicularis	21	1	0.1	25	0	14.8	1.2	4.3	0	1.22	0.32	1.7	0.9	2.2	0	1.6	0	0	0	0	2	0	0.4	0.22	0	0	0.2	1.1
Rubus arcticus	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rumex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix bebbiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.8	0	0	0	0	0	5	0	0	0	0	0
Salix glauca	0	3.2	0	0	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15.8
Salix myrtillifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix planifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.74	0	3.2	0	0	0	0	0	0
Salix pseudomonticola	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix pulchra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix reticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix scouleriana	0	0	0	0	0	0	0	0	5	0	0.42	0	1.2	0	0	0	0	0.8	0	0	0	0	0	0	6	3	0	0
Salix spp.	0	11	2	0.5	1.5	0	2	0	0	7.8	0	0	15	0	1	1	7	9.6	0	0	2.4	0	0	4	0	0	8.9	4.4
Saxifraga reflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lugens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shepherdia canadensis	0	0.2	0	2.6	0	0	11.4	0	7.7	0	0	0	0	0	0	0.8	10.6	0.8	0	0	15.6	19	0	10.6	4.4	0.2	0	0.1
Silene taimyrensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago multiradiata	0	0	0	0.8	0.1	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0

Appendix 1 Continued

	Broadleaf Forest										Mixedwood Forest																	
	83	6	8	15	21	66	70	75	90	92	2	57	74	5	11	17	46	47	48	49	67	68	77	79	80	85	20	65
Solidago simplex	0	0	0	0	0	4.8	0.12	0	0	0.04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spiranthes romanzoffiana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria longifolia	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Triglochan palustre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utricularia minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	2.8	0	6.6	0	1.64	0	0	0	1	0.6	0	0	0	0	0	0	1.2	0.2	11.2	3
Viburnum edule	1.2	0	0	4.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygadenus elegans	0	0.2	0	0	0	0	0	0	0	0	0.22	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Roadside																			
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Achillea millefolium	0	1.01	0.52	0.09	0.7	0.28	2.3	0.66	0.902	1.56	3	2.6	1.1	0	3.5	0.94	0	1.3	0.2	0.2
Alnus sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Androsace septentrionalis	0	0	0.02	0	0	0	0	0	0	0.22	0	0.24	0	0	0.43	0	0	0	0	0
Anemone multifida	0	1.81	0	0	1.52	4.4	2.8	0	0	0	0	0	0	0.1	5.6	0	0	0	0	0
Anemone narcissiflora	0	0	0	1.5	0	0	0	0	0	4.4	.	0.2	0.66	0	0	0	0	0	0	0
Anemone spp.	0	0	0	0	0	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0	0
Antennaria microphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antennaria rosea	0	0	0	0.08	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0
Antennaria spp.	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arabis exilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.04	0	0	0	0	0
Arabis sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos rubra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctostaphylos uva-ursi	0	0	0	0	0	0	0	2.7	0	0	0	0	0	0	0	0	0	0	0	0
Arnica angustifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arnica sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia frigida	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Artemisia laciniata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster alpinus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aster sibiricus	0	2.8	0	1.16	0	0.1	0	0	7	0	0	0	0	0	0	0.2	0	0	1	0
Aster spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus adsurgens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus americanus	0	4.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus bodinii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus eucosmus	0	0	0	0	0.02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astragulus tenellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.5	0	0	0	0
Betula glandulosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Betula neoalaskana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus ciliatus	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bromus inermis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.1	1.64	3.4	0
Bromus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryophyte spp.	0	0.02	0.4	0.2	0.4	0.3	0	0.2	4.402	3.2	0	2.1	0.2	0.4	0.6	0	0	1.6	0.1	0.4
Bupleurum americanum	0	0	0	0.2	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Calamagrostis canadensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis lapponica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calamagrostis purpurascens	0	0.41	0	1.2	0	0	0	0	0	0.42	0	0	0.2	0	2	0	0	0	0	0
Calamagrostis spp.	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Roadside																			
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Calamagrostis stricta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex aquatilis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex atherodes	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex capillaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex concinna	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Carex duriuscula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex filifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex obtusata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carex spp.	0	0.01	0	0.13	0.02	0	0	1.8	3.8	1.3	0.4	0	0.8	0	1	0	0	0	0	0
Carex utriculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Castilleja raupii	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chamaerhodos erecta	0	0	0	0	0	0	0	0	0	2.06	0	0	0	0	0	0	0	0	0	0
Chamerion angustifolium	0	0.2	1.66	0	0.6	0.3	0.4	0.72	0.2	0.4	0.62	0	0	0.2	0	3.5	0.4	0.2	0	1.9
Conioselinum cnidiifolium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepis tectorum	0	0	0.22	0	0	0	0.262	0	0	0.52	0	2.4	0.1	0.3	0.3	0	0	0	0	0
Dasiphora fruticosa	0	0	0	0	0	0	0	0.7	0	0	0	0	0	0	0	0	0	0	0.4	0
Deschampsia caespitosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elymus trachycaulus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Empetrum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epilobium sp.	0	0	0	0	0	0	0	0	0.1	0	0	0.02	0	0	0	0	0	0	0	0
Equisetum arvense	0	0	0	0	0	0	0	2.7	1.4	0	0	0	0	0	0	1	2	0	0.46	0
Equisetum scirpoides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Equisetum spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron compositus	0	0	0	0	0	0	0.92	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron glabellus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erigeron spp.	0	0	0	0	0.202	0	0	0	0	0	0	0	7.8	0	0	0	0	0	0	0
Eriophorum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca altaica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca brachyphylla	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca saximontana	0	0	5.76	0	0	0	0	0	0	0	0	0	0	0	2.7	0.4	0	0	0	0
Festuca spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Festuca trachyphylla	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fragaria virginiana	0	7	0	2	0	47	0	0	0	1.2	0.4	0.4	0	0.42	0	1.4	0	0	0.2	4.64
Fungi spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galium boreale	0	0	0	0	0	0	0	0	0	0	4.4	0	0	0	0	0	0	0	0	0
Gentiana propinqua	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentian sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Roadside																			
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Gentianella amarella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gentianopsis detonsa	0	0	0	0	0	0	0	0	0	0	0	0.02	0	0	0	0	0	0	0	0
Geocaulon lividum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Graminoid spp.	0	0.02	0	0	0.02	0	4.8	0.82	6.2	0.5	1.8	4.4	3.6	0.66	0	0	0	0	1.8	0
Hedysarum alpinum	0	0	0	1	0	0	0	0	0	0	0.1	0	0	4	0	0	0	1.2	2.6	0
Hedysarum boreale	0	13.6	0	0	0	0	0	0	0	0	4	0	0	0	0	0	6.4	0	0.2	0
Hedysarum sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hippuris vulgaris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus balticus	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0
Juncus castaneus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juncus spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Juniperus horizontalis	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kobresia myosuroides	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum decumbens	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ledum groenlandicum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lichen spp.	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Linnaea borealis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Linum lewisii	0	0	0	0.12	0.022	0.02	0.02	0.002	0	0	0	0	0	0.02	1.7	0	0	0.4	0	0
Lupinus arcticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melilotus alba	0	3.2	6	0.7	0	0	21.6	0.32	0	4.6	0	0	0	0	0	0	0	0	0	0
Mertensia paniculata	0	0.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minuartia rubella	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minuartia spp.	0	0	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0
Moneses uniflora	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orobanche fasciculata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orthilia secunda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxytropis campestris	0	0	0	0	0	0	0	0	0	7	10.8	47	5.8	13.8	4.2	0	2	1.6	20.6	0
Oxytropis deflexa	0	1	0	33	0.6	0.2	0	0.4	0	1	0	1	0	1	0	4	0.9	7.8	0.2	8.4
Oxytropis nigrescens	0	0	0	0	0	0	2.8	0	0	0	0	0	0.04	0	0	0	0	0	0	0
Oxytropis splendens	0	0	0	0.14	0	0.2	8.8	0	0	0	0.6	0	0	0	0	0	4.6	0	3	0
Oxytropis spp.	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0
Parnassia palustris	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis sudetica	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedicularis verticillata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Penstemon gormanii	0	0	0	0	0	0	0.102	0	0	0	0	0	0	0	0.8	0	0	0	0	0
Penstemon procerus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petasites sagittatus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1 Continued

	Roadside																			
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Picea glauca	0	3	1.2	1	1	0	0	1.2	0.6	0	0.8	0	0	0	0	0	0	2	0	5.8
Platanthera hyperborea	0	0	0	0	8.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Platanthera sp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glauca	0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0
Poa pratensis	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0	0	0	0
Poa spp.	0	0.01	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0
Polemonium pulcherrimum	0	0	0	0	0	0	0	0	0	0.4	0	0.2	0	0	3.2	0	0	0	0	0
Polygonum amphibium	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygonum viviparum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Populus balsamifera	0	20	1.7	16.2	0	6.4	3	1.8	0	0.6	0.2	0	1.3	0.2	0	0	4.4	0.1	0.6	0
Populus tremuloides	0	0	0	0.2	0	4.9	0	0	0	0	15.6	26.6	0	0	0	0	0	0	0	1.2
Potamogeton sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arenosa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla arguta	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Potentilla nivea	0	0	0	0	0	0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0
Potentilla pensylvanica	0	0.4	0	0	0	0.4	0	0	0.06	0	0	0	0.4	0	5.6	0	0	0	0	0
Potentilla rubricaulis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potentilla spp.	0	0	0	0	0	0	0	0	0.46	0.2	0.16	0.6	0	0	0	0	0	0	0	0
Primula incana	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Pulsatilla ludoviciana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyrola asarifolia	0	0	0	0	0	0	0	0.08	0	0	0	0	0	0	0	0	0	0	0	0
Pyrola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rosa acicularis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0
Rubus arcticus	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rumex sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix bebbiana	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix glauca	0	2	4	0	1.2	0.2	0	31.6	46.8	0	1.6	0	0	0	0	1	0	0.4	0	0
Salix myrtillifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix planifolia	0	0	0	0	0	1	0	10	0	0	0	0	0	0	0	0	0	0	0	2
Salix pseudomonticola	0	0	0	0	0	0	0	0	4.6	0	0	0	0	0	0	0	0	0	0	0
Salix pulchra	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix reticulata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix scouleriana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Salix spp.	0	0	3	0	0	0	0	2.2	0	0	0	0	0	0	0	0	0	0	0	0
Saxifraga reflexa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Senecio lugens	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0
Shepherdia canadensis	0	1	0	0	13	0	0	10	0.1	0	0.4	0	0	0	0	0	2	0	0	0.4

Appendix 1 Continued

	Roadside																			
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
Silene taimyrensis	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sisyrinchium montanum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solidago multiradiata	0	0	0.46	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0
Solidago simplex	0	0.81	0.08	0.61	2.4	1.6	0.8	0	0	1.3	1.8	3	1.26	0.9	0.26	5	1.6	2.9	0	3
Solidago spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spiranthes romanzoffiana	0	0	0	0	0	0	0	0.08	0.2	0	0	0	0	0	0	0	0	0	0	0
Stellaria longifolia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stellaria spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stipa comata	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum officinale	0	0	0	0	0	1.6	0	1.22	0	0	0	0	0	0	0	0	0	0	0	0
Taraxacum spp.	0	0	0	0	0.02	0	0.44	0	1.16	0.06	2.2	0.8	0	0	3.6	0.2	0	2.6	1.26	0.2
Trifolium pratense	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0.6
Triglochan palustre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Utricularia minor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vaccinium vitis-idaea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viburnum edule	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Viola sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zygadenus elegans	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX 2. – Representative habitat class photos.

Figure 2.1. Low shrub habitat.

Figure 2.2. Shrub/treed wetland.

Figure 2.3. Tall shrub habitat.

Figure 2.4. Herbaceous wetland.

Figure 2.5. Herbaceous habitat.

Figure 2.6. Conifer forest.

Figure 2.7. Broadleaf forest.

Figure 2.8. Mixedwood forest.

Figure 2.9. Burned/exposed land.

Figure 2.10. Roadside right-of-way.

APPENDIX 3 – Carrying Capacity Calculations

Total area of the community type within the study area

End of growing season biomass of all graminoids, forbs and shrubs

Peak biomass - forb biomass + leaf litter biomass

Fall biomass - 50% deciduous shrub biomass (i.e. leaf portion). Assumes 1:1 mass of stem:leaf (Yang et al. 2010). Conifer shrub biomass remains available

Each Fic value is weighted by the maximum Fic value for that season (i.e. 1.14/2.06)

Vegetation Type	Area (ha)	% study area	Biomass (kg)	Peak Biomass (kg/ha)	Leaf litter biomass (kg/ha)	Fall biomass (kg/ha)	Winter biomass (kg/ha)	Fic - Winter	Fic - Spring	Fic - Summer	Fic - fall	Biomass - Winter	Biomass - Spring	Biomass - Summer	Biomass - Fall	Biomass - year
				Biomass Values				**Forage index Values**				**Seasonally Weighted and FIC Weighted Biomass**				
Mixedwood Forest	522	1.03%	1081698.84	2072		2052	1543	1.14	0.62	0.72	0.66	184449.02	59936.78	110284.33	55064.98	1081698.84
Broadleaf Forest	992	1.96%	444376.32	448	140	527	207	1.13	1.23	1.37	1.51	46596.83	48848.52	86207.77	61450.88	444376.32
Coniferous Forest	15708	30.97%	25348942.08	1614		1594	1594	1.05	0.32	0.39	0.36	5281397.48	724945.20	1399907.71	702231.28	25348942.08
Herbaceous	4232	8.34%	3173111.28	750		737	503	1.52	1.44	0.95	0.87	650127.48	408359.97	426858.44	211376.04	3173111.28
Herbaceous Wetland	1124	2.22%	2186921.84	1946		1905	1901	0.54	0.93	1.53	2.14	231662.76	181765.55	473805.01	356776.33	2186921.84
Shrub/Treed Wetland	438	0.86%	1081562.16	2469		2435	1653	1.87	1.71	1.63	1.97	271943.69	165288.62	249639.93	163642.34	1081562.16
Low Shrub	16419	32.37%	23603954.4	1438		1438	914	2.06	1.87	1.63	2.04	6207002.77	3944770.46	5448128.37	3750160.98	23603954.40
Tall Shrub	2645	5.21%	2661187.4	1006		949	541	2	2	1.78	2.02	574589.12	475664.59	670765.04	395041.71	2661187.40
Burned/Exposed	8363	16.49%	14175368.63	1695		1172	633	1.78	1.69	1.64	1.82	1891637.78	2140998.83	3291949.54	1389027.47	14175368.63
Roadside	278	0.55%	565835.64	2035		1905	1045	0.83	1.33	1.01	0.77	48422.09	67256.97	80925.73	31766.90	565835.64
Total Area	**50721**	100.00%	**Total Biomass**	**15473**	**140**	**69411156**	**53063930**					**Total Biomass**	**15387829.03**	**8217835.49**	**12238471.89**	**7116538.92**	**74322958.59**

Values

Total peak biomass	74322958.6
Elk weighted average weight	238
Elk forage consumption	7.14
Elk winter forage consumption	7.14

Ungulates require 3% of their body weight in forage/day

Amount (total kg) consumed by X number of horses or mule deer in a year

Mule deer have an 18% dietary similarity with elk (Hansen and Clark 1977)

Horses and Mule Deer

Annual forage consumption

	Number	Weight (kg)	Unweighted	Weighted
Horses	0	450	0	0
Mule Deer	25	88	24090	4336.2

Seasonal forage consumption

	Winter	Spring	Summer	Fall
Unweighted				
Horses	0.00	0.00	0.00	0.00
Mule Deer	10037.50	4015.00	6022.50	4015.00
Weighted				
Horses	0.00	0.00	0.00	0.00
Mule Deer	1806.75	722.70	1084.05	722.70

Safe-use Factors

Available Biomass

Winter	Spring	Summer	Fall
4079510.34	2218804.49	3305015.27	1929114.55

25% of available biomass for forested vegetation types, 50% for graminoid vegetation types

Scenario 1: Maximum carrying capacity

Scenario 2: Seasonally weighted carrying capacity

Scenario 3 : Adjustment for diet similarities between mule deer and elk diets

Scenario 4 : Adjustment for seasonal forage availability

Scenario 5: Adjustment for forage preference

Scenario 6 : Application of ecologically sustainable safe-use factors

Scenario 7 : Klondike Highway right-of-way biomass excluded

Carrying Capacity

Scenario	Winter	Spring	Summer	Fall
1	28519	28519	28519	28519
2a*	28519	28519	28519	159368
2b	28510	18859	18622	159359
3a	28519	28519	28519	159368
3b	28517	28517	28517	159366
4a	49218	28519	28519	159368
4b	49216	28517	28517	159366
5a	14273	19183	19045	16340
5b	14271	19181	19044	16338
6a	3784	5094	5031	4429
6b	3782	5093	5030	4428
7a	3761	5017	4970	4393
7b	3760	5016	4968	4391

* a - carrying capacity without mule deer
b - carrying capcaity with mule deer