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RÉSUMÉ

La cueillette de petits fruits est une activité importante dans les communautés nordiques. Ce projet a comme objectif de décrire la distribution des quatre espèces de petits fruits prisées par les Inuit à Baker Lake, Nunavut, soit *Vaccinium vitis-idaea* L., *Vaccinium uliginosum* L., *Empetrum nigrum* L., et *Rubus chamaemorus* L., dans une variété de végétation, et d'évaluer la productivité pour deux de ces espèces. En mars 2009, nous avons entrepris des entrevues dans la communauté avec 26 ainé(e)s pour recueillir de l'information sur l'importance des petits fruits dans leurs vies. De plus, nous voulions savoir s'ils avaient remarqué des transformations sur le territoire dans le contexte des changements climatiques. À partir de la classification d'images satellites (Landsat) des secteurs homogènes (minimum 90 m × 90 m) dans sept zones de végétation différentes où des arbustes à petits fruits étaient présents ont été identifiés. Au cours de l'été 2009, j'ai évalué le couvert végétal et complété une description de l'habitat pour 83 parcelles de végétation (5 m × 5 m) représentant les sept zones de Baker Lake et le long de la rivière Thelon. Un total de 95 espèces de plantes vasculaires et quatre taxons de cryptogames a été documenté. Le terrain était dominé par les cryptogames et les arbustes. Une analyse d'ordination indirecte (DCA) montre des distinctions claires entre les zones de graminées, d'arbustes hauts et de sol clairsemé, tandis qu'il y avait peu de différences entre les zones d'arbustes nains. *Betula glandulosa* était l'espèce d'arbuste la plus abondante à travers nos sites. Dans la zone à couvert arbustif haut (> 40 cm) *B. glandulosa*, *Salix planifolia* et *V. vitis-idaea* représentaient la majorité du couvert de plantes vasculaires. *Vaccinium uliginosum* était l'espèce vasculaire la plus fréquente (95 % des sites), tandis que *V. vitis-idaea* et *E. nigrum* ont été observés dans 90 % et 88 % des sites respectivement. *Rubus chamaemorus* se trouvait dans 14 % des sites, et seulement le long de la rivière Thelon. En automne 2009 et 2010, les petits fruits d'*E. nigrum* et *V. vitis-idaea* ont été récoltés (20 quadrats de 25 cm × 25 cm) dans 29 des 83 parcelles. On a observé une productivité plus élevée pour *E. nigrum* que pour *V. vitis-idaea* (5-112 g/m^2 et < 1-87 $/m^2$, respectivement) en 2009 et (< 1-22 g/m^2 et < 1-11 g/m^2) en 2010. Il n'y avait aucune différence significative de productivité entre les zones. Les deux espèces ont montré une productivité plus élevée en 2009 qu'en 2010 ($p < 0.001$). Ces résultats soulignent que malgré des différences importantes dans le recouvrement et les conditions environnementales dans les diverses zones étudiées, il y a plus de variabilité entre les années et on ne peut pas conclure que certaines zones sont plus productives que les autres (trop de variabilité intra-zone). Un suivi des parcelles sur plusieurs années sera nécessaire pour évaluer la variation inter-annuelle de la productivité sur les arbustes à petits fruits. Cette étude représente une contribution essentielle pour comprendre la composition et la structure des communautés végétales dans lesquelles existent les arbustes producteurs de petits fruits de Baker Lake.

Mots-clés : Baker Lake, Nunavut, petits fruits, arbustes, communautés végétales, changements climatiques

CHAPITRE I

RÉSUMÉ SUBSTANTIEL

1.1 Introduction

La cueillette des petits fruits est une activité importante dans les communautés inuites (Parlee & Berkes 2005; Murray *et al.* 2005) et les petits fruits constituent une source abondante de vitamine C (Fediuk *et al.* 2002) et d'autres antioxydants (Hakkinen *et al.* 1999; Kahkonen *et al.* 2001) dans leur alimentation. Comme c'est le cas pour d'autres espèces, il est bien connu que la distribution spatiale et temporelle, ainsi que la productivité des arbustes à petits fruits varient en fonction de facteurs environnementaux (*p. ex.* Krebs *et al.* 2009; Murray *et al.* 2005; Suring *et al.* 2008; Wallenius 1999; Yudina & Maksimova 2005; Miina *et al.* 2009; Ihalainen & Pukkala 2001; Saastamoinen *et al.* 2000). Cependant, l'écologie des espèces productrices de petits fruits dans l'Arctique canadien n'est que peu documentée (voir Krebs *et al.* 2009; Murray *et al.* 2005).

À Baker Lake, au Nunavut, *Vaccinium vitis-idaea* L., *Vaccinium uliginosum* L., *Empetrum nigrum* L., et *Rubus chamaemorus* L. sont les quatre espèces de petits fruits les plus récoltées. Selon les ainé(e)s de la communauté, la distribution ainsi que la productivité de ces espèces varient en fonction de la topographie et du climat, mais surtout avec les précipitations (Cuerrier *et al.*, en prép.). Nous nous sommes donc intéressés à évaluer la distribution et à estimer la productivité des espèces d'arbustes à petits fruits près de la communauté, parmi les différentes communautés végétales sur le territoire. Cette étude est donc la première à lier le savoir traditionnel avec des approches scientifiques touchant à l'écologie de ces arbustes producteurs de petits fruits dans le centre de l'Arctique canadien. Elle contribuera à un effort de recherche entrepris avec des partenaires dans l'est du Nunavut, au Nunavik et au Nunatsiavut afin de mieux comprendre l'écologie de ces espèces dans l'Arctique canadien.

1.2 Problématique

Des changements au niveau de la végétation, des températures plus élevées, et des conditions hydrologiques plus sèches sont observés par les Inuit dans l'Arctique canadien (*p. ex.* Thorpe *et al.* 2002; McDonald *et al.* 1997; Ford & Community of Igloolik 2006; Jolly *et al.* 2002; Govt. of Nunavut 2005). L'augmentation des températures globales affecte fortement les régions arctiques où des changements de végétation sont prévus (Walker *et al.* 2006) et déjà détectables par endroits (Myers-Smith *et al.* 2011; Elmendorf *et al.* 2012). Cependant, peu d'information est disponible sur la résistance des communautés végétales aux changements climatiques (Hudson & Henry 2010). De tels changements pourraient notamment influencer la composition, la structure, et la dynamique des communautés végétales (Aerts *et al.* 2006; Wookey *et al.* 2009), ainsi que les interactions entre espèces (Aerts *et al.* 2006; Parsons *et al.* 1994; Chapin *et al.* 1992, 1995). Présentement, une augmentation du couvert des arbustes érigés en Alaska (Tape *et al.* 2006), dans l'Arctique canadien (Ropart et Boudreau 2012; Lantz *et al.* 2010; Tremblay *et al.* 2012) et ailleurs dans le monde est de mieux en mieux documentée (Elmendorf *et al.* 2012; Myers-Smith *et al.* 2011). Au Nunavik, *Betula glandulosa* est l'espèce responsable de plus de 90 % de l'augmentation du couvert d'arbustes observée entre 1960 et 2003 (Tremblay *et al.* 2012; Ropart et Boudreau 2012). Ceci pourrait avoir un impact négatif sur la distribution et la productivité des arbustes nains producteurs de petits fruits, car ceux-ci sont sensibles à la compétition pour la lumière et les éléments nutritifs (Press *et al.* 1998).

Pour évaluer l'hétérogénéité des changements temporels de la végétation dans les régions vastes et isolées, la télédétection est un outil utile. La carte « Circa 2000 Land Cover Map », développée à partir de l'indice de végétation de la différence normalisée (NDVI) d'images Landsat de résolution moyenne (30 m), caractérise le couvert végétal selon les formes de croissance dominantes pour 15 zones à travers l'Arctique canadien (Olthof *et al.* 2009). Cette carte nous a permis de choisir nos sites en fonction de la présence d'arbustes producteurs de petits fruits. Ensuite, sur le terrain, l'échantillonnage nous a fourni une caractérisation détaillée du couvert végétal.

1.3 Objectifs

Cette étude vise à quantifier l'abondance d'arbustes producteurs de petits fruits en lien avec les autres espèces arbustives à proximité de Baker Lake. Elle cible les quatre espèces de petits fruits les plus consommés par les Inuit, soit *Vaccinium vitis-idaea* L., *Vaccinium uliginosum* L., *Empetrum nigrum* L., et *Rubus chamaemorus* L. (Cuerrier *et al.*, en prép.).

Les objectifs sont :

1. Caractériser la distribution d'arbustes producteurs de petits fruits parmi différentes communautés végétales autour de Baker Lake, Nunavut.
2. Comparer la productivité d'*E. nigrum* L. et *V. vitis-idaea* L. dans différentes communautés végétales autour de Baker Lake, Nunavut.

Les deux objectifs sont traités dans le chapitre II, sous forme d'article scientifique, « Berry shrub distribution and productivity estimates for *Empetrum nigrum* L. and *Vaccinium vitis-idaea* L. in the vicinity of Baker Lake, Nunavut ». En annexe se trouve une liste complète des espèces observées dans nos sites d'étude, les tableaux de données du couvert végétal et des facteurs environnementaux, ainsi que les données de poids et de productivité des petits fruits en 2009 et en 2010.

1.4 Méthodologie

1.4.1 Site d'étude

Le village de Baker Lake (*Qamani'tuaq*) (64°19' N, 96°01' W) est une communauté principalement inuite dans la région Kivalliq (Figure 1.1). Il s'agit de la seule communauté à l'intérieur des terres au Nunavut. Nous avons choisi Baker Lake comme site d'étude pour ses données climatologiques à long terme (depuis 1945), ainsi que pour les bons rapports déjà établis dans la communauté, tant pour le savoir inuit

(Fox 2003) que pour l'écologie végétale (Krebs 1963; Svoboda & Staniforth 1998; Levasseur 2007). Baker Lake est un site ITEX depuis 1992, une étude à long terme initiée par Dr Josef Svoboda et poursuivie par Lucie-Guylaine Levasseur en 2005.

Figure 1.1 : Carte du Nunavut montrant la localisation de Baker Lake. Modifié de http://commons.wikimedia.org/wiki/File:Canada_%28geolocalisation%29.svg.

La région est située dans le Bas-Arctique, dans le domaine bioclimatique de la toundra à arbustes nains érigés (Walker *et al.* 2005). La topographie varie entre collines et plaines, zones humides et affleurements rocheux (Bureau géoscientifique Canada-Nunavut 2007). La température moyenne annuelle est de -11,8 °C et la température moyenne au mois de juillet est de 11,4 °C. Le vent souffle en moyenne à 20 km/heure et provient principalement du nord-ouest. Baker Lake reçoit en moyenne 157 mm de pluie et 131 mm de neige par année (Environnement Canada 2008).

1.4.2 Espèces étudiées

La nomenclature scientifique est basée sur Aiken *et al.* (2007), et les noms en Inuktitut proviennent de Hattie Manniq (comm. pers. 2009). L'information sur la préférence d'espèces de petits fruits et leur utilisation a été obtenue au cours d'entrevues menées auprès de 24 aîné(e)s/experts locaux en 2009 (Cuerrier *et al.*, en prép.).

***Empetrum nigrum* L. Famille Empetraceae**

Dans l'Arctique, la camarine noire (« *paurngaq* ») est un arbuste rampant et nain (< 15 cm), aux feuilles sempervirentes, qui préfère les sols sableux, rocheux ou acides (Porsild & Cody 1980). Elle produit des petits fruits noirs et juteux bien aimés par les Inuit à Baker Lake (Cuerrier *et al.*, en prép.).

***Vaccinium vitis-idaea* L. subsp. minus (Lodd.) Hultén, Famille Ericaceae**

La canneberge ou l'airelle (« *kimminaq* ») est un arbuste sempervirent d'une hauteur de 2 - 10 cm. Elle est communément trouvée dans les communautés d'éricacées xériques à humides (Johnson 1987) avec mousses et lichens. Les petits fruits sont rouge vif, ils ont un goût aigre et sont traditionnellement utilisés pour combattre les maux de gorge (Vera Avaala, com. pers. 2009).

***Vaccinium uliginosum* L. subsp. microphyllum (Lange) Tolm., Famille Ericaceae**

Le bleuet (« *kegotangenak* ») est un arbuste nain (moins de 15 cm de haut à Baker Lake) à feuilles caduques. On le trouve sur des sols acides (Porsild & Cody 1980), en toundra humide, ainsi qu'en milieux rocheux et exposés (Ootoova *et al.* 2001). Les petits fruits bleu foncé sont plus sucrés que *E. nigrum* et *V. vitis-idaea* et sont prisés dans la communauté (Cuerrier *et al.*, en prép.).

***Rubus chamaemorus* L., Famille Rosaceae**

La chicouté (« *akpik* ») est une espèce vivace (Mallory & Aiken 2004) aux feuilles décidues. Elle peut atteindre de 6 à 20 cm et est commune dans les tourbières humides (Porsild & Cody 1980). Le petit fruit ressemble une framboise orange qui devient plus pâle et molle en mûrissant. *Akpik* est l'espèce la plus prisée par les Inuit à Baker Lake (Cuerrier *et al.*, en prép.).

1.4.3 Les entrevues

Pour avoir l'avis des membres de la communauté et leurs idées au sujet des petits fruits dans le contexte des changements climatiques, nous avons interviewé 24 aîné(e)s de Baker Lake à l'aide d'une interprète en mars et avril 2009.

1.4.4 La végétation

Des milieux homogènes (minimum 3 × 3 pixels; 90 m × 90 m) ont été identifiés à partir d'images Landsat de résolution moyenne (30 m) associés à la carte « Circa 2000 Land Cover Map » (Olthof *et al.* 2009). Nous avons choisi des habitats où se trouvaient des petits fruits tout en évitant les zones humides. Il n'y avait pas de sites homogènes d'arbustes hauts (> 40 cm) près de Baker Lake, mais quatre parcelles ont pu être échantillonnées le long de la rivière Thelon. Donc, à l'aide du logiciel ArcGIS (ESRI, version 9,2), nous avons choisi 83 parcelles parmi sept des quinze zones de végétation présentées par Olthof *et al.* (2009). Soixante-douze de ces parcelles se trouvaient dans un rayon de 10 km autour de Baker Lake et 11 se situaient le long de la rivière Thelon, entre le lac Schwartz et le lac Aberdeen.

L'échantillonnage a été effectué au cours de l'été 2009. Une description de chaque site a été effectuée, et un échantillon de sol a été prélevé à chaque site pour analyse de texture, matière organique, et d'éléments nutritifs. Dans chaque parcelle, on a positionné un quadrat de 5 m × 5 m dans un milieu représentatif de l'habitat. Le pourcentage de recouvrement pour chaque taxon a été évalué selon la classification de recouvrement de Braun-Blanquet (1932). Nous avons identifié, à l'espèce, les plantes vasculaires se trouvant à l'intérieur de la parcelle. Si une espèce ne se trouvait pas dans la parcelle, mais très près, dans le même habitat, elle a été identifiée et désignée comme espèce 'trace'. La nomenclature des espèces suit la classification de Aiken *et al.* (2007). Les lichens ont été identifiés selon leur forme de croissance (crustacé, fruticuleux et foliacé) et le pourcentage de recouvrement a été noté. Le recouvrement de mousses a aussi été noté. Les espèces non-identifiées ont été récoltées et ramenées à l'herbier de l'UQTR pour identification. Une valeur moyenne a été calculée pour chaque classe Braun-Blanquet, et cette valeur a été utilisée comme moyenne de recouvrement pour chaque espèce. La fréquence, la richesse spécifique, ainsi que les moyennes de recouvrement des espèces dominantes et les formes de croissance ont été déterminées pour évaluer la distribution des arbustes producteurs de petits fruits parmi les sept zones de végétation échantillonnées.

Nous avons utilisé des analyses multivariées, dont des approches d'ordination indirecte (DCA, CANOCO 4,53, ter Braak & Smilauer, 2004) pour évaluer les similitudes et les différences entre les communautés végétales.

1.4.5 La récolte de petits fruits

En septembre 2009 et en août 2010, nous sommes retournés dans la communauté pour faire la récolte des petits fruits avec l'objectif d'évaluer la variabilité de la productivité de *E. nigrum* L. et *V. vitis-idaea* L. Les petits fruits ont été récoltés (20 quadrats de 25 cm × 25 cm) dans 29 des 83 parcelles à travers cinq des sept zones de végétation échantillonnées, puis expédiés à l'UQTR pour les analyses. La productivité moyenne (poids gelé, g/m^2) par zone a été déterminée, et les résultats ont été comparés entre les zones avec des ANOVA. Lorsqu'il y avait des différences significatives entre les zones, des tests post-hoc Tukey permettaient d'identifier entre quelles zones se situaient les différences. Les mêmes tests ont servi à déterminer la variabilité de la productivité entre les deux années.

1.5 Résultats

Tous les membres de la communauté qu'on a interviewés ont exprimé de l'intérêt au sujet des petits fruits, et souligné l'importance de ces espèces dans leurs vies, particulièrement pendant leur enfance, lorsqu'ils habitaient sur le territoire. Ils ont tous constaté que la distribution ainsi que la productivité des petits fruits sont variables sur le territoire (Cuerrier *et al.*, en prép.).

1.5.1 Végétation

Les cryptogames et les arbustes nains (< 40 cm) dominaient le paysage à l'intérieur de six des sept zones échantillonnées, tandis que la zone de graminées était dominée par les cypéracées. Nous avons identifié au total 95 espèces de plantes vasculaires dans les sites d'étude (Annexe A). La richesse spécifique la plus élevée se trouvait dans la zone des cypéracées, alors que la plus basse était dans les zones clairsemées et la zone arbustive haute. *Betula glandulosa* était l'espèce vasculaire dominante, représentant < 1 - 68 % du couvert vasculaire total. *Vaccinium uliginosum*, *Vaccinium vitis-idaea*, et *Empetrum nigrum* étaient présents dans environ 90 % de nos parcelles, et représentaient 6 - 35 % du couvert total des plantes vasculaires. La communauté d'arbustes de plus de 40 cm était dominée par *B. glandulosa*, *Salix planifolia* et *V. vitis-idaea*. *Rubus chamaemorus* est une espèce de petits fruits très prisée par les Inuit, mais peu commune près de Baker Lake (présente dans 14 % des sites), où les habitats humides qu'elle préfère sont rares. Les 16 autres espèces arbustives constituaient de 4 - 73 % du couvert végétal dans nos sites; les espèces les plus fréquentes étaient *Ledum palustre* (90 %) et *B glandulosa* (87 %). *Hierochloe alpina* était l'espèce de graminée la plus fréquente (72 %), tandis que *Oxytropis Maydelliana* et *Dryas integrifolia* étaient les espèces d'herbacées à feuilles larges les plus fréquentes, se retrouvant respectivement dans 72 % et 69 % des parcelles.

L'ordination des 103 taxons et des 83 parcelles (*DCA sample scores,* Figure 2.1) a révélé que les communautés végétales échantillonnées se distinguaient bien selon les formes de croissance, *p. ex.* graminées, arbustes hauts, clairsemée. Cependant, les zones d'arbustes nains étaient moins distinctes. De plus, l'orientation des sites a démontré un gradient de drainage de la zone 1 (toundra à cypéracées) à la zone 8 (roche-mère, clairsemée).

En général, les sols autour de Baker Lake étaient des sables limoneux (Tableau 2.4). Le niveau des éléments nutritifs (azote et phosphore) ne variait pas significativement entre les différentes zones (Tableau 2.5).

1.5.2 Petits fruits

On a observé une productivité plus élevée pour *E. nigrum* que pour *V. vitis-idaea* (5-112 g/m^2 et < 1-87 g/m^2, respectivement) en 2009 et en 2010 (< 1-22 g/m^2 et < 1-11 g/m^2). La productivité a varié de façon significative entre les deux années pour *E. nigrum* et *V. vitis-idaea* ($p = < 0{,}001$), mais il n'y avait aucune différence significative de productivité entre les différentes zones (Annexe D).

1.6 Discussion et conclusions

Même si la richesse spécifique par site était plus élevée dans les zones de graminées, la richesse spécifique totale était la plus élevée dans les zones d'arbustes prostrés. Cependant, la richesse spécifique était très basse dans la zone arbustive haute. Les trois espèces d'arbustes producteurs de petits fruits à Baker Lake étaient abondantes, mais leur couvert était variable selon les zones. Ces observations correspondent bien avec l'information recueillie pendant les entrevues. Dans les zones arbustives hautes, le sol est riche en matière organique et en éléments nutritifs; c'est au sein de ces zones que l'abondance de *Vaccinium vitis-idaea* était la plus élevée. Cependant, c'est au sein des zones rocheuses qu'on trouve le couvert le plus élevé d'*Empetrum nigrum*. *Vaccinium uliginosum* était l'espèce de petits fruits la plus abondante autant dans les zones de graminées que dans les zones d'arbustes prostrés; ceci démontre sa capacité de croître tant en milieu humide qu'en milieu sec (Aiken *et al.* 2007).

Étant donné l'importance des cryptogames sur le territoire, ainsi que leur importance écologique (Callaghan *et al.* 2004), il serait intéressant d'ajouter l'identification des espèces invasculaires échantillonnées aux analyses de recouvrement.

Même si on s'attendait à ce que la productivité soit variable entre les différentes communautés végétales, nos résultats ont montré que même si la productivité des arbustes à petits fruits variait selon l'espèce et l'année, la productivité était semblable entre les communautés végétales que nous avons échantillonnées. Selon la littérature, la productivité des arbustes de petits fruits est liée au climat (Krebs *et al.* 2009) et à la productivité des années précédentes (Kelly & Sork 2002; Selas 2000; Yudina & Maksimova 2005). Cependant, les aîné(e)s à Baker Lake nous ont dit qu'ils remarquaient que la productivité des petits fruits était très variable, mais plutôt liée aux précipitations.

Il est clairement ressorti des entrevues avec les aîné(e)s que les petits fruits représentaient pour eux la période pendant laquelle ils habitaient sur le territoire ainsi que l'importance des petits fruits dans leur mémoire et leur culture. Cette étude représente une importante contribution pour comprendre la composition et la structure des communautés végétales dans lesquelles croissent les arbustes producteurs de petits fruits à Baker Lake. Cette étude servira de plus comme référence dans la perspective d'un suivi à long terme visant à évaluer la variabilité de la distribution et de la productivité interannuelle, combinées aux effets des changements environnementaux sur les espèces productrices de petits fruits à Baker Lake.

CHAPITRE II

BERRY SHRUB DISTRIBUTION AND PRODUCTIVITY OF *EMPETRUM NIGRUM* L. AND *VACCINIUM VITIS-IDAEA* L. IN THE VICINITY OF BAKER LAKE, NUNAVUT, CANADA

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2.1 Résumé

Les petits fruits constituent une source fraîche et abondante d'éléments nutritifs pour les Inuit, et la cueillette de petits fruits est une activité importante dans les communautés nordiques encore de nos jours. La distribution spatiale et temporelle, ainsi que la productivité des arbustes producteurs de petits fruits varient en fonction de facteurs environnementaux. On prévoit que les changements climatiques entraîneront des modifications au nivea des communautés végétales. Une augmentation du couvert des arbustes érigés, documentée ailleurs dans l'Arctique canadien, pourrait avoir un impact négatif sur les arbustes à petits fruits. Ce projet a comme premier objectif de décrire la distribution des quatre principales espèces productrices de petits fruits à Baker Lake, Nunavut, soit *Vaccinium uliginosum* L., *Empetrum nigrum* L., *Vaccinium vitis-idaea* L., et *Rubus chamaemorus* L. parmi différentes communautés végétales. Le deuxième objectif de cette étude est d'évaluer la productivité des petits fruits parmi différentes communautés végétales. À partir de la classification d'images satellites (Landsat) de secteurs homogènes (minimum 90 m × 90 m) ont été identifiés dans sept zones de végétation différentes où des arbustes à petits fruits étaient présents. Au cours de l'été 2009, on a évalué le couvert végétal et complété une description de l'habitat pour 83 parcelles de végétation (5 m x 5 m) représentant les sept zones. Un total de 95 espèces de plantes vasculaires a été identifié et classifié selon leurs formes de croissance, en plus de quatre taxons de cryptogames (mousses et lichens). Une analyse d'ordination (DCA) a démontré des différences entre les communautés de graminées, d'arbustes hauts et des communautés de végétation clairsemée, mais moins entre les communautés d'arbustes nains. Les cryptogames recouvraient 100 % du territoire dans toutes les zones échantillonnées, sauf dans la zone de graminées où ils couvraient 64 %. La richesse d'espèces vasculaires était plus élevée dans cette dernière zone (n = 29 espèces par site), toutefois le nombre total d'espèces vasculaires identifiées était le plus élevé dans la zone d'arbustes nains (n = 73). Les arbustes dominaient le couvert vasculaire (12-100 %) dans toutes les zones sauf la zone des graminées. Les quatre espèces d'arbustes de petits fruits représentaient 6-35 % du couvert végétal à travers les sept zones. Le couvert des 15 autres espèces d'arbustes était 4-73 %, et l'espèce la plus abondante était *Betula glandulosa*, avec un couvert moyen de < 1-68 % à travers tous les sites. *V. uliginosum* était l'espèce vasculaire la plus fréquente (95 %), tandis que *V. vitis-idaea* et *E. nigrum* ont été observés à 90 % et 88 % des sites respectivement. Le couvert de *V. vitis-idaea* était 25 % dans la zone où le couvert arbustif était haut (> 40 cm), et où *B. glandulosa* dominait. *R. chamaemorus* se trouvait seulement dans quelques sites humides le long de la rivière Thelon. *Hierochloe alpina* était l'espèce graminée la plus fréquente (72 %), tandis que *Oxytropis maydelliana* et *Dryas integrifolia* étaient les espèces d'herbacées à feuilles larges les plus communes (72 % et 69 % respectivement). En septembre 2009 et en août 2010, 29 des 83 parcelles ont été revisitées, et les petits fruits de *V. vitis-idaea* et *E. nigrum* ont été échantillonnés. On a observé une productivité plus élevée pour *E. nigrum* que pour *V. vitis-idaea* (5-112 g/m^2 et < 1-87 g/m^2, respectivement) en 2009 et (< 1-22 g/m^2 et < 1-11 g/m^2) en 2010. Les deux espèces ont montré une productivité plus élevée en 2009 qu'en 2010 ($p < 0.001$), mais il n'y avait aucune différence significative de productivité entre les zones. Ces résultats soulignent que malgré des différences importantes dans le recouvrement et les conditions environnementales des diverses zones étudiées, il y a plus de variabilité entre les années. On ne peut donc pas conclure que certaines zones sont plus productives que les autres car il y a trop de variabilité intra-zone. Un suivi des parcelles sur plusieurs années sera nécessaire pour évaluer la variation inter-annuelle de la productivité des arbustes à petits fruits à Baker Lake. Cette étude démontre la prépondérance des arbustes producteurs de petits fruits dans le centre de l'Arctique canadien.

Mots-clés : Baker Lake, Nunavut, petits fruits, arbustes, communautés végétales, changements climatiques

2.2 Abstract

Berries provide a significant source of nutrients and berry picking is an important cultural tradition for people across the Canadian Arctic. Distribution and productivity vary both temporally and spatially according to environmental conditions, and long-term data addressing the variability in berry shrub distribution and productivity are presently lacking. It is predicted that the current changes in climate will lead to shifts in plant

community structure. An increase in the cover of erect shrubs is already underway in the Canadian Arctic, and this could be detrimental to the more prostate dwarf berry shrubs. The first objective of this project was to characterize the plant communities associated with the distribution of four commonly harvested berry producing shrubs in the vicinity of Baker Lake, Nunavut, namely *Vaccinium vitis-idaea* L., *Empetrum nigrum* L., *Vaccinium uliginosum* L. and *Rubus chamaemorus* L., and the second objective was to assess the productivity of *V. vitis-idaea* L., *E. nigrum* L. Using 30 m resolution Landsat images, homogeneous sectors of vegetation (a minimum of 90 m × 90 m) were identified. In the summer of 2009, vegetation cover and environmental characteristics were evaluated for 83 vegetation plots (5 m × 5 m) from seven of the 15 vegetation zones around Baker Lake and along the Thelon River. A total of 95 vascular species were identified and classified according to growth form, and four taxa of cryptogams were identified. Multivariate analyses using the cover data revealed clear groupings for graminoids, tall shrubs and sparsely vegetated plant communities while grouping of low shrub zones was less distinct. Cryptogams covered 100% of the landscape across all of the zones except for the graminoid zone, where they covered 64%. Vascular species richness was highest in this zone (n = 29 species per site) however, the greatest total number of species (n = 73) was observed in the dwarf shrub zone (Zone 7). Shrubs dominated vascular plant cover (12-100%) across all zones but Zone 1 where graminoids were more abundant. Collectively, the four berry shrubs covered 6-35% of our sites across all seven zones. The combined cover of the remaining 15 shrub species was 4-73%, the most abundant species being *Betula glandulosa*, covering an average of < 1-68% of the entire sampling area. *V. uliginosum* was the most frequent vascular species (95%), while *V. vitis-idaea* and *E. nigrum* were observed 90% and 88% of our sites respectively. The mean cover of *V. vitis-idaea* was 25% in the tall shrub (> 40 cm) zone) where *B. glandulosa* dominated the sites. *R. chamaemorus* was present in only a few mesic sites along the Thelon River. *Hierochloe alpina* was the most frequently observed graminoid (72% of the sites), while *Oxytropis maydelliana* and *Dryas integrifolia* were the most common forb species (72% and 69% respectively). In September of 2009 and August 2010 the berries of *E. nigrum* and *V. vitis-idaea* were harvested from 29 of our 83 plots. There was no significant difference in berry

productivity in either species between the different plant communities, however both species showed significantly higher productivity in 2009 than 2010 ($p < 0.001$). Productivity tended to be higher in *E. nigrum* than *V. vitis-idaea* both years (5-112 g/m^2 and < 1-87 g/m^2 respectively in 2009; < 1-22 g/m^2 and < 1-11 g/m^2 in 2010). Our results demonstrate that in spite of the wide range in plant cover and environmental factors, berry productivity variability from one year to the next is greater than that across the different vegetation communities, and given the high degree of intra-zone variability we cannot conclude that there is any difference in berry productivity between vegetation zones. This study demonstrates the prevalence of berry producing shrubs in the central Canadian Arctic and provides data important to the long term monitoring of these sites which will be necessary to evaluate the temporal variability in the productivity of berry species.

Key Words: Baker Lake, Nunavut, berries, shrubs, plant communities, climate change

2.3 Introduction

I have observed that the cloudberries are not growing as they should be and the same thing with the baunngaq (Empetrum nigrum). This may be due to very little or no rain during upinngaaq (summer).

John Avaala, 2005, Baker Lake (Govt. of Nunavut 2005)

Berry picking is an important family tradition and community activity across the Arctic (Parlee & Berkes 2005, Murray *et al.* 2005). Traditionally used as food and medicines (Fediuk *et al.* 2000; Fraser *et al.* 2007; Goetz 2006), berries provide an excellent source of antioxidants (*e.g.*: Hakkinen *et al.* 1999; Kahkonen *et al.* 2001; Latti *et al.* 2010; Szajdek and Borowska 2008) in the diet of the local people, and are also important for animals like grizzly bears (Gau *et al.* 2002), arctic foxes (Kaysel 1999) and birds (Cadieux *et al.* 2005; Summers & Underhill 1996). While the value of berries in the local diet of Nordic people has been addressed elsewhere in the Canadian Arctic (*e.g.*: Krebs *et al.* 2009; Murray *et al.* 2005; Parlee *et al.* 2005), there is currently no reference material on berry producing shrubs in the central Canadian Arctic.

Baker Lake, Nunavut, with its rich cultural history, is an important site, both for its long term meteorological data (since 1945) and past research projects on traditional knowledge (Fox 2003) and ecology (Krebs 1963; Svoboda & Staniforth 1998; Levasseur 2007). It has been an ITEX (International Tundra Experiment) site since 1992, when long-term vegetation plots, as well as research on the effects of snow on vegetation, and permafrost studies with the Circumpolar Active Layer Monitoring Program (CALM) were established (Svoboda & Staniforth 1998).

The earth's climate is changing, and these changes are being experienced particularly intensely in the Arctic, where average temperatures have risen at almost twice the rate of the rest of the world in the past few decades (McBean *et al.* 2005). This trend is predicted to continue throughout the 21st century, and is expected to have profound impacts on arctic ecosystems (Callaghan *et al.* 2005). As individual species and community structure are affected by environmental changes (Aerts *et al.* 2006; Wookey *et al.* 2009), little is known about how different plant communities will resist environmental changes (Hudson & Henry 2010). Experimental data have shown that such warming will cause changes in vegetation patterns, such as an increase and northward migration of erect shrubs and grasses and sedges, which tend to increase in height and cover in warmer conditions (Walker *et al.* 2006). With greater shrub canopy comes reduced light availability (Totland & Esaete 2002), which may significantly affect the more prostate berry shrub species in the Arctic (Press *et al.* 1999).

In fact, satellite images, climatic models and scientific observation reveal significant changes in tundra community composition across the Arctic (*e.g.*: Elmendorf *et al.* 2012; Myers-Smith *et al.* 2011; Stow *et al.* 2004). An expansion of erect shrubs associated with higher temperatures is currently underway in northern Alaska (Tape *et al.* 2006), western Canada (Lantz *et al.* 2008), eastern Canada (Ropars & Boudreau 2012; Tremblay *et al.* 2012), and elsewhere throughout the world (Elmendorf *et al.* 2012; Myers-Smith *et al.* 2011). In Nunavik, *Betula glandulosa* is responsible for more than

90% of increased shrub cover observed between 1960 and 2003 (Ropars & Boudreau 2012; Tremblay *et al.* 2012). In Daring Lake, North West Territories, a significant increase in ground cover, (but not height) of *B. glandulosa* within a variety of low arctic tundra habitats has been observed between 2006 and 2011 (Grogan, unpubl. data *in* Myers-Smith *et al.* 2011). Across the Canadian Arctic, predicted changes in vegetation, as well as warmer temperatures and drier conditions, have been reported by Inuit observation (*e.g.*: Ford & Community of Igloolik 2006; Govt. of Nunavut 2005; Jolly *et al.* 2002; McDonald *et al.* 1997; Thorpe *et al.* 2002), including interviews with community Elders conducted at Baker Lake (Cuerrier *et al.*, unpubl. data).

Berry producing shrubs, like many plants, show significant variability in their distribution and productivity (*e.g.*: Ihalainen & Pukkala 2001; Krebs *et al.* 2009; Miina *et al.* 2009; Murray *et al.* 2005; Saastamoinen *et al.* 2000; Suring *et al.* 2008; Wallenius 1999; Yudina & Maksimova 2005), and each berry species responds individualistically to weather variables (Krebs *et al.* 2009) making yields difficult to predict.

In this study, we aimed to characterize the distribution of four species of commonly used berry shrubs in the vicinity of Baker Lake, in the Canadian Arctic, namely "Baongak" (*Empetrum nigrum* L.), "Kegotangenak" (*Vaccinium uliginosum* L.), "Kinminak" (*Vaccinium vitis-idaea* L.), and "Akpik" (*Rubus chamaemorus* L.) (Inuktitut names are from Hattie Mannik, pers. comm. 2009), in relation to other shrub species, with the following objectives: 1. to evaluate the distribution of berry producing species and describe the plant communities surrounding them throughout different habitats; and 2. to evaluate the productivity of *E. nigrum* L. and *V. vitis-idaea* L. in the vicinity of Baker Lake, Nunavut, within different plant communities. While we expect distribution and productivity of the berry species to be variable within zones, we hypothesize that *E. nigrum* and *V. uliginosum* cover will be greater in the well drained zones with more acidic substrates and low organic matter content, that *V. vitis-idaea* will be more common on soils with higher organic content, and that *R. chamaemorus* cover will be elevated in peaty, mesic or wetter communities. A fifth berry species, *Arctous alpina* L.

is found in Baker Lake, however, it is not consumed by the Inuit of Baker Lake, and so was not included as a study species.

While NDVI (normalized difference vegetation index) has increasingly been used as a tool to monitor spatial heterogeneity of temporal changes in vegetation across large, remote areas, like in the Canadian Arctic (Jia *et al.* 2006; Laidler *et al.* 2008), vegetation surveys at the ground level and long-term monitoring offer a more detailed view of vegetation changes (Elmendorf *et al.* 2012; Hudson & Henry 2009). For our field survey, we used the Circa 2000 Land Cover Map of northern Canada which made use of medium resolution (30 m) Landsat data as well as vegetation data to define a land cover legend consisting of 15 classes, or zones (Olthof *et al.* 2009). This information provided us with valuable information on the landscape around Baker Lake and facilitated site selection.

The abundance of berry-producing species in association with various erect shrub species is of particular interest in the context of increasing competitive interactions. While other studies have focused on the effects of climate change on tundra plants, this will be the first plant community characterization of the berry species in the central Canadian Arctic. Furthermore, it provides valuable baseline data for future monitoring of the distribution and productivity of these species.

2.4 Methodology

2.4.1 Study site

The hamlet of Baker Lake ("Qamani'tuaq") (64°19' N, 96°01' W) is a predominantly Inuit community on the northwest shore of Baker Lake (Fig. 1.1). Located in the Kivalliq Region, it is the only inland settlement within Nunavut. The topography varies from rolling hills to tundra plains, hummocky wetlands, and rocky outcrops (Canada-Nunavut Geoscience Office 2007). Classified as a low arctic site within the erect dwarf-shrub tundra bioclimatic domain, the vegetation is characterized by lichens, mosses and dwarf shrubs on the Circumpolar Arctic Vegetation Map (Walker *et al.* 2005).

According to data from 1971 - 2000, the average annual daily temperature is -11.8°C, with an average July temperature of 11.4°C. The winds, predominantly from the northwest, average 20 km/hour. Baker Lake receives an average of 157 mm per year of rainfall, and another 131 mm of snow, and the average annual number of thawing degree days is 913 (Environment Canada 2008).

2.4.2 Study species

Taxonomic names follow the nomenclature of Aiken *et al.* (2007), while Inuktitut names are from Hattie Manniq (pers. com. 2009).

Empetrum nigrum L. **subsp.** ***hermaphroditum*** **(Lange ex Hagerup) Böcher, Family Empetraceae**

In the Arctic, "Baunngaq", "crowberry" or "blackberry" in English, is a dwarf (< 15 cm high), evergreen shrub found on sandy, rocky or acid soil (Porsild & Cody 1980) whose lateral branches can take root and grow from contact points with the ground (Emanuelsson 1984 *in* Parsons 1994).

Rubus chamaemorus **L., Family** ***Rosaceae***

"*Akpik*", "cloudberry" or "bake apple berry", is a perennial (Mallory & Aiken 2004), low-growing deciduous herb (6 cm - 20 cm) that propagates from creeping rootstalks (Johnson 1987). It is common in moist peaty places (Porsild & Cody 1980). Cloudberries look like orange raspberries that become paler and softer as they ripen, and are the choicest berries of all in Baker Lake (Cuerrier *et al.*, unpubl. data).

Vaccinium uliginosum* L., Family *Ericaceae

"*Kigutangirnaq*", "blueberry" or "bilberry", is a low growing (< 15 cm), often prostrate deciduous shrub around Baker Lake. It is common on acidic soils (Porsild & Cody 1980), and it grows both on low humid tundra and on exposed rocky hills (Ootoova *et al.* 2001). Where the branches touch the ground, roots may develop (Mallory & Aiken 2004). The dark blue berries are a favourite in the community (Cuerrier *et al.*, unpubl. data).

Vaccinium vitis-idaea* L. subsp. *minus* (Lodd.) Hult., Family *Ericaceae

"*Kinngmingnaq*", "lingonberry" or "partridgeberry", is a low (2 cm - 10 cm) evergreen plant common in heath communities that grows on dry to moist peat, usually around moss and/or lichen (Johnson 1987) and spreads underground through laterally spreading rhizomes (Parsons 1994). The bright red berries are very tart, and can be taken to treat a sore throat (Cuerrier *et al.*, unpubl. data).

2.4.3 Experimental design and data collection

To identify zones with berry shrub habitat, we used the vegetation classification presented with the medium resolution (30 m) orthorectified Landsat images of Olthof *et +al.* (2009). While they identified 15 vegetation classes ('zones'), we concentrated our efforts in zones representing berry shrub habitat, avoiding wetlands and non-vegetated habitats. Potential sites were preselected based on the classified images using ArcGIS (ESRI, version 9.2). Homogeneous sites (minimum 3 × 3 pixels; 90 m × 90 m) were identified and a series of 1000 GPS (global positioning system) coordinates derived for a radius of 10 km around Baker Lake, and west along the Thelon River to Aberdeen Lake.

Sampling was carried out in the summer of 2009 in a subset of the preselected sites. Sites were chosen according to berry habitat, accessibility, and also their proximity to other sites from different zones. In this way we were able to sample as many sites and cover the greatest area possible. Homogeneous sites (90 m × 90 m) around Baker Lake within Zone 6 (tall shrub sites) were absent, but we were able to sample four of these sites along the Thelon River. Zone 4 (dry graminoid; prostrate dwarf shrub tundra) was not sampled, as sites were not present in the vicinity of Baker Lake nor along the Thelon River. In order to have data representing rocky outcrops and sparsely vegetated areas, we sampled Zone 8 (sparsely vegetated bedrock) and Zone 10 (bare soil with cryptogam crust - frost boils) around Baker Lake. Thus plots were identified within seven of the 15 zones classified by Olthof *et al.* (2009).

In total, 83 sites were sampled, based on likelihood of berry shrubs and accessibility. We accessed all sites by foot and all-terrain vehicles around Baker Lake, and by boat and on foot with local guides along the Thelon River. Topographical maps (1: 250 000), maps generated using ArcGIS (1: 74 265), and a GPS were used to locate sites in the field. Upon surveying the site, one 5 m × 5 m plot was positioned in a representative sector.

Vegetation cover was evaluated for each 5 m × 5 m plot using a modified Braun-Blanquet (1932) cover abundance scale (Table 2.1). Additional species, absent within the plot but observed within a 25 m radius, were noted as "trace" (T) species and assigned a cover value of 0.1%. Vascular plants were identified to species. In order to readily differentiate taller shrubs on the ordination diagrams, shrubs were identified by species and as "low" (< 40 cm) or "tall" (> 40 cm). Lichens were identified to growth form (crustose, fruticose, foliose), and the presence/absence and percent cover of mosses and litter were recorded. Unidentifiable species were brought back to the UQTR herbarium for identification. Voucher specimens of all vascular plant species sampled (numbers permitting) were pressed, dried and labelled, and are available for reference at the UQTR herbarium. Nomenclature of vascular plants follows Aiken *et al.* (2007).

Each plot was photographed and standard ecological information on the plant communities was recorded for each plot: date and time of sampling, temperature (°C), and wind and sun conditions. Latitude, longitude and altitude (m) were measured with a GPS. The slope (°) of each site was measured using a clinometer, and the aspect (°) using a compass. Topography (*e.g.*: flat, mid-slope, upper-slope), landform (*e.g.*: ridge, valley) and microtopography (*e.g.*: hummocks, frost boils) were noted.

Moisture level was described as xeric-mesic, mesic, or mesic-moist, and drainage was described on a scale of 1- very well drained to 5- very poorly drained. Rockiness of each site (bedrock cover: R0- low to R5- high) and stoniness (stones coarser than 25 cm: S0- low to S5- high) were noted, using the Soil Survey Manual of the U.S. Department of Agriculture (1951) as a reference (Soil Classification Working Group 1998).

One soil sample (10 cm × 10 cm × 15 cm deep) was collected from each site by probing three to four points within the plot and collecting a representative sample. Nearest landmarks, such as cabins, were noted for future reference.

In order to assess the productivity of two of the four berry species, namely *E. nigrum* and *V. vitis-idaea,* we revisited 29 of our 83 plots in September of 2009 and August of 2010. We avoided tussock graminoid (Zone 1) sites, given their low berry cover, and we were unable to get back to the sites in zone 6 given their location along the Thelon River, so that our sampling took place in shrub sites of Zones 3, 5, and 7 and in sparsely vegetated sites of Zones 8 and 10. In each 5 m × 5 m plot all of the berries were picked within 10 random 25 cm × 25 cm quadrats. Berries were separated to species, and ripeness was evaluated following standard protocol (Lévesque *et al.* 2013). They were counted, frozen and shipped to UQTR for further analyses.

2.4.4 Data analysis

For statistical purposes, each of the four shrub species which grew over 40 cm tall (*Betula glandulosa*, *Salix alaxensis*, *S. glauca*, *S. planifolia*) was treated as either tall (> 40 cm) or low (< 40 cm), so that in any given plot, there could be both tall and low shrubs of the same species. Consequently, the vegetation data matrix consisted of 103 taxa. Given the multivariate nature of our data, an indirect ordination analysis was performed using CANOCO 4.53 (Microcomputer Power, Ithaca, NY). We used a detrended correspondence analysis (DCA, CANOCO 4.53, ter Braak & Smilauer 2004) to detect the patterns in the relations among the species we sampled ($n = 103$) and passively with the environmental variables available ($n = 30$). Rare species were downweighted to lessen the influence they would have on the final result (Jongman *et al.* 1995). A scatter plot permitted us to visually evaluate the grouping of different plant communities.

A midpoint value was assigned to each Braun-Blanquet class, and this value was used as the mean % cover of each species per site (Table 2.1). Since more than one strata of vegetation was present, total cover could exceed 100%. Subsequently, mean cover was determined for each species per zone. Species were then grouped according to growth form (graminoid, forb, low shrub, tall shrub, lichen, moss), though we did keep the four berry species separate to simplify comparison. Mean cover per zone was calculated for each group.

Species frequency was calculated by dividing the number of times a particular species was observed across our study sites by the total number of sites. Species richness was tabulated per zone both with the total number of species encountered and with the average number of species observed per plot. Dominant plant cover and species richness were used to evaluate the distribution of berry shrubs throughout the different vegetation zones.

Productivity values for *E. nigrum* and *V. vitis-idaea* were determined in g/m^2 for each site (frozen weight), and averages within zones were calculated. ANOVA were used to compare the annual productivity (g/m^2) as well as the variability between zones for each of the species. If differences were observed, Tukey tests (SYSTAT 11.0) were useful in determining where the differences occurred.

Table 2.1

Cover abundance scale and corresponding mid-point values for vegetation cover estimates, based on Braun Blanquet (1932)

Class	Percent cover (%)	Midpoint value (%)
tr	Outside plot	0.1
0	< 1	0.5
1	1 - 5	2.5
2	5 - 10	7.5
3	10 - 25	17.5
4	25 - 50	37.5
5	50 - 75	62.5
6	75 - 100	87.5

Soil samples were weighed (wet and dry) to obtain total moisture content, sifted to 2 mm, and the fine fraction of a subset of three samples per zone was sent to the Forestry Soil Science Laboratory, Université Laval in Québec City for analyses. Texture (% sand, silt and clay) was analyzed using granulometric analysis, determined by the hydrometer method (Bouyoucos 1962). Soil pH analysis was performed using $CaCl_2$ (McKeague 1978), and organic matter using methods outlined in Yeomans and Bremner (1988). The Kjeldahl method was used to extract and determine total nitrogen content and available phosphorus was determined using the methods in Mehlich (1984) in a subset of the samples obtained in the sites where berries were harvested.

2.5 Results

2.5.1 Vegetation

Ninety-five vascular species and four classes of cryptogams (crustose, fruticose and foliose lichens, and bryophytes) were identified during the course of our field season. Prostrate dwarf shrub vegetation clearly dominate the landscape around Baker Lake and is classified as Zone 7 on the Circa-2000 Map of Northern Canada (Olthof *et al.* 2009). While we tried to sample as many shrub sites as possible in the different shrub zones

(Z3, Z5, Z6, Z7), 35 of the 83 sites sampled belonged to Z7 (Table 2.2). Consequently, Zones 3, 5 and 6 may be less well represented in our dataset.

Multivariate clustering techniques using data obtained from our relevés revealed clear distinctions between the low and high shrub communities, sparsely vegetated zones, and graminoid zones (Fig. 2.2). Meanwhile, no such clear distinctions existed for the dwarf shrub zones. The first axis explained 45.7% of the variance, following a moisture gradient from Z1 - tussock graminoid tundra (poorly drained) to Z8 - sparsely vegetated bedrock (very well drained) at the opposite end. Zone 7 occupied a central position in the scatter diagram, strongly associated with the other dwarf shrub zones we sampled. The second axis, meanwhile, explained 26.2% of the variance. No clear groupings could be distinguished on the second axis, the spread being restricted to Z6 and a few sites in Zones 1 and 5.

Table 2.2

Vegetation zones of the *circa* 2000 land cover map of Northern Canada adapted from Olthof *et al.* (2009), and number of sites sampled in each of these zone at Baker Lake, Nunavut (n = 72) and along the Thelon River (n = 11) during the summer of 2009. Wetland and non-vegetated zones were not sampled (-).

Vegetation zone	Description	Number of sites sampled	
Graminoid dominated		**Baker Lake**	**Thelon River**
Zone 1	tussock graminoid tundra (< 25% dwarf shrub)	6	-
Zone 2	wet sedge	-	-
Zone 3	moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)	7	2
Zone 4	dry graminoid prostrate dwarf shrub tundra (70-100% cover)	-	-
Shrub dominated (> 25% cover)			
Zone 5	low shrub (< 40 cm; > 25% cover)	14	2
Zone 6	tall shrub (> 40 cm; > 25% cover)	-	4
Zone 7	prostrate dwarf shrub	32	3
Sparse vegetation (2-10% cover)			
Zone 8	sparsely vegetated bedrock (2-10% cover)	8	-
Zone 9	sparsely vegetated till – collovium (2-10% cover)		
Zone 10	bare soil with cryptogam crust - frost boils	5	-
Wetlands			
Zone 11	Wetlands	-	-
Non-vegetated (<2% cover)			
Zone 12	Barren	-	-
Zone 13	Ice/Snow	-	-
Zone 14	Shadow	-	-
Zone 15	Water	-	-

Vascular species richness was highest in the graminoid zone (Z1), averaging 29 species per plot (Table 2.3), most of which were sedge species. The low shrub (< 40 cm) zones showed intermediate species richness per site, with 23, 21 and 20 species per site for

Zones 3, 5 and 7 respectively. However, as a whole, more vascular species were observed throughout these zones (57, 62 and 73 respectively). The tall shrub (> 40 cm) (Z6), sparsely vegetated bedrock (Z8) and bare soil with cryptogams (Z10) communities each supported a lower diversity, averaging 13, 12 and 14 species per site respectively.

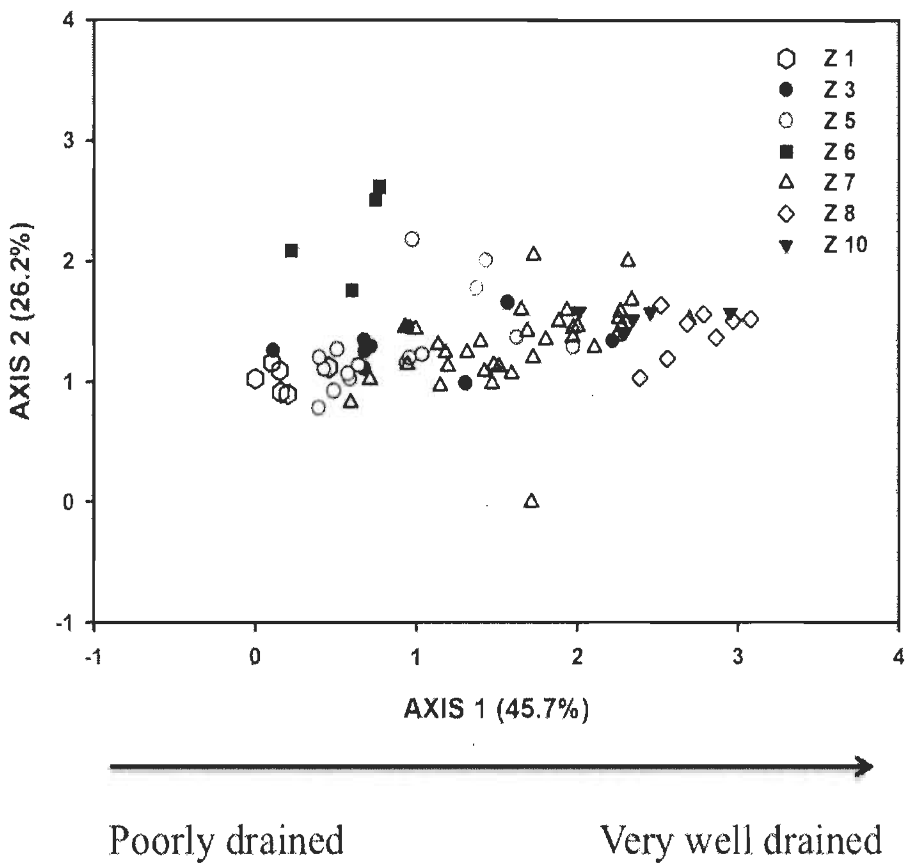

Figure 2.1 The first two axes of a DCA (detrended correspondence analysis) for 83 sites and 103 taxa in the vicinity of Baker Lake and along the Thelon River during the summer of 2009 (eigenvalues = 45.7% and 26.2%; total inertia = 2.12).
Each zone is represented by a symbol, and clusters are used to evaluate the Landsat characterization of sites.

Cryptogams represented 100% of the vegetative cover across all of the vegetation zones we sampled except for the graminoid community (Z1), where clay and silt levels in the soil tended to be higher (Table 2.4). Here, cryptogam cover was 64% (Fig. 2.3a), most of which was made up of mosses (58%). Total cryptogam cover was similar in the low shrub zones (Z3, 5 and 7), where Z3 and Z5 showed greater moss cover (67% and 73% respectively), while Z7, a sandier, better drained zone, was dominated by lichens (97%). In the sparsely vegetated zones (Z8, 10) lichens represented over 90% cover, while mosses covered only 8%.

Table 2.3

Species richness according to zone
Both total number of species observed throughout the field season and the mean number of species per site per zone are indicated.

Zone	# of sites	Species richness		
		Total # of vascular species	# of vascular species per zone	SE
Z1	6	51	29	1.4
Z3	9	57	23	2.3
Z5	16	62	21	1.3
Z6	4	30	13	1.25
Z7	35	73	20	1.15
Z8	8	36	12	1.7
Z10	5	29	14	1.2

Shrubs dominated the vascular plant cover (12-100%) everywhere but Z1, where graminoids were more abundant (66%) (Fig. 2.3b). Zones 5 and 6 were the shrubbiest zones, both with mean cover values of over 100%, while Z1, 3 and 7 had similar total mean shrub cover (49%, 56% and 58% respectively). The four berry shrub species collectively made up 6-35% of the total vegetative cover, highest in the low shrub community (Z5) and lowest in the graminoid (Z1) and sparsely vegetated communities (Z8, Z10). The combined cover of the remaining 15 species of shrubs sampled (see Apendix A for a complete species list) was 4-73%, the most abundant species being *Betula glandulosa*, with an average cover of < 1-68%. The only species that grew tall (> 40 cm) were *B. glandulosa* and *Salix planifolia*. Interestingly, *B. glandulosa* cover in the sparsely vegetated zones was less 1% while the four berry species collectively averaged 7% mean cover in these zones.

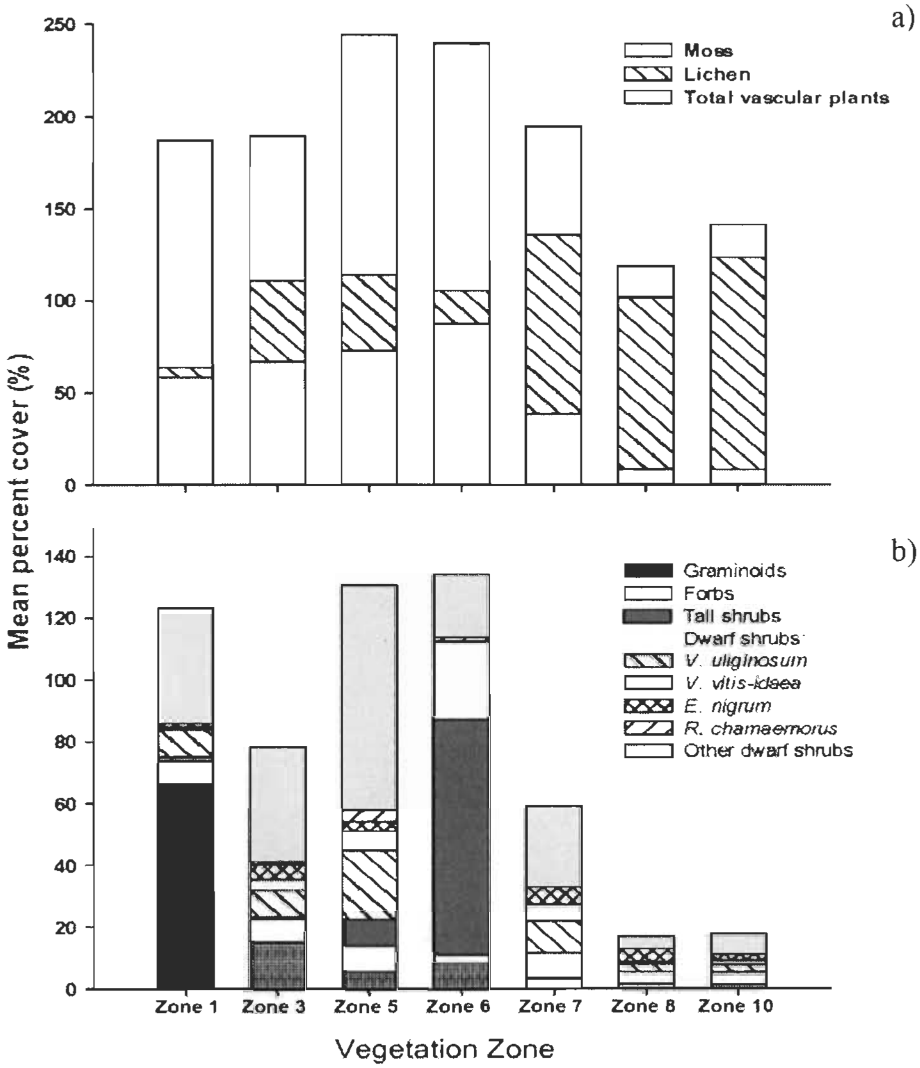

Figure 2.2 Mean cover values (%) across seven vegetation zones sampled at n = 83 sites at Baker Lake, Nunavut and along the Thelon River during the summer of 2009. 2 a. shows the dominance of cryptogams relative to vascular species, while 2 b. illustrates the significant cover of Berry shrubs relative to other vegetation types.

Table 2.4

Soil characteristics (mean ± SE) sampled from 83 sites among seven vegetation zones identified by Olthof *et al.* (2009) at Baker Lake, Nunavut in 2009
Nitrogen (%) was only calculated in those zones in which we harvested berries.

	Graminoid tundra	**Dwarf shrub tundra**			**Tall shrub tundra**	**Sparsely vegetated tundra**	
	Zone 1	Zone 3	Zone 5	Zone 7	Zone 6	Zone 8	Zone 10
Slope (%)	1.0 ± 0.3	1.7 ± 0.4	2.2 ± 0.6	1.8 ± 0.2	0.9 ± 0.1	3.7 ± 0.7	2.0 ± 1.0
Soils:							
pH	4.73 - 5.29	4.33 - 5.71	3.86 - 4.75	3.71 - 5.86	3.98 - 4.52	3.95 - 4.42	4.22 - 4.81
Nitrogen (%)		0.09 - 0.24	0.08 - 0.89	0.06 - 1.21		0.421 - 1.467	0.07 - 0.112
Phosphorus (%)	2.5 - 72.3	12.0 - 101	5.0 - 61.2	4.1 - 54.0	36.9 - 84.1	5.9 - 36.1	4.8 - 51.4
Organic matter (%)	1.26 - 4.0	1.46 - 5.92	1.94 - 29.86	1.34 - 49.55	32.9 - 37.4	8.36 - 47.01	1.76 - 5.46
Texture (%):							
Sand	54 ± 12.78	67 ± 10	49 ± 8	86 ± 4		85	92 ± 0.67
Silt_coarse	12 ± 0.67	6 ± 2	9 ± 2	4 ± 2		4	1 ± 0.33
Silt_fine	17 ± 5.36	9 ± 4	16 ± 1	4 ± 2		4	1 ± 0.88
Clay	18 ± 7.02	19 ± 7	26 ± 9	6 ± 1		7	6 ± 0.33

Graminoids, though found in every plot we sampled, covered only 1-8% of the non-graminoid sites we sampled (Z5, 6, 7, 8, 10). Zone 3, a graminoid-shrub community, showed 15% graminoid cover and 56% shrub cover, 18% of which were berry shrubs. Forb cover was generally low, averaging 3-9%, lowest in the tall shrub and sparsely vegetated sites, and highest in the graminoid and dwarf shrub communities. *Dryas integrifolia* was the most abundant forb, with a cover of 2.5%. Horsetails (n = 1 species) and ferns (n = 2 species) covered less than 1% throughout our entire study area.

Vaccinium uliginosum was the most frequent vascular species, found in 95% of the sites studied, with a total mean cover of 55% across all of our sites. It was the most abundant berry species in the graminoid (Z1 - 9%), low shrub (Z3 - 8%; Z5 - 22%), and prostate dwarf shrub (Z7 - 10%) communities. *Empetrum nigrum* had a frequency of 90%, covering an average of 21% of our total sampling area. Its mean cover was highest (6%) in the prostrate dwarf shrub community (Z7), and it represented more cover than the other berry species in the bedrock zone (Z8 - 4%). *Vaccinium vitis-idaea* was found in 88% of our sites, with a mean total cover of 42%. Its cover was highest in the tall shrub community (Z6 - 25%), where *E. nigrum* and *V. uliginosum* were virtually absent (< 1%). It covered less than 1% of the graminoid (Z1) and bedrock (Z8) communities. *Rubus chamaemorus* was much less frequent, observed at 14% of the sites. Its total mean cover was 6%, and most of this was found in Z5 (4%). The only other zones with *R. chamaemorus* were Z3 (< 1%) and Z6 (1%). *Arctous alpina* was another berry species frequently observed in our study area (83%). Of the non-berry producing shrubs, *Ledum palustre* was the most common, at 90% of the sites followed by *B. glandulosa* (< 40 cm), at 87% of the sites we sampled. Mean covers ranged from < 1-63% for *L. palustre* and < 1-88% for *B. glandulosa*, both being lowest in the sparsely vegetated zones, and highest in the low shrub communities. Tall *B. glandulosa* (> 40 cm) was observed at 18% of our sites.

The most frequent of the 31 graminoid species we sampled was *Hierochloe alpina*, observed at 72% of our sites, followed by *Carex scirpoidea* (54%). Sixty-four species of forbs were identified, the most frequent being *Oxytropis maydelliana* (72%), followed closely by *D. integrifolia* (69%). Tall shrubs (> 40 cm), mainly *B. glandulosa* and *Salix planifolia* were restricted to Z5 and Z6.

The soils around Baker Lake were predominantly sandy silt. Sand constituted 38-91% of soils sampled, and Z10 and Z7 were significantly sandier than the other zones. Silt ranged from < 1% in xeric areas to 23% in more mesic soils. Zone 10 had significantly less silt than the other zones (p = 0.019). The clay content of the soils we sampled ranged from 4-42%, slightly, but not significantly, higher in the moist zones. Organic matter varied from 1-50% in our topsoil samples, and was greatest under tall shrubs (Z6) and in bedrock dominated, sparsely vegetated sites (Z8). The pH varied, though not significantly, from 4.2 in the rocky habitats to 5.0 in the tussock tundra. While the level of soil nutrients was variable, it did not differ significantly across the zones (Table 2.5).

Table 2.5

Soil characteristic ANOVA values for nine soil factors sampled from 83 sites across seven vegetation zones identified by Olthof *et al.* (2009) at Baker Lake, Nunavut

Variable	d. f.	*p* - value
pH	6	0.394
Organic matter (%)	6	0.029
Total Nitrogen (%)	4	0.099
Soil phosphorus (%)	6	0.566
Sand (%)	5	0.034
Silt_coarse (%)	5	0.012
Silt_fine (%)	5	0.052
Clay (%)	5	0.211

2.5.2 Berry productivity

There was no significant difference in the berry weight of either species across the zones, however, *V. vitis-idaea* berries were significantly smaller in 2010 than they were in 2009 (p = 0.004). *E. nigrum* showed the same tendency, however the difference was marginal (p = 0.055) (see Appendix D).

Productivity values of both *E. nigrum* and *V. vitis-idaea* varied significantly between the two years we sampled them ($p < 0.001$). For both species 2009 was a year of higher productivity than 2010. Productivity tended to be higher in *E. nigrum* than *V. vitis-idaea* for both years (5-112 g/m^2 and < 1-87 g/m^2 respectively in 2009; < 1-22 g/m^2 and < 1-11 g/m^2 in 2010). *V. vitis-idaea* was most productive in Zone 3 and *E. nigrum* in Zone 5, yet there was no significant difference in the mean productivity of either species across the different zones.

2.6 Discussion

Environmental variables, in particular topography, snow cover, soil moisture and soil pH (Gould & Walker 1999) and increased shrub cover (Pajunen *et al.* 2011) have been correlated with plant species richness, which varied from quite low in the tall shrub community to almost three times higher in graminoid communities. The greatest total number of species was recorded in the prostate dwarf shrub zone, where vascular plant cover was less than half of what it was in the tall shrub zone. While this may in part be a consequence of our sampling so many sites in this zone, the greater heterogeneity of this zone is visible by the greater spread on the DCA. Meanwhile, tighter grouping on the DCA reveals how much more homogeneous the sites within the graminoid and tall shrub communities are.

The DCA also showed a clear moisture gradient along the first axis, suggesting that sites in the dwarf shrub zones were more poorly drained than those in the prostrate dwarf shrub zone, as evidenced by their left leaning position along the horizontal axis. This demonstrates the importance of topographic position and drainage characteristics in Arctic plants (Tedrow 1977 *in* Bliss & Svoboda 1984), and could possibly explain the lower mean cover and more prostrate growth habit of the shrubs in this zone.

More than half of all northern species are nonvascular (Matveyeva and Chernov 2000), and lichens are an important group in the Arctic for their use as winter forage for caribou and the ability of some to fix nitrogen in strongly nitrogen limited systems (Callaghan *et al.* 2004). Mosses dominated in the mesic regions where clay and silt levels in the soil were moderately higher while lichens became more abundant in the sandier, better drained zones. Experimental data have shown that lichen and bryophyte cover decrease with increasing temperatures, likely as a result of shading by vascular species such as shrubs, but also grasses and sedges, which tend to increase in height and cover in warmer conditions (Cornelissen *et al.* 2001, Walker *et al.* 2006). Interestingly, the Elders of the community have noted an increase in graminoid species around Baker Lake (Gérin-Lajoie & Spiech 2009, unpubl. data). Lichen and moss identification would have been a positive addition to the plant list compiled in our study, and would have also influenced the results of our DCA, possibly helping to distinguish differences amongst the species found in the prostrate dwarf shrub community from those found in the other two dwarf shrub communities.

Dwarf shrubs and sedges made up the majority of vascular vegetation cover across our sites, with *Vaccinium uliginosum*, *Vaccinium vitis-idaea*, and *Empetrum nigrum* being three of the most abundant vascular plant species. As expected, berry distribution was variable between zones. While *V. uliginosum* cover was highest in the dwarf shrub communities, *V. vitis-idaea* cover was greatest in the tall shrub zone. In the sparsely vegetated sites, the mean cover of berries was similar to that all of the other shrubs combined, and in the bedrock zone, berry shrub cover was higher, demonstrating the ability of the berry producing species to grow in a variety of habitats and conditions.

In 1950, Porsild wrote that *E. nigrum* was the most important fruit in Arctic regions because of its abundance and hardiness, and for that reason it is a commonly harvested species by the members of the community. As expected, it was most abundant in the sandy substrates of the prostrate shrub and the well-drained bedrock communities where lichen cover was high and lowest in the graminoid community where mosses and sedges were the most common plants.

Vaccinium uliginosum is suited to both moist and dry soil conditions (Aiken *et al.* 2007). Though it seemed to prefer the dwarf shrub community, where moss cover was high, it also did well in the prostrate shrub zone, where the higher sand content meant better drainage of the sites and subsequently the replacement of mosses by greater lichen coverage. This seems to have been the most distinctive factor differentiating it from the other dwarf shrub zones.

In soils of the bedrock zone where *E. nigrum* and *V. uliginosum* were common, soil was restricted to small pockets where litter and nutrient-rich run-off from the bedrock accumulated, accounting for the significantly higher organic matter and nitrogen levels. The tall shrub zone was also significantly higher in organic matter than the other zones, likely a result poorer drainage as well as the constant abundance of litter covering the ground (Weintraub & Schimel 2003). *Betula glandulosa* and *V. vitis-idaea* cover were at their highest in this zone, reflecting their preference for higher organic content (Aiken *et al.* 2007).

2.7 Conclusion

Given our sampling strategy, with a bias on sites within the prostrate dwarf shrub communities, and avoiding wetlands and non-homogeneous areas, we have not identified the full diversity of vegetation around Baker Lake. Future studies could focus on plant communities poorly represented here. More extensive travel along the Thelon River, to taller shrub and more mesic sites would help complete the botanical picture and may have yielded greater numbers of *Rubus chamaemorus*.

Shrubs and cryptogams dominated the landscape, and it is clear that the berry producing shrubs, while ubiquitous, vary greatly in their spatial distribution. *Betula glandulosa* also represented significant cover across the territory, and this may be a worthy incentive to monitor changes in the vegetation. We recommend that the sites be re-evaluated every five to ten years to track changes in the vegetation structure and diversity, and more specifically to the berry producing shrubs. Also, an annual harvest of the berries in our sites would provide invaluable long-term data on the productivity of the berry producing shrubs.

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ANNEXE A

LIST OF 95 VASCULAR PLANT SPECIES IDENTIFIED FROM 83 SITES IN THE VICINITY OF BAKER LAKE, NUNAVUT, SUMMER 2009

Scientific nomenclature is based on Aiken *et al.* (2007), except *Elven *et al.* 2003; **Gillespie *et al.* 2012; ***USDA, NRCS. 2014.
Abbreviations are those used in data matrices.

Growth form	Abbreviation
Shrubs	
Andromeda polifolia L. *sensu lato.*	And poli
Arctous alpina (L.) Nied.	Arc alpi
Betula glandulosa Michx.	Bet glan
Cassiope tetragona (L.) D. Don	Cas tetr
Diapensia lapponica L. subsp. *lapponica*	Dia lapp
Empetrum nigrum L.	Emp nigr
Ledum palustre L. subsp. decumbens (Aiton) Hultén	Led palu
Loiseleuria procumbens (L.) Desv.	Loi proc
Rhododendron lapponicum (L.) Wahlenb.	Rho lapp
Salix alaxensis (Andersson) Coville	Sal alax
Salix arctica Pall.	S. arcti
Salix arctophila Cock. ex Heller	S. arcto
Salix fuscescens Andersson	Sal fusc
Salix glauca L. subsp. stipulifera (Flod. ex Hayren) Hiitonen	Sal glau
Salix herbacea L.	Sal herb
Salix planifolia Pursh	Sal plan
Salix reticulata L.	Sal reti
Vaccinium uliginosum L. subsp. *microphyllum* (Lange) Tolm.	Vac ulig
Vaccinium vitis-ideae L. subsp. *minus* (Lodd.) Hultén	Vac viti
Forbs	
Antenaria alpina (L.) Gaertn. subsp. *porsildii* (E. Ekman) Chmiel.	Ant alpi
Armeria scabra Pall. ex Roem. and Schult.	Arm scab
Arnica angustifolia Vahl	Arn alpi
Artemisia borealis Pallas subsp. *borealis*	Art bore
Astragalus alpinus L.	Ast alpi
Bistorta vivipara (L.) Delarbre	Bis vivi

Growth form	Abbreviation
Forbs (continued)	
Castilleja elegans Ostenf.	Cas eleg
Cerastium alpinum L.	Cer alpi
Chamerion latifolium (L.) Holub	Cha lati
Comarum palustre L.	Com palu
Diapensia lapponica L. subsp. *lapponica*	Dia lapp
Draba lactea Adams	Dra lact
Draba nivalis Lilj.	Dra niva
Dryas integrifolia Vahl	Dry inte
Eutrema edwardsii R. Br.	Eut edwa
Hedysarum americanum (Michx.) Britton	Hed amer
Minuartia rubella (Wahlenb.) Hiern	Min rube
Orthilia secunda (L.) House subsp. *obtusata* (Turcz.) Böcher	Ort secu
Oxyria dignya (L.) Hill	Oxy dign
Oxytropis bellii (Britton ex Macoun) Palib.***	Oxy bell
Oxytropis maydelliana Trautv. subsp. *melanocephala* (Hooker) A. E. Porsild	Oxy mayd
Papaver labradoricum (Fedde) Solstad & Elven*	Pap labr
Parnassia palustris L.	Par palu
Pedicularis flammea L.	Ped flam
Pedicularis labradorica Wirsing	Ped labr
Pedicularis lanata Willd. ex Cham. and Schltdl.	Ped lana
Pedicularis lapponica L.	Ped lapp
Pedicularis sudetica complex Willd.	Ped sude
Pinguicula villosa L.**	Pin vill
Pinguicula vulgaris L.	Pin vulg
Platanthera obtusata (Banks x Pursh) Lindley***	Pla obtu
Potentilla hyparctica Malte s.l.	Pot hypa
Pyrola grandiflora Radius	Pyr gran
Rubus chamaemorus L.	Rub cham
Saussurea angustifolia (L.) DC.*	Sau angu
Saxifraga cernua L.	Sax cern
Saxifraga tricuspidata Rothb.	Sax tric
Silene acaulis (L.) Jacq.	Sil acau
Stellaria longipes Goldie	Ste long
Tofieldia coccinea Richardson, in Franklin	Tof cocc
Tofieldia pusilla (Michx.) Pers.	Tof pusi

Growth form	Abbreviation
Horsetails	
Equisetum arvense L.	Equ arve
Ferns	
Dryopteris fragrans (L.) Schott	Dry frag
Huperzia appressa (Bach.Pyl. ex Desv.) Á. Löve & D. Löve**	Hup appr
Graminoids	
Agrostis mertensii Trin.	Agr mert
Alopecurus magellanicus Lam.	Alo mage
Arctagrostis latifolia (R. Br.) Griseb. subsp. *latifolia*	Arc lati
Calamagrostis lapponica (Wahlenb.) Hartm.	Cal lapp
Carex aquatilis Wahlenb. subsp. *stans* (Drejer) Hultén	Car aqua
Carex arctogena Harry Sm.	Car arct
Carex bigellowii Torr. in Schwein. subsp. *bigelowii*	Car bige
Carex capillaris L. subsp. *fuscidula* (Krecz. ex T.V. Egorova) Á. Löve and D. Love	Car capi
Carex fuliginosa Schkuhr subsp. *misadra* (R. Br.) Nyman	Car fuli
Carex holostoma Drejer	Car holo
Carex membranaceae Hooker	Car memb
Carex nardia Fr.	Car nard
Carex rariflora (Wahlenb.) Sm.	Car rari
Carex scirpoidea Michx.	Car scir
Carex vaginata Tausch	Car vagi
Elymus alaskansus (Scribn. and Merr.) Á. Löve	Ely alas
Eriophorum angustifolium Honck. s.l.	Eri angu
Eriophorum callitrix Cham. ex C.A. Meyer	Eri call
Eriophorum scheuchzeri Hoppe	Eri sche
Eriophorum vaginatum L.	Eri vagi
Festuca brachyphylla Schult. and Schult. f.	Fes brac
Festuca rubra L. subsp. *rubra* L.	Fes rubr
Hierochloë alpina (Swartz) Roem. and Schult. subsp. *alpina*	Hie alpi
Juncus arcticus Willd.	Jun arct
Juncus castaneus Sm.	Jun cast
Juncus triglumis L. s.l.	Jun trig
Luzula confusa Lindeberg	Luz conf
Poa arctica R. Br. subsp. *arctica*	Poa arct
Poa glauca Vahl	Poa glau
Trichophorum cespitosum (L.) Hartm.	Tri cesp
Trisetum spicatum (L.) K. Richter	Tri spic

ANNEXE B

MEAN VASCULAR PLANT COVER (%) FOR 103 TAXA SAMPLED IN 83 SITES ACROSS SEVEN ZONES IN THE VICINITY OF BAKER LAKE AND ALONG THE THELON RIVER, NUNAVUT IN THE SUMMER OF 2009

For the detailed species list, see Annexe A. For statistical purposes, mean cover of each of the four species that grew tall (> 40 cm) was evaluated for both tall and low individuals. A '2' after the species abbreviation denotes tall shrub cover (> 40 cm).

Taxa	Zone 1 - tussock graminoid tundra (< 25% dwarf shrub)					
	Z128	**Z143**	**Z149**	**Z180**	**Z1149**	**Z12008**
Tall shrub (> 40 cm)						
Bet gla2	0	0	0	0	0	0
Sal ala2	0	0	0	0	0	0
Sal gla2	0	0	0	0	0	0
Sal pla2	0.1	0	0	0	7.5	0
Low shrub (< 40 cm)						
And poli	0	2.5	2.5	2.5	2.5	2.5
Arc alpi	2.5	0	0.1	0	0.1	0.5
Bet glan	62.5	17.5	7.5	37.5	17.5	2.5
Cas tetr	0.5	0	2.5	2.5	2.5	0
Emp nigr	0.5	0.5	0.5	2.5	2.5	0.5
Led palu	2.5	2.5	0.5	0.1	0.5	0.5
Loi proc	0	0	0	0	0	0
Rho lapp	0	0	0	0.5	0.5	0.5
Sal alax	0	0	0	0	0	0
S. arcti	2.5	2.5	0.5	0	7.5	2.5
S. arcto	0	0	0	0	0	0
Sal fusc	2.5	0.5	0	0	0	0
Sal glau	0	0	0	0	0	0
Sal herb	0.1	0	0	0	0	0
Sal plan	0	2.5	0.5	17.5	7.5	0
Sal reti	0	0	0	0	0	0.5
Vac ulig	17.5	7.5	7.5	2.5	17.5	0.5
Vac viti	2.5	0.5	0.5	0	0.5	0.1

Taxa	Zone 1 - tussock graminoid tundra (< 25% dwarf shrub)					
	Z128	**Z143**	**Z149**	**Z180**	**Z1149**	**Z12008**
Forbs						
Ant alpi	0	0	0	0	0	0
Arm scab	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0
Art bore	0	0	0	0	0	0
Ast alpi	0.1	0.1	0.5	0.5	0	0.5
Bis vivi	0	0.5	0.5	0.5	0.5	0.5
Car bell	0	0	0	0	0	0
Car digi	0.5	0	0	0	0	0
Cas eleg	0	0	0	0	0	0
Cer alpi	0	0	0	0	0	0
Cha lati	0	0	0	0	0	0
Com palu	0	0	0	0	0	0
Dia lapp	0	0	0	0	0	0
Dra lact	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0
Dry inte	0.5	0.5	2.5	2.5	7.5	2.5
Eut edwa	0	0	0	0	0	0
Hed amer	0	0.1	0.1	0.5	0	0
Min rube	0	0	0	0	0	0
Ort secu	0	0	0	0	0	0
Oxy dign	0	0	0	0	0	0
Oxy bell	0	0	0	0	0	0
Oxy mayd	0.5	0.1	0.5	0.5	0.1	0
Pap labr	0	0	0	0	0	0
Par palu	0	0	0	0	0	0
Ped flam	0	0	0	0	0	0
Ped labr	0	0	0	0	0	0
Ped lana	0	0	0	0	0	0
Ped lapp	2.5	0.5	0.5	2.5	2.5	0
Ped sude	0	0.5	2.5	0.5	2.5	0
Pin vill	0	0	0.5	0	0	0
Pin vulg	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0
Pot hypa	0	0	0	0	0	0
Pyr gran	0	0.5	0	0	0	0
Rub cham	0	0	0	0	0	0
Sau angu	0.5	0.5	0.1	0.5	0.5	0.5
Sax cern	0	0	0	0	0	0
Sax tric	0	0	0	0	0	0
Sil acau	0	0.1	0.5	2.5	0	0
Ste long	0	0.1	0	0.5	0	0
Tof cocc	0	0	0	0	0	0
Tof pusi	0	0	0.5	0	0	0.5

Taxa	Zone 1 - tussock graminoid tundra (< 25% dwarf shrub)					
	Z128	**Z143**	**Z149**	**Z180**	**Z1149**	**Z12008**
Graminoids						
Agr mert	0	0	0	0	0	0
Alo mage	0	0	0	0	0	0
Arc lati	0.5	0.5	0.5	0.5	0	0.5
Cal lapp	0	0	0	0	0	0
Car aqua	0	17.5	17.5	17.5	17.5	7.5
Car arct	0	0	0	0	0	0
Car bige	0.5	2.5	0	7.5	0	7.5
Car capi	0	0	0	2.5	0	0
Car fuli	0.5	7.5	7.5	2.5	7.5	7.5
Car holo	0	2.5	7.5	0	2.5	17.5
Car memb	2.5	17.5	17.5	17.5	7.5	0
Car nard	0	0	0	0	0	0
Car rari	0	2.5	0	2.5	2.5	0
Car scir	0	2.5	0	7.5	7.5	17.5
Car vagi	0.5	7.5	0	0	7.5	0
Ely alas	0	0	0	0	0	0
Eri angu	0	0	7.5	0	7.5	17.5
Eri call	0	0	0	0	0	2.5
Eri sche	0	0.5	7.5	0	0	0
Eri vagi	7.5	0.1	0	0	0	0
Fes brac	0	0	0	0	0	0
Fes rubr	0	0	0	0	0	0
Hie alpi	0	0	0	0.5	0.5	0
Jun arct	0	0	0	0	0	0
Jun cast	0	0	0.5	0	0	0
Jun trig	0	0	0.5	0	0	0
Luz conf	7.5	0	0	7.5	0	0
Poa arct	0	0	0	0	0	0.5
Poa glau	0	0	0	0	0	0
Tri cesp	0	17.5	17.5	0	7.5	2.5
Tri spic	0	0	0	0	0	0
Horsetails						
Equ arve	0	0	0	0	0.5	0
Ferns						
Dry frag	0	0.5	0	0	0	0
Hup appr	0.1	0.5	0.5	0.5	0.5	0.5
Lichens						
Cru lich	0.5	0.5	2.5	0.5	0.5	0
Fol lich	2.5	2.5	2.5	2.5	0.5	2.5
Fru lich	2.5	2.5	7.5	0.5	2.5	0.5
Mos spec	87.5	37.5	37.5	62.5	62.5	62.5

Taxa	Zone 3 - moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)								
	Z350	**Z367**	**Z3133**	**Z3135**	**Z3965**	**Z3971**	**Z32002**	**Z32009**	**Z32015**
Tall shrub (> 40 cm)									
Bet gla2	2.5	0	0	0	0	0	0	0	2.5
Sal ala2	0	0	0	0	0	0	0	0	0
Sal gla2	0	0	0	0	0	0	0	0	0
Sal pla2	0	0	0	0	0	0	0	0	0
Low shrub (< 40 cm)									
And poli	0.5	0	0	0	0	0	2.5	0.1	0.5
Arc alpi	0	0.5	7.5	2.5	0.1	0.5	7.5	0.5	2.5
Bet glan	7.5	37.5	7.5	17.5	37.5	7.5	37.5	17.5	7.5
Cas tetr	2.5	7.5	2.5	2.5	2.5	2.5	2.5	0.1	2.5
Emp nigr	0.5	7.5	7.5	7.5	2.5	2.5	7.5	7.5	0
Led palu	0.5	2.5	2.5	0	7.5	17.5	2.5	2.5	2.5
Loi proc	0	0	2.5	0	0	0	0	0	0
Rho lapp	0	0	0	0	0	2.5	0.5	0	0
Sal alax	0	0.1	0	0	0	0	0	0	0
S. arcti	0.5	2.5	7.5	0	7.5	2.5	0.5	2.5	0
S. arcto	0	0	0	0	0	2.5	0	0	0.5
Sal fusc	0	0	0	0	0	0	0	0	0
Sal glau	0	0	0	0	0	0	0	0	0
Sal herb	0	0	0	0	0.5	0.5	0	0	0.5
Sal plan	2.5	0	0	0	7.5	2.5	17.5	0	2.5
Sal reti	0.5	0	0	0.5	0.5	0	0	0	2.5
Vac ulig	7.5	2.5	7.5	17.5	7.5	2.5	7.5	7.5	17.5
Vac viti	0.5	2.5	2.5	0	7.5	7.5	2.5	0.5	7.5

Taxa	Zone 3 - moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)								
	Z350	**Z367**	**Z3133**	**Z3135**	**Z3965**	**Z3971**	**Z32002**	**Z32009**	**Z32015**
Forbs									
Ant alpi	0	0	0	0	0	0.5	0	0	0
Arm scab	0	0	0	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0	0	0	0
Art bore	0	0	0	0	0	0	0	0	0
Ast alpi	0	0.1	0.1	0	0	0	0	0	0.5
Bis vivi	0.5	0	0.5	0	0	0.5	0	0	2.5
Car bell	0	0	0	0	0	0	0.5	0	0
Car digi	0.5	0	0	0	0.5	0.5	0	0	0
Cas eleg	0	0	0	0	0	0	0	0	0.5
Cer alpi	0	0	0	0	0	0	0	0	0
Cha lati	0	0	0	0	0	0	0	0	0
Com palu	0	0	0	0	0	0	0	0	0
Dia lapp	0	0	0.5	0	0	0	0.5	0	0
Dra lact	0	0	0	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0	0	0	0
Dry inte	2.5	0.5	0.5	7.5	0	0	0.1	0.5	2.5
Eut edwa	0.5	0.5	0	0	0	0.5	0	0	0
Hed amer	0.5	0	0	0	0	0	0.5	0	2.5
Min rube	0	0	0	0	0	0	0	0	0
Eut edwa	0.5	0.5	0	0	0	0.5	0	0	0
Hed amer	0.5	0	0	0	0	0	0.5	0	2.5
Min rube	0	0	0	0	0	0	0	0	0
Ort secu	0	0	0	0	0	0	0	0	0
Oxy dign	0	0	0	0	0	0	0	0	0
Oxy bell	0	0	0	0	0	0.1	0	0	0
Oxy mayd	0	0.1	2.5	2.5	0.5	0.5	0.5	0.5	0.1

Taxa	Zone 3 - moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)								
	Z350	**Z367**	**Z3133**	**Z3135**	**Z3965**	**Z3971**	**Z32002**	**Z32009**	**Z32015**
Forbs (con't)									
Pap labr	0	0	0	0	0	0	0	0	0
Par palu	0	0	0	0	0	0	0	0	0
Ped flam	0	0	0	0	0	0	0	0	0
Ped sude	0	0	0	0	0	0	0	0	0.5
Pin vill	0	0	0	0	0	0	0	0	0
Pin vulg	0	0	0	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0	0	0	0
Pot hypa	0	0	0	0	0	2.5	0	0	0
Pyr gran	0	0	0	0	2.5	0	0	0	0.5
Rub cham	0.5	0	0	0	0.1	0.1	0	0	7.5
Sau angu	0	2.5	0.5	0	0.1	0	0.1	0	0.5
Sax cern	0	0	0	0	0	0	0	0	0
Sax tric	0	0	0	0	0	0	0	0	0
Sil acau	0	0	0	0.5	0	0.1	0	0	0.1
Ste long	0	0	0	0.5	0	0	0	0	0
Tof cocc	0	0	0.5	0	0	0.5	0	0	0
Tof pusi	0	0	0.5	0	0.5	0.5	0.5	0	2.5
Graminoids									
Agr mert	0	0	0	0	0	0	0	0	0
Alo mage	0	0	0	0	0	0	0	0	0
Arc lati	0	0.5	0	0	7.5	0.1	0	0.1	0.5
Cal lapp	0	0	0	0	0	0	0	0	0
Car aqua	17.5	0	0	0	0	0.5	0	0	7.5
Car arct	0	0	0	0	0	0	0	0	0

Taxa	Zone 3 - moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)								
	Z350	**Z367**	**Z3133**	**Z3135**	**Z3965**	**Z3971**	**Z32002**	**Z32009**	**Z32015**
Graminoids (con't)									
Car bige	0	0	0.5	0	0	0	0	0	7.5
Car capi	0	0	0	0	0	0.1	0	0	2.5
Car fuli	0	0	0	0	0	0	0	0	0
Car holo	0	0	0	0	0	0	0	0	0
Car memb	0	0	0	0	0	0	0	0	17.5
Car nard	0	0	0	0	0	0	0	0	0
Car rari	2.5	0	0	0	0	0	0	0	0
Car scir	7.5	0.5	0.1	2.5	0	0.5	0	0	0.5
Car vagi	17.5	0.5	0	0.5	0	0	7.5	0	2.5
Ely alas	0	0	0	0	0	0	0	0	0
Eri angu	17.5	0	0	0	0	0.1	0	0	2.5
Eri call	0	0	0	0	0	0	0	0	0
Eri sche	0	0	0	0	0.5	0	0	0	0
Eri vagi	0	0	0	0	0.1	0	0.1	0.1	0
Fes brac	0	0	0	0	0	0	0	0	0
Fes rubr	0	0	0	0.1	0	0	0	0	0
Hie alpi	0	2.5	0.1	0.5	0.5	2.5	0.5	0.5	0.1
Jun arct	0	0	0	0	0	0	0	0	0
Jun cast	0	0	0	0	0	0	0	0	0.1
Jun trig	0	0	0	0	0	0	0	0	0
Luz conf	0	0.5	0.5	0.5	0.5	0.5	0	0.1	0
Poa arct	0	0	0	0	0	0	0	0	0
Poa glau	0	0	0	0	0	0	0	0	0
Tri cesp	0	0	0	0	0	0	0.1	0	0
Tri spic	0	0	0	0	0	0	0	0	0

Taxa	Zone 3 - moist to dry non-tussock graminoid / dwarf shrub tundra (50-70% cover)								
	Z350	**Z367**	**Z3133**	**Z3135**	**Z3965**	**Z3971**	**Z32002**	**Z32009**	**Z32015**
Horsetails									
Equ arve	0.5	0	0	0	0	0	0	0	0.5
Ferns									
Dry frag	0	0	0	0	0	0	0	0	0
Hup appr	0	0	0	0	0.5	0	0	0	0.5
Lichens									
Cru lich	0.5	0.5	17.5	7.5	0.5	17.5	7.5	0.5	2.5
Fol lich	0.5	7.5	37.5	17.5	17.5	37.5	2.5	2.5	17.5
Fru lich	0.5	2.5	87.5	17.5	37.5	37.5	7.5	2.5	7.5
Mos spec	87.5	87.5	2.5	37.5	87.5	62.5	87.5	62.5	87.5

Taxa	Zone 5 - low shrub (< 40 cm; > 25% cover)															
	Z533	**Z557**	**Z558**	**Z559**	**Z560**	**Z569**	**Z5101**	**Z5148**	**Z5209**	**Z5211**	**Z5215**	**Z5216**	**Z5224**	**Z5553**	**Z5968**	**Z52016**
Tall shrub (> 40 cm)																
Bet gla2	2.5	0	0	0	0	17.5	2.5	0	0	0	7.5	0	62.5	17.5	0	2.5
Sal ala2	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0
Sal gla2	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal pla2	0	0	0	0	0	2.5	0	0.5	0	0	2.5	0	17.5	0	0	0
Low shrub (< 40 cm)																
And poli	0.1	0	0.5	0.1	0.1	0.5	2.5	0.5	0.5	2.5	0.5	0	0.5	0	2.5	0
Arc alpi	2.5	2.5	0.5	0	0.5	0	0	0.5	0	0	0	0	0	0	0.1	0
Bet gla1	37.5	7.5	7.5	37.5	87.5	37.5	62.5	62.5	87.5	87.5	87.5	87.5	7.5	62.5	7.5	7.5
Cas tetr	0.5	0.5	17.5	0.5	0.1	0	0	2.5	7.5	0.1	2.5	0	0.1	0	0	0
Emp nigr	7.5	7.5	7.5	2.5	2.5	2.5	2.5	7.5	2.5	0	2.5	2.5	2.5	0.1	2.5	0
Led palu	0.5	2.5	2.5	0.5	2.5	2.5	2.5	7.5	7.5	0.5	7.5	2.5	37.5	37.5	7.5	62.5
Loi proc	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rho lapp	0	0.5	0	0.1	0	0.5	0.1	0	0	0.1	0	0	0	0	0	0
Sal ala1	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0
S. arcti	0	0.5	2.5	2.5	0.5	2.5	0	2.5	2.5	7.5	0.5	2.5	7.5	0.1	0.5	2.5
S. arcto	0	0	0	0	0	0	0	2.5	0	2.5	0	0	0	0	0	0
Sal fusc	0	0	0	0.5	2.5	0	0	0	0	0	0	0	0	0	0	0
Sal glan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal herb	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	2.5	0.1
Sal pla1	0.1	0	0.1	2.5	7.5	0.5	0	0.5	2.5	2.5	2.5	17.5	2.5	0	2.5	0.1
Sal reti	0	0	0	0.5	0	2.5	62.5	0	0	2.5	0	0	0.1	0	0	0
Vac ulig	7.5	7.5	17.5	7.5	17.5	62.5	17.5	37.5	7.5	37.5	7.5	37.5	17.5	2.5	62.5	7.5
Vac viti	2.5	2.5	0.5	2.5	7.5	0	0	2.5	0.5	2.5	2.5	0	37.5	17.5	2.5	17.5

Taxa	Zone 5 - low shrub (< 40 cm; > 25% cover)															
	Z533	**Z557**	**Z558**	**Z559**	**Z560**	**Z569**	**Z5101**	**Z5148**	**Z5209**	**Z5211**	**Z5215**	**Z5216**	**Z5224**	**Z5553**	**Z5968**	**Z52016**
Forbs																
Ant alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arm scab	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Art bore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ast alpi	0	0.1	0	0	0.1	0	0.5	0.1	0	0.5	0	0.5	0	0	0	0
Bis vivi	0	0	0.5	0	0	0.5	2.5	0.1	0.1	0.5	0	0.1	0.1	0	0.5	0
Car bell	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car digi	0	0	0	0.5	0.5	0	0	0	0	0.5	0	0.1	0.1	0	0.1	0
Cas eleg	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
Cer alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cha lati	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Com palu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Dia lapp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dra lact	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry inte	0	0	0.5	0.5	0.5	2.5	0.5	0.5	2.5	2.5	2.5	2.5	0.1	0	0	0
Eut edwa	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Hed amer	0	0	0	0	0	0.5	2.5	0	0	0	0	0	0	0	0	0
Min rube	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ort secu	0	0	0	0	0	0	2.5	0	0.1	0	0	0	0	0	0	0
Oxy dign	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy bell	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy Mayd	0.1	0.5	0.1	0.5	0.1	2.5	0.5	0.1	0.5	2.5	0	0.5	0.1	0	0	0
Pap labr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Par palu	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Ped flam	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0

Taxa	Zone 5 - low shrub (< 40 cm; > 25% cover)															
	Z533	**Z557**	**Z558**	**Z559**	**Z560**	**Z569**	**Z5101**	**Z5148**	**Z5209**	**Z5211**	**Z5215**	**Z5216**	**Z5224**	**Z5553**	**Z5968**	**Z52016**
Forbs (con't)																
Ped labr	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Ped lana	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped lapp	0	0	0.5	2.5	0.5	0	2.5	0.1	0	0.5	0.5	0	0.1	0	0.5	0
Ped sude	0	0	0	0	0	0	0	0	0	0	0.1	0.5	0	0	0	0
Pin vill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pin vulg	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
Pot hypa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyr gran	0	0	0	0.1	0	0	2.5	0	0	2.5	0.5	0	0.1	0	0	0
Rub cham	0.1	0	0	0	0	0	0	0	0	0	0	0	0	17.5	2.5	37.5
Sau angu	0	0	2.5	0.5	0.5	2.5	0	2.5	2.5	2.5	0.5	2.5	0.5	0	0	0
Sax cern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sax tric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sil acau	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0
Ste long	0	0	0	0	0.1	0.5	0	0.1	0	0.5	0.5	0	0	0.1	0.5	0
Tof cocc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tof pusi	0	0	0.5	0.5	0	0	2.5	0	0	0	0	0	0	0	0	0
Graminoids																
Agr mert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alo mage	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0
Arc lati	0	0	0.5	0.1	0.1	0	0	0	0	0.5	0.5	0	0.1	0.1	2.5	0.1
Cal lapp	0	0	0	0	0	0	0.1	0.5	0	0	0	0	0	0	0	0
Car aqua	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	17.5
Car arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	Zone 5 - low shrub (< 40 cm; > 25% cover)															
	Z533	Z557	Z558	Z559	Z560	Z569	Z5101	Z5148	Z5209	Z5211	Z5215	Z5216	Z5224	Z5553	Z5968	Z52016
Graminoids (con't)																
Car bige	2.5	0	0	0.5	0	0	0	0.5	0	0	2.5	0	0	7.5	2.5	0
Car capi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car fuli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car holo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car memb	2.5	0	0.5	0	0.1	0.5	0.1	0.1	0	0	0	0	0	2.5	2.5	2.5
Car nard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car rari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car scir	0.1	0	0.5	0.5	0	0	0	0	0	2.5	0	0.1	0.1	0	0	0.1
Car vagi	0	0	0.5	0.5	0.1	0	0.1	0	2.5	2.5	0	0	0.5	0	0	0
Ely alas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri angu	0	0	0	0.5	0.1	0	0	0.1	0	0	0	0.5	0	0	0	0
Eri call	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri sche	0	0	0	0	0	0	0	0	0.5	0.1	0	0	0	0	0	0
Eri vagi	0.1	0	0	0.5	0	0.5	0	0	0	0.1	0.5	2.5	0.1	0	0	0.1
Fes brac	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0
Fes rubr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hie alpi	0.5	0.5	0.1	2.5	2.5	0	0	0.5	0	0	0.1	0.5	0.1	0.1	2.5	0
Jun arct	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0
Jun cast	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Jun trig	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luz conf	0	0	0	0	0	0	2.5	0.5	0	0.5	0	0	0	0	0.5	0
Poa arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glau	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Tri cesp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tri spic	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0

Taxa	Zone 5 - low shrub (< 40 cm; > 25% cover)															
	Z533	**Z557**	**Z558**	**Z559**	**Z560**	**Z569**	**Z5101**	**Z5148**	**Z5209**	**Z5211**	**Z5215**	**Z5216**	**Z5224**	**Z5553**	**Z5968**	**Z52016**
Horsetails																
Equ arve	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0
Ferns																
Dry frag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hup appr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lichens																
Cru lich	17.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	2.5	0.5	2.5
Fol lich	37.5	17.5	17.5	2.5	0.5	2.5	7.5	17.5	17.5	2.5	0.5	0.5	17.5	37.5	37.5	62.5
Fru lich	62.5	37.5	17.5	2.5	2.5	2.5	17.5	37.5	7.5	7.5	0.5	2.5	17.5	62.5	2.5	62.5
Mos spec	37.5	2.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	87.5	62.5	87.5	17.5	87.5	87.5

Taxa	Zone 6 - Tall shrub (> 40 cm; > 25% cover)			
	Z6544	**Z6547**	**Z6549**	**Z62017**
Tall shrub (> 40 cm)				
Bet gla2	87.5	87.5	37.5	2.5
Sal ala2	0	0	0	0
Sal gla2	0	0	0	0
Sal pla2	0	2.5	0	87.5
Low shrub (< 40 cm)				
And poli	0	0	0	0
Arc alpi	0	0	0	0
Bet glan	7.5	7.5	37.5	2.5
Cas tetr	0	0	0	0
Emp nigr	0	0.1	0.1	0
Led palu	7.5	7.5	2.5	0
Loi proc	0	0	0	0
Rho lapp	0	0	0	0
Sal alax	0	0	0	0
S. arcti	0	0.5	0	0
S. arcto	0	0	7.5	0
Sal fusc	0	0	0	0
Sal glau	0	0	0	0
Sal herb	0	0.1	0	0.5
Sal plan	0.5	0.5	0.1	0
Sal reti	0	0	0	0
Vac ulig	0	0.1	0.1	0
Vac viti	37.5	62.5	0.1	0
Forbs				
Ant alpi	0	0	0	0
Arm scab	0	0	0	0
Arn alpi	0	0	0	0
Art bore	0	0	0	0.1
Ast alpi	0	0	0	0
Bis vivi	0	0.1	0	0.5
Car bell	0	0	0	0
Car digi	0	0	0	0
Cas eleg	0	0	0	0
Cer alpi	0	0	0	0
Cha lati	0	0	0	0
Com palu	0	0	0	0
Dia lapp	0	0	0	0
Dra lact	0	0	0	0
Dra niva	0	0	0	0

Taxa	Zone 6 - Tall shrub (> 40 cm; > 25% cover)			
	Z6544	Z6547	Z6549	Z62017
Forbs (con't)				
Dry inte	0	0	0	0
Eut edwa	0	0	0	0
Hed amer	0	0	0	0
Min rube	0	0	0	0
Ort secu	0	0	0	2.5
Oxy dign	0	0	0	0
Oxy bell	0	0	0	0
Oxy mayd	0	0	0	0
Pap labr	0	0	0	0
Par palu	0	0	0	0
Ped flam	0	0	0	0
Ped labr	0	0	0	0
Ped lana	0	0	0	0
Ped lapp	0.1	0.1	0.5	0
Ped sude	0	0	0.1	0
Pin vill	0	0	0	0
Pin vulg	0	0	0	0
Pla obtu	0	0	0	0
Pot hypa	0	0	0	0.1
Pyr gran	0.1	0.5	0	0.1
Rub cham	2.5	2.5	0.1	0
Sau angu	0	0	0	0
Sax cern	0	0	0	0
Sax tric	0	0	0	0.1
Sil acau	0	0	0	0
Ste long	0	0.1	0	0.5
Tof cocc	0	0	0	0
Tof pusi	0	0	0	0
Graminoids				
Agr mert	0	0	0	0
Alo mage	0	0	0	0
Arc lati	7.5	2.5	2.5	7.5
Cal lapp	0	0	0	2.5
Car aqua	0.1	0	0.1	0
Car arct	0	0	0	0
Car bige	0	0	0	0
Car capi	0	0	0	0
Car fuli	0	0	0	0
Car holo	0	0	0	0
Car memb	0	0.5	0	0

Taxa	Zone 6 - Tall shrub (> 40 cm; > 25% cover)			
	Z6544	**Z6547**	**Z6549**	**Z62017**
Graminoids (con't)				
Car nard	0	0	0	0
Car rari	0	0	0	0
Car scir	0	0	0	0
Car vagi	0	0	0	0
Ely alas	0	0	0	0
Eri angu	0	0	0	0
Eri call	0	0	0	0
Eri sche	2.5	0	0	0
Eri vagi	0	0.1	7.5	0
Fes brac	0	0	0	0
Fes rubr	0	0	0	0
Hie alpi	0	0	0	0
Jun arct	0	0	0	0
Jun cast	0	0	0	0
Jun trig	0	0	0	0
Luz conf	0	0	0	0
Poa arct	0	0	0	0
Poa glau	0	0	0	0
Tri cesp	0	0	0	0
Tri spic	0	0	0	0
Horsetails				
Equ arve	0	0	0	0
Ferns				
Dry frag	0	0	0	0
Hup appr	0	0	0	0
Lichens				
Cru lich	0.5	0.5	2.5	0.5
Fol lich	7.5	7.5	7.5	2.5
Fru lich	17.5	7.5	17.5	0.5
Mos spec	87.5	87.5	87.5	87.5

Taxa	Zone 7 - Prostrate dwarf shrub																
	Z714	Z719	Z721	Z7103	Z7104	Z7105	Z7106	Z7109	Z7111	Z7116	Z7117	Z7122	Z7126	Z7129	Z7138	Z7144	Z7161
Tall shrub (> 40 cm)																	
Bet gla2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal ala2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal gla2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal pla2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low shrub (< 40 cm)																	
And poli	2.5	0	0	0	0.5	0.1	0	0.5	0	0.1	2.5	0	0	7.5	0.5	0.5	2.5
Arc alpi	2.5	0.5	2.5	2.5	2.5	2.5	0.1	0.1	2.5	2.5	2.5	2.5	7.5	2.5	2.5	2.5	0.5
Bet glan	2.5	7.5	17.5	2.5	17.5	37.5	2.5	37.5	7.5	7.5	7.5	17.5	0	7.5	0	2.5	17.5
Cas tetr	7.5	0	2.5	0.1	17.5	2.5	2.5	17.5	0	2.5	7.5	0.5	0	7.5	2.5	17.5	7.5
Emp nigr	2.5	2.5	7.5	2.5	7.5	2.5	2.5	7.5	17.5	2.5	2.5	17.5	2.5	17.5	2.5	2.5	2.5
Led palu	2.5	2.5	7.5	0.5	0	0.5	0	0.5	2.5	7.5	2.5	7.5	7.5	2.5	0	7.5	0.5
Loi proc	0	0	0	0	2.5	2.5	0	0.1	0.1	0.1	0.5	0	0	7.5	0	0	2.5
Rho lapp	0	0	0	0.5	2.5	0.1	0.1	2.5	0	0	2.5	0.1	0.1	2.5	2.5	0	0.5
Sal alax	0	0	0	0.5	0	0	0.1	0	0	0	0	0	0	0	0	0	0
S. arcti	0.5	0	0.5	7.5	0	0.1	7.5	0	0	0	0	2.5	0	7.5	7.5	7.5	0
S. arcto	0	0	0	2.5	0	0	0	0	0	0	2.5	0	0	0	0	0	0
Sal fusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal glau	0	0	0	0	0	0	0	0	0	2.5	0	0	2.5	0	0	0	0
Sal herb	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Sal plan	0	0	0	0	0	0	0	0	0	0	0	7.5	0	7.5	0	0	0
Sal reti	0	0	0	2.5	2.5	2.5	2.5	0	0	0	0.1	0	0	2.5	2.5	0	0
Vac ulig	7.5	2.5	0.5	37.5	17.5	37.5	17.5	37.5	7.5	7.5	17.5	2.5	7.5	37.5	7.5	2.5	2.5
Vac viti	0.5	2.5	7.5	0.5	0	0.1	0.5	0	2.5	2.5	2.5	7.5	0.5	7.5	2.5	2.5	0.5

Taxa	Zone 7 - Prostrate dwarf shrub																
	Z714	**Z719**	**Z721**	**Z7103**	**Z7104**	**Z7105**	**Z7106**	**Z7109**	**Z7111**	**Z7116**	**Z7117**	**Z7122**	**Z7126**	**Z7129**	**Z7138**	**Z7144**	**Z7161**
Forbs																	
Ant alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arm scab	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Art bore	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0
Ast alpi	0	0	0	0.1	0	0	2.5	0	0	0.1	0	0	2.5	0	0	0	0
Bis vivi	0	0	0	2.5	0.5	0	0.5	0.5	0	0	0.5	0	0.5	0.5	2.5	0	0.1
Car bell	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car digi	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0.5	0	0	0
Cas eleg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Cer alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Cha lati	0	0	0	0	2.5	0.1	0	0.1	0	0	0.1	2.5	0.1	0.5	0.1	0.1	0.1
Com palu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dia lapp	0	0	0	0	0	0.5	0	0	0.1	0.1	0.5	0	0	2.5	0	0	0
Dra lact	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry inte	0	0	0	7.5	7.5	7.5	7.5	7.5	2.5	0.1	2.5	2.5	0	2.5	17.5	2.5	0
Eut edwa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hed amer	0	0	0	2.5	0	0.1	2.5	0	0	0	0	0	0	0	0.1	0	0
Min rube	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ort secu	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0.5	0	0
Oxy dign	0.1	0	0	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0
Oxy bell	0	0	0.1	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
Oxy mayd	0.1	0.1	0.1	0.5	0.5	0.5	2.5	2.5	0.5	0	0.5	0.1	2.5	0	17.5	0	2.5
Pap labr	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Par palu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped flam	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	Zone 7 - Prostrate dwarf shrub																
	Z714	**Z719**	**Z721**	**Z7103**	**Z7104**	**Z7105**	**Z7106**	**Z7109**	**Z7111**	**Z7116**	**Z7117**	**Z7122**	**Z7126**	**Z7129**	**Z7138**	**Z7144**	**Z7161**
Forbs (con't)																	
Ped labr	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0.1	0
Ped lana	0	0	0	0.5	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Ped lapp	0	0	0	0	0.5	0.5	0.1	0.5	0	0	0.1	0	0	0.5	0.1	0	0
Ped sude	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pin vill	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0.5	0	0	0
Pin vulg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pot hypa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Pyr gran	0	0	0	0.1	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Rub cham	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sau angu	0.1	0	0	0.5	0.5	0.5	2.5	0.1	0	0.5	2.5	0	0.1	2.5	0	0	0.5
Sax cern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sax tric	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0.1
Sil acau	0	0	0	0.1	0.1	0.5	0	0.1	0	0	0	0.1	0	0.5	2.5	0	0.1
Ste long	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0.5	0
Tof cocc	0	0	0	0.5	0	0.5	0.5	0	0	0	0.5	0	0	0.5	0	0	0
Tof pusi	0	0	0	0	2.5	2.5	0	2.5	0	0.1	0.1	0.1	0	2.5	0.1	0.1	0.5
Graminoids																	
Agr mert	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alo mage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arc lati	0.5	0	0	0	0	0	0	0	0	0	0	0	0.1	0.1	0	0.1	0
Cal lapp	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car aqua	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0
Car arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0

Taxa	Zone 7 - Prostrate dwarf shrub																
	Z714	Z719	Z721	Z7103	Z7104	Z7105	Z7106	Z7109	Z7111	Z7116	Z7117	Z7122	Z7126	Z7129	Z7138	Z7144	Z7161
Graminoids (con't)																	
Car bige	2.5	0	0	0	0	0	0	0	0	2.5	0.5	0.1	2.5	0	0	0	0
Car capi	0	0	0	0	2.5	0	0	0.1	0	0	0	0	0	0.5	0	0	0
Car fuli	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car holo	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car memb	0.5	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0	0	0
Car nard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car rari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car scir	0	0	0	0.5	0.5	0.1	0.5	2.5	0.1	0	0.5	0.1	0.1	2.5	2.5	0	0.5
Car vagi	0.5	0	0	0	0.1	0.5	0	0.1	0	0	0	0	0	0.5	0	0.1	0.1
Ely alas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0
Eri angu	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri call	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri sche	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri vagi	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0
Fes brac	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fes rubr	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0
Hie alpi	0.1	0.5	0.1	0.1	0	0.1	0	0.1	0.1	0.5	0.1	0.5	2.5	0	0.1	0.5	0.1
Jun arct	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun cast	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun trig	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luz conf	2.5	0	0	0.5	0.5	0.5	0.5	0	0	0.5	0.5	0.1	2.5	0.5	0.5	0.1	0
Poa arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glau	0	0	0	0.1	0	0.1	0	0	0	0	0	0	0	0	0.1	0	0
Tri cesp	0	0	0	0	0	0	0	0	0	0	0	0	0	7.5	0	0	0
Tri spic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	Zone 7 - Prostrate dwarf shrub																
	Z714	**Z719**	**Z721**	**Z7103**	**Z7104**	**Z7105**	**Z7106**	**Z7109**	**Z7111**	**Z7116**	**Z7117**	**Z7122**	**Z7126**	**Z7129**	**Z7138**	**Z7144**	**Z7161**
Horsetails																	
Equ arve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ferns																	
Dry frag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hup appr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lichens																	
Cru lich	2.5	62.5	37.5	2.5	0.5	2.5	7.5	2.5	17.5	7.5	2.5	2.5	37.5	7.5	7.5	0.5	2.5
Fol lich	62.5	17.5	62.5	17.5	37.5	62.5	17.5	37.5	37.5	62.5	62.5	7.5	2.5	62.5	17.5	87.5	87.5
Fru lich	62.5	17.5	87.5	62.5	62.5	62.5	62.5	87.5	87.5	87.5	87.5	87.5	7.5	62.5	17.5	62.5	87.5
Mos spec	17.5	0.5	7.5	87.5	37.5	37.5	87.5	62.5	7.5	37.5	62.5	17.5	17.5	62.5	87.5	37.5	17.5

Taxa (continued)	Zone 7 - Prostrate dwarf shrub																	
	165	**169**	**174**	**175**	**179**	**186**	**203**	**946**	**966**	**2001**	**2005**	**2006**	**2007**	**2010**	**2011**	**2012**	**2018**	**2019**
Tall shrub (> 40 cm)																		
Bet gla2	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal ala2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal gla2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal pla2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Low shrub (< 40 cm)																		
And poli	0.1	0.5	2.5	0	0.5	0.5	0	0	0	0.5	0.5	0.5	0.1	2.5	0	0	0	0.5
Arc alpi	7.5	2.5	2.5	0.1	2.5	0.5	0.1	0	0	2.5	0	2.5	2.5	2.5	2.5	0.5	2.5	2.5
Bet gla1	7.5	7.5	17.5	2.5	17.5	2.5	0.1	0.1	0	37.5	17.5	17.5	2.5	2.5	0.5	7.5	2.5	7.5
Cas tetr	2.5	7.5	17.5	0.1	0.1	7.5	0	0	0	2.5	2.5	7.5	0.1	0.5	0	7.5	2.5	17.5
Emp nigr	7.5	2.5	7.5	17.5	2.5	7.5	17.5	0.1	0	0	7.5	0.5	7.5	2.5	2.5	7.5	2.5	7.5
Led palu	7.5	2.5	2.5	0.5	7.5	7.5	2.5	17.5	7.5	0	2.5	0.5	7.5	0.5	2.5	7.5	2.5	2.5
Loi proc	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0.5	0	0.5
Rho lapp	0	0	0.1	0	0	0.1	0	0	0	2.5	0.5	0.5	0.1	0.5	0	0.1	2.5	2.5
Sal alax	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
S. arcti	0.1	0	2.5	0	0.5	2.5	0.1	0	0	2.5	2.5	2.5	2.5	2.5	0.1	2.5	2.5	2.5
S. arcto	0	7.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal fusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal gla1	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Sal herb	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.1	0	0	0
Sal pla1	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	7.5
Sal reti	0	0	0.5	0	0	0	0	0	0	0.5	0	0	0	0.5	0	0	2.5	0
Vac ulig	2.5	7.5	17.5	2.5	7.5	0.5	2.5	0.1	0	17.5	7.5	7.5	2.5	7.5	7.5	2.5	2.5	17.5
Vac viti	0.5	2.5	2.5	2.5	2.5	17.5	0.5	37.5	62.5	0.5	2.5	0.1	2.5	0.1	0.5	2.5	2.5	2.5

Taxa (continued)	Zone 7 - Prostrate dwarf shrub																	
	165	**169**	**174**	**175**	**179**	**186**	**203**	**946**	**966**	**2001**	**2005**	**2006**	**2007**	**2010**	**2011**	**2012**	**2018**	**2019**
Forbs																		
Ant alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arm scab	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Art bore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ast alpi	0	0	0.1	0	0	0.1	0.1	0	0	0	0.5	0	0.1	2.5	0.5	0	0.5	0
Bis vivi	0	0.5	0.1	0	0	0	0	0	0	0.5	0	0.1	0	0	0	0	2.5	0
Car bell	0	0.5	0	0	0	0	0	0	0	0	0.5	0	0.1	0.1	0	0	0	0
Car digi	0	0	0.1	0	0	0	0	0	0	0.5	0.5	0	0.1	0.5	0	0	0.5	0
Cas eleg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cer alpi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cha lati	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Com palu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dia lapp	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
Dra lact	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry inte	0	0	2.5	0.5	0	0	37.5	0	0	2.5	0	0.5	2.5	0.5	2.5	0.5	17.5	2.5
Eut edwa	0	0	0	0	0	0	0	0	0	0.5	0.5	0	0.5	0	0	0	0	0.1
Hed amer	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0
Min rube	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ort secu	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0.1**	**0**
Oxy dign	0	0	2.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy bell	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0	0
Oxy Mayd	0	2.5	0	0.5	0.1	0.1	0.1	0	0	0.5	2.5	0.1	0.1	0.5	0.1	0.5	0.5	2.5
Pap labr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Par palu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped flam	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa (continued)	Zone 7 - Prostrate dwarf shrub																	
	165	169	174	175	179	186	203	946	966	2001	2005	2006	2007	2010	2011	2012	2018	2019
Forbs (cont't)																		
Ped labr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped lana	0	0	0	0	0	0	0	0	0	0	0.5	0	0.1	0	0	0	0	0
Ped lapp	0	0	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0.5
Ped sude	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Pin vill	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pin vulg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pot hypa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyr gran	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.5	0
Rub cham	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Sau angu	0	2.5	2.5	0	0	0	0	0	0	0.5	0.5	0.5	0.1	0.5	0	0.1	2.5	2.5
Sax cern	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sax tric	0	0	0	0.1	0	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
Sil acau	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0.1	0	0	0.1
Ste long	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Tof cocc	0	0	0	0	0	0	0	0	0	0.1	0	0	0.1	0	0.5	0	0	2.5
Tof pusi	0	0.5	0.5	0	0	0	0	0	0	0	0.5	0.1	0	0	0	0.1	0	2.5
Graminoids																		
Agr mert	0	0	0	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Alo mage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arc lati	0.5	0.5	0	0	0	0	0	0.5	0	0	0	0	0.5	0	0.1	0.5	0	0.1
Cal lapp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car aqua	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Car arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa (continued)	Zone 7 - Prostrate dwarf shrub																	
	165	169	174	175	179	186	203	946	966	2001	2005	2006	2007	2010	2011	2012	2018	2019
Graminoids (con't)																		
Car bige	0	0.1	7.5	0	0.1	0	0	0	0	0	0	0.5	0	0.1	0	0.1	0	0
Car capi	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0
Car fuli	0	0	0	0	0	0	0.5	0	0	0	0	0	0	0	0	0	0	0
Car holo	0	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0
Car memb	2.5	0.5	0	0	0	0	0	0	0	0	2.5	0.5	0	0	0.5	0.5	0	0
Car nard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car rari	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Car scir	0	0.1	0.1	0	0.1	0	2.5	0	0	7.5	0.5	0.5	0.5	0	0.5	0	0	0.1
Car vagi	0	0.5	2.5	0	0	0	0	0	0	2.5	0	0.5	0.1	0	0	0	0	0
Ely alas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri angu	0	0.5	0.1	0	0	0	0	0	0	0	0.1	0	0.1	0	0	0	0	0
Eri call	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri sche	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0.1	0
Eri vagi	0.5	0	0	0	0	0	0	0	0	2.5	0	0	0	0	0	0	0	0
Fes brac	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Fes rubr	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hie alpi	0	0.1	0	0.1	0.1	0.5	2.5	2.5	2.5	0	0	0.1	0	0.5	0.5	0.1	0.5	0
Jun arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun cast	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun trig	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Luz conf	0	0.5	0	0	0.1	0.5	2.5	0	0	0.5	0	0.5	0.5	0.5	0.5	0.1	0.5	0.5
Poa arct	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glau	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tri cesp	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.1
Tri spic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa (continued)	Zone 7 - Prostrate dwarf shrub																	
	165	**169**	**174**	**175**	**179**	**186**	**203**	**946**	**966**	**2001**	**2005**	**2006**	**2007**	**2010**	**2011**	**2012**	**2018**	**2019**
Horsetails																		
Equ arve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ferns																		
Dry frag	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hup appr	0.5	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lichens																		
Cru lich	0.5	0.5	7.5	0	37.5	37.5	0.5	37.5	2.5	0.5	0.5	0.5	2.5	2.5	0.5	0.5	2.5	7.5
Fol lich	62.5	17.5	17.5	62.5	62.5	62.5	2.5	62.5	87.5	7.5	17.5	2.5	17.5	2.5	7.5	7.5	37.5	37.5
Fru lich	87.5	17.5	7.5	62.5	62.5	87.5	7.5	87.5	87.5	2.5	17.5	2.5	17.5	2.5	2.5	2.5	2.5	87.5
Mos spec	87.5	87.5	37.5	2.5	2.5	7.5	2.5	7.5	87.5	37.5	37.5	37.5	2.5	37.5	7.5	62.5	87.5	37.5

Taxa	Zone 8 - Sparsely vegetated bedrock (2 - 10% cover)								Zone 10 - Bare soil with cryptogam crust - frost boils				
	Z823	**Z8164**	**Z8176**	**Z8178**	**Z8212**	**Z82003**	**Z82013**	**Z82014**	**Z102**	**Z1017**	**Z1046**	**Z1087**	**Z102004**
Tall shrub (> 40 cm)													
Bet gla2	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Sal ala2	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal gla2	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal pla2	0	0	0	0	0	0	0	0	0	0	0	0	0
Low shrub (< 40 cm)													
And poli	0	0	0	0	0	0	0	0	0	0	0	0	0
Arc alpi	0	0	2.5	0	0.1	0.5	7.5	0	2.5	2.5	2.5	2.5	0.1
Bet glan	0	0	0.1	0	0	0.1	0	0	2.5	0.1	2.5	0	0
Cas tetr	0	0	0.1	0	0	0.1	0	0	0.1	0	0	0.1	0.1
Emp nigr	2.5	7.5	7.5	2.5	2.5	2.5	7.5	2.5	2.5	2.5	2.5	2.5	0.1
Led palu	0.1	0.1	0.5	7.5	2.5	0.1	0	0.5	7.5	0.1	2.5	0.1	0
Loi proc	0	0	0	0	0	0	0	2.5	0	0	0	0	0
Rho lapp	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Sal alax	0	0	0	0	0	0	0	0	0	0	0	0	0
S. arcti	0	0	0	0	0	0	7.5	0	7.5	0	0.5	0.1	0
S. arcto	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal fusc	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal glau	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal herb	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal plan	0	0	0	0	0	0	0	0	0	0	0	0	0
Sal reti	0	0	0	0	0	0	0	0	0	0	0	0	0
Vac ulig	2.5	0	2.5	2.5	0.5	2.5	7.5	2.5	2.5	2.5	0.5	7.5	0.1
Vac viti	0.5	0.1	0.5	0.5	0.1	0	2.5	0.5	2.5	0.5	0.5	2.5	0

Taxa	Zone 8 - Sparsely vegetated bedrock (2-10% cover)								Zone 10 - Bare soil with cryptogam crust - frost boils				
	Z823	Z8164	Z8176	Z8178	Z8212	Z82003	Z82013	Z82014	Z102	Z1017	Z1046	Z1087	Z102004
Forbs													
Ant alpi	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Arm scab	0	0	0	0	0	0	0	0	0	0	0	0	0
Arn alpi	0	0	0	0	0	0	0	0	0	0	0	0	0
Art bore	0	0	0	0	0	0	0	0	0	0	0	0	0
Ast alpi	0	0	0	0	0	0.5	0.1	0	2.5	0	0	0	0
Bis vivi	0	0	0	0	0	0	0	0	0.5	0	0	0	0
Car bell	0	0	0	0	0	0	0	0	0	0	0	0	0
Car digi	0	0	0	0	0	0	0	0	0.1	0	0	0	0
Cas eleg	0	0	0	0	0	0	0	0	0	0	0	0	0
Cer alpi	0	0	0	0	0	0.5	0	0.5	0	0	0	0	0
Cha lati	0	0	0	0.1	0	0	0	2.5	0	0	0	0	2.5
Com palu	0	0	0	0	0	0	0	0	0	0	0	0	0
Dia lapp	0	0	0	0	0	0	0	0	0	0	0	0	0
Dra lact	0	0	0	0	0	0	0	0	0	0	0	0	0
Dra niva	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Dry inte	0	0	0.1	0.1	0	7.5	7.5	2.5	2.5	7.5	0.5	0.1	0.1
Eut edwa	0	0	0	0	0	0	0	0	0	0	0	0	0
Hed amer	0	0	0	0	0	0	0	0	0	0	0	0	0
Min rube	0	0	0	0	0	0	0	0	0	0	0	0	0.5
Ort secu	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy dign	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy bell	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxy mayd	0	0	0	0.5	0	0.5	0.5	0.5	0.5	0	0	0.1	0
Pap labr	0	0	0	0	0	0	0	0	0	0	0	0	0
Par palu	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped flam	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	Zone 8 - Sparsely vegetated bedrock (2-10% cover)								Zone 10 - Bare soil with cryptogam crust - frost boils				
	Z823	Z8164	Z8176	Z8178	Z8212	Z82003	Z82013	Z82014	Z102	Z1017	Z1046	Z1087	Z102004
Forbs (con't)													
Ped labr	0	0	0	0	0	0	0	0	0	0	0	0	0
Ped lana	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Ped lapp	0	0	0.1	0	0	0	0	0	0	0	0	0	0
Ped sude	0	0	0	0	0	0	0	0	0	0	0	0	0
Pin vill	0	0	0	0	0	0	0	0	0	0	0	0	0
Pin vulg	0	0	0	0	0	0	0	0	0	0	0	0	0
Pla obtu	0	0	0	0	0	0	0	0	0	0	0	0	0
Pot hypa	0	0	0	0.5	0	0	0	0.1	0	0	0	0	0
Pyr gran	0	0	0	0	0	0	0	0	0	0	0	0	0
Rub cham	0	0	0	0	0	0	0	0	0	0	0	0	0
Sau angu	0	0	0	0	0	0.1	0	0.1	0.1	0	0	0	0
Sax cern	0	0	0	0	0	0	0	0.1	0	0	0	0	0
Sax tric	0	0	0	0.1	0	0	2.5	2.5	0	0.5	0	0.5	0.5
Sil acau	0	0	0	0	0	0	0	0	0	0	0	0	0
Ste long	0	0	0	0.5	0	0	0.5	0	0	0	0	0	0.1
Tof cocc	0	0	0	0	0	0	0	0	0	0	0	0	0
Tof pusi	0	0	0	0	0	0	0	0	0	0	0	0	0
Graminoids													
Agr mert	0	0	0	0	0	0	0	0	0	0	0	0	0
Alo mage	0	0	0	0	0	0	0	0	0	0	0	0	0
Arc lati	0	0	0	0	0	0	0	0	0	0	0	0	0
Cal lapp	0	0	0	0	0	0	0	0	0	0	0	0	0
Car aqua	0	0	0	0	0	0	0	0	0	0	0	0	0
Car arct	0	0	0	0.1	0.5	0	0	0	0	0	0	0.1	0.5

Taxa	Zone 8 - Sparsely vegetated bedrock (2-10% cover)								Zone 10 - Bare soil with cryptogam crust - frost boils				
	Z823	**Z8164**	**Z8176**	**Z8178**	**Z8212**	**Z82003**	**Z82013**	**Z82014**	**Z102**	**Z1017**	**Z1046**	**Z1087**	**Z102004**
Graminoids (con't)													
Car bige	0	0	0	0.1	0.5	0	0	0	0	0	0	0.1	0.5
Car capi	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Car fuli	0	0	0	0	0	0	0	0	0	0	0	0	0
Car holo	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0
Car memb	0	0	0	0	0.5	0	0	0	0	0	0	0	0.5
Car nard	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1
Car rari	0	0	0	0	0	0	0	0	0	0	0	0	0
Car scir	0	0.1	0.1	0	0	2.5	0	0	0	0.1	0.1	0	0
Car vagi	0	0	0	0	0	0.5	0	0	0	0	0	0	0
Ely alas	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri angu	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri call	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri sche	0	0	0	0	0	0	0	0	0	0	0	0	0
Eri vagi	0	0	0	0	0	0	0	0	0	0	0	0	0
Fes brac	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1
Fes rubr	0	0	0	0	0	0	0	0	0	0	0	0	0
Hie alpi	0.1	0.5	0.5	0.5	0.5	0.1	2.5	0.1	0.5	0.5	0.1	0.5	0.5
Jun arct	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun cast	0	0	0	0	0	0	0	0	0	0	0	0	0
Jun trig	0	0	0	0	0	0	0	0	0	0	0	0	0
Luz conf	0	0	0	0.1	0.5	0	0.1	0.1	0	0.5	0.5	0.1	0
Poa arct	0	0	0	0	0	0	0	0	0	0	0	0	0
Poa glau	0	0	0	0	0	0	0	0	0	0	0	0	0
Tri cesp	0	0	0	0	0	0	0	0	0	0	0	0	0
Tri spic	0	0	0	0	0	0	0	0	0	0	0	0	0

Taxa	Zone 8 - Sparsely vegetated bedrock (2-10% cover)								Zone 10 - Bare soil with cryptogam crust - frost boils				
	Z823	**Z8164**	**Z8176**	**Z8178**	**Z8212**	**Z82003**	**Z82013**	**Z82014**	**Z102**	**Z1017**	**Z1046**	**Z1087**	**Z102004**
Horsetails													
Equ arve	0	0	0	0	0	0	0	0	0	0	0	0	0
Ferns													
Dry frag	0	0.1	0	0	0	0.5	0	0.5	0	0	0	0	0
Hup appr	0	0	0.1	0	0	0	0	0	0	0.1	0	0	0
Lichens													
Cru lich	87.5	87.5	87.5	62.5	87.5	37.5	37.5	62.5	17.5	2.5	17.5	2.5	62.5
Fol lich	7.5	7.5	17.5	17.5	2.5	7.5	17.5	2.5	37.5	37.5	37.5	17.5	7.5
Fru lich	17.5	37.5	17.5	17.5	0.5	17.5	7.5	2.5	87.5	62.5	62.5	87.5	37.5
Mos spec	0.5	2.5	17.5	17.5	17.5	2.5	2.5	7.5	37.5	2.5	0.5	0.5	0.5

ANNEXE C

ENVIRONMENAL VARIABLES EVALUATED FOR 83 SITES THROUGHOUT SEVEN VEGETATION ZONES IN BAKER LAKE, NUNAVUT DURING THE SUMMER OF 2009

Zone-site	Latitude	Longitude	Altitude (m)	Slope degree (°)	Aspect (°)	Drainage					Topography		
						Very poor	Poor	Mod. well	Well	Very well	Flat	Incline	Abrupt
Z128	N64.34306	W95.93592	16	0.5	265	0	1	0	0	0	1	0	0
Z143	N64.35061	W95.89190	74	0.5	224	0	1	0	0	0	1	0	0
Z149	N64.35323	W95.91904	54	0.5	80	0	1	0	0	0	1	0	0
Z180	N64.38604	W95.85786	52	2.5	340	0	0	1	0	0	0	1	0
Z1149	N64.31973	W96.17212	64	1	294	0	1	0	0	0	0	1	0
Z12008	N64.32737	W99.94580	54	1	232	1	0	0	0	0	1	0	0
Z350	N64.35466	W95.84921	53	3	135	1	0	0	0	0	0	1	0
Z367	N64.37492	W95.89492	50	1	114	0	0	0	1	0	0	1	0
Z3133	N64.30254	W95.92033	25	3	166	0	0	0	1	0	0	1	0
Z3135	N64.30474	W95.92857	35	3.5	170	0	0	0	1	0	0	1	0
Z3965	N64.72149	W97.89221	79	0.5	248	0	0	0	1	0	1	0	0
Z3971	N64.72507	W97.89282	78	1	196	0	0	0	1	0	1	0	0
Z32002	N64.32623	W96.02585	57	1	183	0	1	0	0	0	1	0	0
Z32009	N64.31102	W95.95013	14	1	239	0	0	0	1	0	1	0	0
Z32015	N64.31474	W95.92240	26	1.5	150	0	1	0	0	0	1	0	0
Z533	N64.34591	W95.87334	78	9	144	0	0	1	0	0	0	0	1
Z557	N64.36201	W95.84798	58	1	80	0	0	0	1	0	1	0	0

Zone-site	Latitude	Longitude	Altitude (m)	Slope degree (°)	Aspect (°)	Drainage					Topography		
						Very poor	Poor	Mod. well	Well	Very well	Flat	Incline	Abrupt
Z558	N64.36467	W95.89605	62	2.5	232	0	0	1	0	0	0	1	0
Z559	N64.36563	W95.90342	50	1	252	0	0	1	0	0	1	0	0
Z560	N64.36671	W95.90160	56	0.5	344	0	0	1	0	0	1	0	0
Z569	N64.37686	W95.894697	57	2	90	0	0	1	0	0	0	1	0
Z5101	N64.28123	W96.13774	4	2.5	156	0	1	0	0	0	0	1	0
Z5148	N64.31576	W95.91487	42	1	164	0	0	1	0	0	0	1	0
Z5209	N64.36097	W95.94869	63	0.5	24	0	0	1	0	0	1	0	0
Z5211	N64.36310	W95.92558	53	0	46	0	1	0	0	0	1	0	0
Z5215	N64.36900	W95.88662	61	1.5	344	0	0	0	1	0	0	1	0
Z5216	N64.37022	W95.88910	52	2.5	335	0	0	0	1	0	0	1	0
Z5224	N64.38858	W95.86004	46	2.5	354	0	1	0	0	0	0	1	0
Z5553	N64.68172	W98.15296	79	2.5	284	0	0	0	1	0	0	1	0
Z5968	N64.72339	W97.89812	70	0.5	278	0	0	1	0	0	1	0	0
Z52016	N64.68312	W98.15375	75	5.5	212	0	1	0	0	0	0	1	0
Z6544	N64.65738	W98.02679	85	1	340	0	0	0	1	0	0	1	0
Z6547	N64.65907	W98.02798	80	1	348	0	1	0	0	0	1	0	0
Z6549	N64.66090	W98.02642	74	0.5	344	0	1	0	0	0	1	0	0
Z62017	N64.73011	W97.93411	71	1	130	0	0	1	0	0	1	0	0
Z714	N64.33103	W96.04276	55	2.5	184	0	0	0	1	0	0	1	0
Z719	N64.33567	W95.98894	75	1	220	0	0	0	0	1	0	1	0
Z721	N64.33853	W95.99345	79	2.5	208	0	0	0	0	1	0	1	0
Z7103	N64.28470	W96.11888	-1	1	84	0	0	0	1	0	1	0	0
Z7104	N64.28555	W96.17633	41	3.5	151	0	0	0	1	0	0	1	0
Z7105	N64.28566	W96.15743	26	2.5	150	0	0	0	0	1	0	1	0

Zone-site	Latitude	Longitude	Altitude (m)	Slope degree (°)	Aspect (°)	Drainage					Topography		
						Very poor	Poor	Mod. well	Well	Very well	Flat	Incline	Abrupt
Z7106	N64.28657	W96.10857	-1	2	208	0	0	0	1	0	0	1	0
Z7109	N64.28963	W96.17551	53	5.5	142	0	0	0	1	0	0	1	0
Z7111	N64.29212	W96.14611	41	1	190	0	0	0	0	1	1	0	0
Z7116	N64.29382	W96.13720	34	0.5	224	0	0	0	1	0	1	0	0
Z7117	N64.29533	W96.14700	44	0.5	100	0	0	1	0	0	1	0	0
Z7122	N64.29810	W96.15583	55	1	86	0	0	0	0	1	0	1	0
Z7126	N64.30038	W95.93177	34	2	132	0	0	0	0	1	0	1	0
Z7129	N64.29866	W96.15633	50	0.5	82	0	0	1	0	0	1	0	0
Z7138	N64.30644	W95.95809	-3	3	192	0	0	0	1	0	0	1	0
Z7144	N64.31063	W96.14822	78	1	188	0	0	0	1	0	0	1	0
Z7161	N64.33082	W95.95344	60	4.5	182	0	0	0	1	0	0	1	0
Z7165	N64.33488	W96.10450	84	1	204	0	0	0	1	0	0	1	0
Z7169	N64.33604	W96.04184	67	1.5	368	0	0	1	0	0	0	1	0
Z7174	N64.33855	W96.13520	91	0.5	180	0	0	1	0	0	1	0	0
Z7175	N64.33910	W96.05392	74	2.5	210	0	0	0	1	0	0	1	0
Z7179	N64.34084	W95.99767	90	3	184	0	0	0	1	0	0	1	0
Z7186	N64.34756	W96.04375	67	3	184	0	0	1	0	0	0	1	0
Z7203	N64.35763	W95.95110	91	3.5	235	0	0	0	0	1	0	1	0
Z7946	N64.70149	W98.09585	81	3	178	0	0	0	1	0	0	1	0
Z7966	N64.72189	W97.93365	77	0.5	230	0	0	0	1	0	1	0	0
Z72001	N64.31393	W95.97933	32	1	158	0	0	0	1	0	0	1	0
Z72005	N64.33727	W95.91403	822	0.5	87	0	0	0	0	1	1	0	0
Z72006	N65.30392	W95.92205	44	1	142	0	0	0	1	0	1	0	0
Z72007	N64.30245	W95.91467	43	1	298	0	0	0	1	0	1	0	0
Z72010	N64.31005	W95.94460	70	2	329	0	0	0	1	0	0	1	0
Z72011	N64.31415	W95.95247	58	0.5	132	0	0	0	0	1	0	1	0

Zone-site	Latitude	Longitude	Altitude (m)	Slope degree (°)	Aspect (°)	Drainage					Topography		
						Very poor	Poor	Mod. well	Well	Very well	Flat	Incline	Abrupt
Z72012	N64.30335	W96.22189	39	2	232	0	0	0	1	0	0	1	0
Z72018	N64.76954	W97.06968	74	2.5	200	0	0	0	1	0	0	1	0
Z72019	N64.29922	W96.15001	46	1	72	0	0	0	1	0	0	1	0
Z823	N64.34095	W95.87508	92	6	142	0	0	0	0	1	0	1	0
Z8164	N64.33428	W95.87048	83	5.5	162	0	0	0	0	1	0	1	0
Z8176	N64.33967	W96.11436	105	5.5	66	0	0	0	0	1	0	1	0
Z8178	N64.33997	W96.13324	106	0	134	0	0	0	0	1	1	0	0
Z8212	N64.36292	W95.86802	90	4	134	0	0	0	0	1	0	0	1
Z82003	N64.32407	W95.99190	73	3	150	0	0	0	0	1	0	1	0
Z82013	N64.29164	W95.73151	16	3	32	0	0	0	1	0	0	1	0
Z82014	N64.28671	W95.82642	38	2.5	148	0	0	0	0	1	0	1	0
Z102	N64.31155	W95.92948	50	0.5	20	0	0	0	1	0	1	0	0
Z1017	N64.33400	W95.96794	58	0.5	170	0	0	0	0	1	1	0	0
Z1046	N64.35141	W95.85574	79	0.5	80	0	0	0	1	0	1	0	0
Z1087	N64.31083	W96.11211	88	5	55	0	0	0	0	1	0	1	0
Z102004	N64.32436	W95.99036	73	3.5	120	0	0	0	0	1	0	1	0

Zone-site	Substrate					Landform					
	Peat	Clay	Sand	Gravel	Bed rock	Valley	Foot	Bottom	Mid slope	Top slope	Plateau
Z128	0	1	0	0	0	0	0	0	0	0	1
Z143	1	0	0	0	0	1	0	0	0	0	0
Z149	0	1	0	0	0	0	0	0	1	0	0
Z180	0	1	0	0	0	1	0	0	0	0	0
Z1149	1	0	0	0	0	1	0	0	0	0	0
Z12008	0	1	0	0	0	1	0	0	0	0	0
Z350	0	0	1	0	0	1	0	0	0	0	0
Z367	0	1	0	0	0	0	0	0	0	0	1
Z3133	1	0	0	0	0	0	0	0	1	0	0
Z3135	0	0	0	1	0	0	0	0	0	0	1
Z3965	0	1	0	0	0	0	0	0	0	0	1
Z3971	0	1	0	0	0	0	0	0	0	0	1
Z32002	0	1	0	0	0	0	0	0	0	0	1
Z32009	1	0	0	0	0	0	0	0	0	0	1
Z32015	0	1	0	0	0	0	1	0	0	0	0
Z533	1	0	0	0	0	0	0	0	1	0	0
Z557	1	0	0	0	0	0	0	0	1	0	0
Z558	0	0	1	0	0	0	0	0	1	0	0
Z559	0	1	0	0	0	1	0	0	0	0	0
Z560	0	1	0	0	0	1	0	0	0	0	0
Z569	0	1	0	0	0	0	0	0	1	0	0
Z5101	0	0	1	0	0	0	0	0	1	0	0
Z5148	0	0	1	0	0	0	0	1	0	0	0
Z5209	0	1	0	0	0	0	0	0	0	0	1
Z5211	0	1	0	0	0	1	0	0	0	0	0
Z5215	0	1	0	0	0	0	0	0	1	0	0
Z5216	0	1	0	0	0	0	0	0	1	0	0
Z5224	0	1	0	0	0	1	0	0	0	0	0
Z5553	1	0	0	0	0	1	0	0	0	0	0
Z5968	1	0	0	0	0	0	0	0	0	0	1
Z52016	1	0	0	0	0	0	0	1	0	0	0
Z6544	1	0	0	0	0	0	0	0	1	0	0
Z6547	0	1	0	0	0	0	0	1	0	0	0
Z6549	1	0	0	0	0	1	0	0	0	0	0
Z62017	1	0	0	0	0	0	0	0	0	0	1
Z714	0	0	1	0	0	0	0	0	1	0	0
Z719	1	0	0	0	0	0	0	0	1	0	0
Z721	0	0	1	0	0	0	0	0	1	0	0
Z7103	0	0	1	0	0	0	0	0	0	0	1
Z7104	0	0	1	0	0	0	0	0	1	0	0
Z7105	0	0	0	1	0	0	0	0	1	0	0
Z7106	1	0	0	0	0	0	0	0	1	0	0
Z7109	0	0	1	0	0	0	0	0	1	0	0

Zone-site	Substrate					Landform					
	Peat	Clay	Sand	Gravel	Bedrock	Valley	Foot	Bottom	Mid slope	Top slope	Plateau
Z7111	0	0	1	0	0	0	0	0	0	0	1
Z7116	1	0	0	0	0	0	0	0	0	0	1
Z7117	1	0	0	0	0	0	0	0	0	0	1
Z7122	0	0	1	0	0	0	0	0	1	0	0
Z7126	1	0	0	0	0	0	0	0	0	0	1
Z7129	1	0	0	0	0	0	0	0	1	0	0
Z7138	0	0	0	1	0	1	0	0	0	0	0
Z7144	0	0	1	0	0	0	0	0	0	0	1
Z7161	1	0	0	0	0	0	0	0	1	0	0
Z7165	0	0	1	0	0	0	0	0	0	0	1
Z7169	0	0	1	0	0	1	0	0	0	0	0
Z7174	1	0	0	0	0	0	0	0	0	0	1
Z7175	0	0	1	0	0	0	0	0	1	0	0
Z7179	0	1	0	0	0	0	0	0	1	0	0
Z7186	1	0	0	0	0	0	0	0	0	0	1
Z7203	0	0	1	0	0	0	0	0	0	1	0
Z7946	0	0	1	0	0	0	0	0	0	0	1
Z7966	1	0	0	0	0	0	0	0	0	0	1
Z72001	0	0	1	0	0	0	0	0	0	0	1
Z72005	0	1	0	0	0	1	0	0	0	0	0
Z72006	1	0	0	0	0	0	0	0	0	0	1
Z72007	1	0	0	0	0	0	0	0	0	0	1
Z72010	1	0	0	0	0	0	0	0	1	0	0
Z72011	0	0	1	0	0	0	0	0	0	0	1
Z72012	1	0	0	0	0	0	0	0	1	0	0
Z72018	0	0	1	0	0	0	0	0	1	0	0
Z72019	1	0	0	0	0	0	0	0	1	0	0
Z823	0	0	0	1	0	0	0	0	1	0	0
Z8164	0	0	0	1	0	0	0	0	1	0	0
Z8176	0	0	1	0	0	0	0	0	1	0	0
Z8178	1	0	0	0	0	0	0	0	0	0	1
Z8212	0	0	0	0	1	0	0	0	1	0	0
Z82003	1	0	0	0	0	0	0	0	0	0	1
Z82013	0	0	1	0	0	0	0	0	0	1	0
Z82014	1	0	0	0	0	0	0	0	1	0	0
Z102	0	0	1	0	0	0	0	0	0	0	1
Z1017	0	0	1	0	0	0	0	0	0	0	1
Z1046	0	0	1	0	0	0	0	0	1	0	0
Z1087	0	0	1	0	0	0	0	0	1	0	0
Z102004	0	0	0	1	0	0	0	0	1	0	0

Zone-site	Stoniness						Rockiness				
	No stones	Some stones	Mod. stony	Very stony	Ext. stony	Exc. stony	Non rocky	Slightly rocky	Mod. rocky	Very rocky	Exc. rocky
Z128	1	0	0	0	0	0	1	0	0	0	0
Z143	0	1	0	0	0	0	1	0	0	0	0
Z149	0	0	0	1	0	0	1	0	0	0	0
Z180	1	0	0	0	0	0	1	0	0	0	0
Z1149	1	0	0	0	0	0	1	0	0	0	0
Z12008	1	0	0	0	0	0	1	0	0	0	0
Z350	1	0	0	0	0	0	1	0	0	0	0
Z367	1	0	0	0	0	0	1	0	0	0	0
Z3133	0	0	0	0	1	0	1	0	0	0	0
Z3135	0	0	0	1	0	0	1	0	0	0	0
Z3965	0	0	0	1	0	0	1	0	0	0	0
Z3971	0	0	0	0	1	0	1	0	0	0	0
Z32002	0	0	0	1	0	0	1	0	0	0	0
Z32009	0	0	1	0	0	0	1	0	0	0	0
Z32015	0	0	1	0	0	0	1	0	0	0	0
Z533	1	0	0	0	0	0	0	0	0	1	0
Z557	0	0	1	0	0	0	1	0	0	0	0
Z558	1	0	0	0	0	0	1	0	0	0	0
Z559	1	0	0	0	0	0	1	0	0	0	0
Z560	1	0	0	0	0	0	1	0	0	0	0
Z569	1	0	0	0	0	0	1	0	0	0	0
Z5101	1	0	0	0	0	0	1	0	0	0	0
Z5148	1	0	0	0	0	0	1	0	0	0	0
Z5209	0	1	0	0	0	0	1	0	0	0	0
Z5211	1	0	0	0	0	0	1	0	0	0	0
Z5215	1	0	0	0	0	0	1	0	0	0	0
Z5216	1	0	0	0	0	0	1	0	0	0	0
Z5224	1	0	0	0	0	0	1	0	0	0	0
Z5553	0	1	0	0	0	0	1	0	0	0	0
Z5968	1	0	0	0	0	0	1	0	0	0	0
Z52016	0	1	0	0	0	0	1	0	0	0	0
Z6544	1	0	0	0	0	0	1	0	0	0	0
Z6547	1	0	0	0	0	0	1	0	0	0	0
Z6549	1	0	0	0	0	0	1	0	0	0	0
Z62017	1	0	0	0	0	0	1	0	0	0	0
Z714	1	0	0	0	0	0	1	0	0	0	0
Z719	0	1	0	0	0	0	0	0	0	0	1
Z721	0	0	1	0	0	0	0	0	1	0	0
Z7103	0	0	1	0	0	0	1	0	0	0	0
Z7104	1	0	0	0	0	0	1	0	0	0	0
Z7105	0	1	0	0	0	0	1	0	0	0	0
Z7106	0	0	1	0	0	0	0	1	0	0	0
Z7109	0	0	0	1	0	0	1	0	0	0	0

Zone-site	Stoniness						Rockiness				
	No stones	Some stones	Mod. stony	Very stony	Ext. stony	Exc. stony	Non rocky	Slightly rocky	Mod. rocky	Very rocky	Exc. rocky
Z7111	0	0	0	0	1	0	1	0	0	0	0
Z7116	0	0	0	1	0	0	1	0	0	0	0
Z7117	0	0	1	0	0	0	1	0	0	0	0
Z7122	0	0	0	1	0	0	1	0	0	0	0
Z7126	0	0	0	0	1	0	1	0	0	0	0
Z7129	0	0	0	1	0	0	1	0	0	0	0
Z7138	1	0	0	0	0	0	1	0	0	0	0
Z7144	1	0	0	0	0	0	1	0	0	0	0
Z7161	1	0	0	0	0	0	1	0	0	0	0
Z7165	1	0	0	0	0	0	1	0	0	0	0
Z7169	0	1	0	0	0	0	1	0	0	0	0
Z7174	0	0	0	1	0	0	1	0	0	0	0
Z7175	1	0	0	0	0	0	1	0	0	0	0
Z7179	1	0	0	0	0	0	0	0	0	1	0
Z7186	0	0	1	0	0	0	0	0	0	1	0
Z7203	0	0	0	1	0	0	1	0	0	0	0
Z7946	0	0	0	0	1	0	1	0	0	0	0
Z7966	1	0	0	0	0	0	0	1	0	0	0
Z72001	0	0	0	1	0	0	0	1	0	0	0
Z72005	0	0	1	0	0	0	1	0	0	0	0
Z72006	1	0	0	0	0	0	1	0	0	0	0
Z72007	0	0	1	0	0	0	1	0	0	0	0
Z72010	1	0	0	0	0	0	1	0	0	0	0
Z72011	0	0	1	0	0	0	1	0	0	0	0
Z72012	0	1	0	0	0	0	1	0	0	0	0
Z72018	0	0	1	0	0	0	1	0	0	0	0
Z72019	1	0	0	0	0	0	1	0	0	0	0
Z823	0	0	0	0	0	1	0	0	0	0	1
Z8164	0	0	0	0	0	1	0	0	0	0	1
Z8176	0	1	0	0	0	0	0	0	0	0	1
Z8178	0	0	0	0	1	0	0	0	0	0	1
Z8212	1	0	0	0	0	0	0	0	0	0	1
Z82003	0	0	0	1	0	0	0	0	0	0	1
Z82013	0	0	0	0	0	1	0	0	0	1	0
Z82014	0	0	0	0	0	1	1	0	0	0	0
Z102	0	0	0	1	0	0	1	0	0	0	0
Z1017	0	0	0	0	1	0	1	0	0	0	0
Z1046	0	0	0	0	0	1	1	0	0	0	0
Z1087	0	1	0	0	0	0	1	0	0	0	0
Z102004	0	0	0	0	0	1	1	0	0	0	0

Zone-site	Microtopography					
	Frostboil	Cracks	No hummocks	Sporatic hummocks	Slightly hummocky	Very hummocky
Z128	0	1	0	0	0	1
Z143	0	0	0	0	0	1
Z149	0	0	0	0	1	0
Z180	0	0	0	0	1	0
Z1149	0	0	0	0	0	1
Z12008	0	0	0	0	1	0
Z350	0	0	0	0	0	1
Z367	0	0	0	0	1	0
Z3133	1	0	1	0	0	0
Z3135	0	0	1	0	0	0
Z3965	1	0	0	0	1	0
Z3971	1	0	0	0	1	0
Z32002	0	0	0	1	0	0
Z32009	0	0	1	0	0	0
Z32015	0	0	0	0	0	1
Z533	0	1	0	1	0	0
Z557	0	0	1	0	0	0
Z558	0	0	0	0	1	0
Z559	0	0	0	0	1	0
Z560	0	1	0	0	1	0
Z569	0	0	0	0	1	0
Z5101	0	0	1	0	0	0
Z5148	0	0	0	0	1	0
Z5209	0	0	0	1	0	0
Z5211	0	0	0	0	0	1
Z5215	0	0	0	0	1	0
Z5216	0	0	0	0	1	0
Z5224	0	0	0	0	0	1
Z5553	1	0	1	0	0	0
Z5968	0	0	0	0	0	1
Z52016	0	0	0	0	0	1
Z6544	0	0	0	0	0	1
Z6547	0	0	0	0	1	0
Z6549	0	0	0	0	0	1
Z62017	0	1	0	0	1	0
Z714	0	0	0	0	1	0
Z719	0	0	1	0	0	0
Z721	0	1	1	0	0	0
Z7103	0	0	1	0	0	0
Z7104	0	0	1	0	0	0
Z7105	0	0	1	0	0	0
Z7106	0	0	1	0	0	0

Zone-site	Microtopography					
	Frostboil	Cracks	No hummocks	Sporatic hummocks	Slightly hummocky	Very hummocky
Z7109	1	0	1	0	0	0
Z7111	1	0	1	0	0	0
Z7116	0	0	0	1	0	0
Z7117	0	0	0	1	0	0
Z7122	0	0	1	0	0	0
Z7126	0	0	1	0	0	0
Z7129	0	0	0	0	0	1
Z7138	0	0	1	0	0	0
Z7144	1	0	0	0	1	0
Z7161	0	0	1	0	0	0
Z7165	0	0	0	0	1	0
Z7169	0	0	0	0	0	1
Z7174	1	0	0	0	1	0
Z7175	1	0	1	0	0	0
Z7179	0	0	1	0	0	0
Z7186	0	0	1	0	0	0
Z7203	0	0	1	0	0	0
Z7946	1	0	1	0	0	0
Z7966	1	0	0	0	1	0
Z72001	0	0	0	1	0	0
Z72005	1	0	1	0	0	0
Z72006	0	0	1	0	0	0
Z72007	0	0	1	0	0	0
Z72010	1	0	1	0	0	0
Z72011	1	0	0	1	0	0
Z72012	0	0	0	1	0	0
Z72018	1	0	0	0	1	0
Z72019	0	0	0	0	1	0
Z823	0	1	1	0	0	0
Z8164	0	0	1	0	0	0
Z8176	0	0	1	0	0	0
Z8178	0	0	1	0	0	0
Z8212	0	0	1	0	0	0
Z82003	0	0	1	0	0	0
Z82013	0	0	1	0	0	0
Z82014	0	0	1	0	0	0
Z102	1	0	0	1	0	0
Z1017	1	0	1	0	0	0
Z1046	1	0	1	0	0	0
Z1087	1	0	1	0	0	0
Z102004	0	0	1	0	0	0

ANNEXE D

VACCINIUM VITIS-IDAEA AND *EMPETRUM NIGRUM* BERRY SIZE (g) AND PRODUCTIVITY (g/m^2) VALUES FROM 30 SITES ACROSS FIVE VEGETATION ZONES IN BAKER LAKE, NUNAVUT IN SEPTEMBER 2009 AND 2010

Quadrats (25 cm × 25 cm) were arbitrarily set within each site. Only those with berries were used, for a total of 20 quadrats per site. 'Number of attempted quadrats' = number of quadrats it took to find 20 quadrats with berries.

	2009		*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	**Number of attempted quadrats**	**Number of quadrats with berries**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2009**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2009**
Z3-0067	22	20	690	100.22	72.88727273	445	56.61	41.17090909
Z3-0133	26	20	25	3.33	2.049230769	535	79.34	48.82461538
Z3-0135	28	20	0	0	0	611	68.21	38.97714286
Z3-2009	23	20	399	68.31	47.52	542	62.91	43.76347826
Z3-2015	31	20	253	25.73	13.28	0	0	0
			MEAN	**39.518**	**27.1473007**	**MEAN**	**53.414**	**34.54722912**
			n	**6**	**6**	**n**	**6**	**6**
			STDEV	**43.51742375**	**31.88409869**	**STDEV**	**31.00210848**	**19.65827637**
			SE	**17.76591385**	**13.01662878**	**SE**	**12.65655779**	**8.02545772**

2009 (continued)			*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	**Number of attempted quadrats**	**Number of quadrats with berries**	**Number of berries**	**Weight (g)**	**Productivity (g/m²) 2009**	**Number of berries**	**Weight (g)**	**Productivity (g/m²) 2009**
Z5-0033	28	20	511	82.55	47.17142857	1391	179.7	102.6857143
Z5-0069	25	20	0	0	0	828	66.92	42.8288
Z5-0101	28	20	0	0	0	1550	195.35	111.6285714
Z5-0148	23	20	41	6.61	4.59826087	28	31.95	22.22608696
Z5-0215	23	20	504	74.8	52.03478261	135	21.25	14.7826087
Z5-0216	21	20	0	0	0	613	94.93	72.32761905
			MEAN	**27.32666667**	**17.30074534**	**MEAN**	**98.35**	**61.07990007**
			n	**6**	**6**	**n**	**6**	**6**
			STDEV	**39.93182774**	**25.13169927**	**STDEV**	**73.99964027**	**40.98507965**
			SE	**16.30210041**	**10.25997326**	**SE**	**30.21022663**	**16.7320887**
Z7-0014	24	20	168	24.51	16.34	897	132.9	88.6
Z7-0103	24	20	298	38.89	25.92666667	435	47.48	31.65333333
Z7-0106	21	20	680	113.93	86.80380952	115	8.35	6.361904762
Z7-0126	30	20	0	0	0	204	23.49	12.528
Z7-0138	39	20	0	0	0	153	20.46	8.393846154
Z7-0144	20	20	131	12.28	9.824	61	6.88	5.504
Z7-0161	23	20	131	17.6	12.24347826	352	38.98	27.11652174
Z7-0165	34	20	0	0	0	777	157.46	74.09882353
Z7-2005	23	20	124	19.33	13.44695652	609	62.57	43.52695652
Z7-2010	22	20	0	0	0	962	122.78	89.29454545
			MEAN	**22.654**	**16.4584911**	**MEAN**	**62.135**	**38.70779315**
			n	**10**	**10**	**n**	**10**	**10**
			STDEV	**34.63361764**	**26.23082173**	**STDEV**	**55.47737482**	**33.76584317**
			SE	**10.95211154**	**8.294914155**	**SE**	**17.5434863**	**10.67769715**

2009 (continued)			*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	**Number of attempted quadrats**	**Number of quadrats with berries**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2009**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2009**
Z8-0164	40	6	0	0	0	318	49.02	19.608
Z8-0176	40	12	6	1.15	0.46	701	105.84	42.336
Z8-0212	40	8	308	56.34	22.536	466	86.96	34.784
			MEAN	**19.16333333**	**7.665333333**	**MEAN**	**80.60666667**	**32.24266667**
			n	**3**	**3**	**n**	**3**	**3**
			STDEV	**32.20107193**	**12.88042877**	**STDEV**	**28.93789442**	**11.57515777**
			SE	**18.59129755**	**7.436519018**	**SE**	**16.70730113**	**6.682920453**
Z10-0002	40	12	8	0.92	0.368	101	12.7	5.08
Z10-0017	40	7	358	77.38	30.952	293	75.18	30.072
Z10-0046	40	14	237	34.3	13.72	317	41.64	16.656
Z10-0087	40	12	57	7.34	2.936	167	18.92	7.568
Z10-2004	40	5	0	0	0	282	37.14	14.856
			MEAN	**23.988**	**9.5952**	**MEAN**	**37.116**	**14.8464**
			n	**5**	**5**	**n**	**5**	**5**
			STDEV	**32.94600006**	**13.17840002**	**STDEV**	**24.4773912**	**9.79095648**
			SE	**14.73389914**	**5.893559658**	**SE**	**10.94662213**	**4.378648851**

2010			*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	**Number of attempted quadrats**	**Number of quadrats with berries**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2010**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2010**
Z3-0050	42	20	63	3.7779	1.4392	69	6.9507	2.647885714
Z3-0067	23	20	146	13.2099	9.189495652	66	6.0722	4.22413913
Z3-0133	29	20	22	1.3987	0.771696552	282	30.7978	16.99188966
Z3-0135	34	20	3	0.1584	0.074541176	101	8.3348	3.922258824
Z3-2009	33	20	34	3.2313	1.566690909	320	35.0349	16.98661818
Z3-2015	38	20	3	0.0443	0.018652632	40	2.7834	1.171957895
			MEAN	**3.63675**	**2.17671282**	**MEAN**	**14.99563333**	**7.657458233**
			n	**6**	**6**	**n**	**6**	**6**
			STDEV	**4.936456168**	**3.497015729**	**STDEV**	**14.06509608**	**7.308375489**
			SE	**2.015299791**	**1.427650693**	**SE**	**5.742051429**	**2.9836318**
Z5-0033	31	20	255	24.296	12.53987097	195	19.2932	9.957780645
Z5-0069	30	20	0	0	0	137	11.6995	6.239733333
Z5-0101	39	20	0	0	0	148	14.0525	7.252903226
Z5-0148	31	20	67	3.8929	2.00923871	14	1.2968	0.669316129
Z5-0215	30	20	100	12.8566	6.856853333	106	11.4853	6.125493333
Z5-0216	39	20	0	0	0	43	4.5579	1.869907692
			MEAN	**6.840916667**	**3.567660502**	**MEAN**	**10.39753333**	**5.352522393**
			n	**6**	**6**	**n**	**6**	**6**
			STDEV	**9.899026265**	**5.136781735**	**STDEV**	**6.516052255**	**3.471757603**
			SE	**4.04126055**	**2.097082362**	**SE**	**2.660167194**	**1.417339106**

2010 (continued)			*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	**Number of attempted quadrats**	**Number of quadrats with berries**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2010**	**Number of berries**	**Weight (g)**	**Productivity (g/m^2) 2010**
Z7-0014	28	20	81	5.6632	3.236114286	167	14.7745	8.442571429
Z7-0103	49	20	73	8.9688	2.928587755	119	12.8688	4.202057143
Z7-0106	30	20	176	20.5955	10.98426667	306	34.8482	18.58570667
Z7-0126	33	20	10	1.0607	0.514278788	70	16.2025	7.855757576
Z7-0138	60	8	0	0	0	11	1.0371	0.27656
Z7-0144	39	20	17	1.7237	0.707158974	302	44.6613	18.32258462
Z7-0161	34	20	8	0.3641	0.171341176	142	11.3521	5.342164706
Z7-0165	45	20	32	3.3802	1.201848889	91	13.1887	4.689315556
Z7-2005	30	20	9	0.8013	0.42736	172	25.1811	13.42992
Z7-2010	34	20	4	0.2957	0.139152941	221	23.0416	10.84310588
			MEAN	**4.28532**	**2.031010948**	**MEAN**	**19.71559**	**9.198974357**
			n	**10**	**10**	**n**	**10**	**10**
			STDEV	**6.406855878**	**3.348191495**	**STDEV**	**12.63719126**	**6.093002513**
			SE	**2.026025721**	**1.058791117**	**SE**	**3.996230761**	**1.926776573**

2010 (continued)			*Vaccinium vitis-idaea* L.			*Empetrum nigrum* L.		
Zone-Site	Number of attempted quadrats	Number of quadrats with berries	Number of berries	Weight (g)	Productivity (g/m^2) 2010	Number of berries	Weight (g)	Productivity (g/m^2) 2010
Z8-0164	50	10	0	0	0	129	14.9983	4.799456
Z8-0176	68	20	16	2.3368	0.549835294	129	15.5449	3.657623529
Z8-0212	63	20	28	3.1631	0.803326984	134	18.0795	4.591619048
			MEAN	**1.8333**	**0.451054093**	**MEAN**	**16.20756667**	**4.349566192**
			n	**3**	**3**	**n**	**3**	**3**
			STDEV	**1.640559231**	**0.410672443**	**STDEV**	**1.644017547**	**0.608183801**
			SE	**0.947177314**	**0.237101845**	**SE**	**0.949173973**	**0.351135081**
Z10-0002	41	20	4	0.5293	0.206556098	181	19.9023	7.76675122
Z10-0017	48	20	0	0	0	248	30.9418	10.31393333
Z10-0046	42	20	26	2.284	0.870095238	376	58.1833	22.16506667
Z10-0087	51	20	20	1.5244	0.478243137	143	16.8797	5.295592157
Z10-2004	45	1	0	0	0	5	0.3604	0.128142222
			MEAN	**0.86754**	**0.310978895**	**MEAN**	**25.2535**	**9.13389712**
			n	**5**	**5**	**n**	**5**	**5**
			STDEV	**1.007159569**	**0.369089514**	**STDEV**	**21.41932994**	**8.199224954**
			SE	**0.450415452**	**0.165061849**	**SE**	**9.579015556**	**3.666804872**