

**The productivity of culturally important berry species in the Kugluktuk region of Nunavut,
and their use in land-based education programs connecting Elders and youth**

by

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Abstract

Communities in the Canadian Arctic are experiencing the effects of a rapidly changing environment. The development of appropriate policies to increase resilience and adaptation potential to these changes can only be gained with the inclusion of communities in research. This community-supported research was initiated to better understand how the changing environment affects the productivity of culturally important berry species by connecting Kugluktukmiut youth and Elders through place-based programming. The study took place during the Career and Technology Studies program offered by Kugluktuk High School in late August of 2011-2013. The place-based programming developed aimed to integrate *Inuit Qaujimagatunqangit* and science.

The production of berries from samples collected by students in Kugluktuk, NU and from Kugluk/Bloody Falls Territorial Park was compared to those collected by researchers at the Tundra Ecology Research Station at Daring Lake, NT. Berry production was highest in coastal regions of Kugluktuk compared to inland sites. Vegetation at Kugluk/Bloody Falls differed from the other two sites due to the presence of *Equisetum arvense* and tall erect shrubs.

Program evaluation is key to understanding how to build meaningful capacity for Inuit youth to connect to the environment. This critical evaluation showed that Inuit youth believe that learning about the environment is important. By providing place-based outreach programming youth are given the opportunity to exercise wellbeing by feeling a sense of identity, freedom and respect. *The Berry Book* was published to give back to the community for supporting the project and to contribute collection of Inuinnaqtun content.

Preface

This thesis is based on field data collected in 2011, 2012 and 2013 in collaboration with the Kugluktuk High School and was funded in part by grants to G Henry from the Canadian International Polar Year Program, ArcticNet and NSERC and to S Desrosiers from the Northern Scientific Training Program. All data from the field were collected by myself with the assistance of my field assistants and student participants. I undertook all analysis of data and writing of the thesis manuscript, with editorial input from my supervisor (G Henry) and committee members Cynthia Nicol and Susan Rowley.

Several licenses were required in order to conduct this research. They included: Nunavut Research Institute (NRI) Social Science Research Permit (04 007 13R-M), Government of Nunavut Department of Environment Wildlife Research Permit, UBC Behavioral Research Ethics Board (H12-01943-001), Nunavut Territorial Park Use Permit (2013-10PU) and Northwest Territories Scientific Research License (15113).

Table of Contents

Abstract	ii
Preface	iii
Table of Contents.....	iv
List of Tables.....	vii
List of Figures	ix
Acknowledgements	xii
Dedication.....	xiv
Chapter 1: Introduction.....	1
1.1 Literature review and research context.....	9
1.1.1 The Kitlinermiut	10
1.1.1.1 Traditional life	10
1.1.1.2 Transition from old ways to new ways.....	12
1.1.2 Residential Schools.....	13
1.1.3 Brief history of education in Nunavut	16
1.1.4 A brief history of language rights after the establishment of Nunavut	19
1.1.5 Inuit Qaujimajatuqangit.....	21
1.1.6 Arctic vegetation.....	23
1.1.7 Community berry monitoring.....	26
1.2 Summary.....	27
Chapter 2: Environmental influences on berry productivity	28
2.1 Introduction	28

2.1.1	Tundra ecosystems: vegetation change	28
2.1.2	Impacts on berry producing plants	30
2.2	Species composition	32
2.3	Methods	34
2.3.1	Study area	34
2.3.2	Establishment of monitoring plots and site descriptions	38
2.3.3	Plant abundance and composition	42
2.3.4	Berry monitoring	45
2.3.5	Statistical methods	46
2.4	Results	47
2.4.1	Vegetation composition	47
2.4.2	Total shrub cover and berry plant cover	52
2.4.3	Berry productivity across sites	55
2.5	Discussion	61
2.6	Conclusion	64
Chapter 3: <i>Akiitug</i>: “When I’m out on the land I feel free. I feel like a true Inuk”-		
Perceptions of land-based education in Kugluktuk, Nunavut.....		
3.1	Introduction	65
3.1.1	Land-based programming	69
3.2	Giving a voice to Inuit youth	73
3.2.1	Perceptions of land-based education	73
3.2.2	Youths’ connection to the environment	78

3.2.3	The “Ground Up Mural” activity: finding a balance between <i>Inuit Qaujimajatuqangit</i> and science in land-based education	81
3.3	A personal reflection on outreach programming	85
3.3.1	Kugluk/Bloody Falls camping trip	87
3.4	Conclusion	95
Chapter 4:	Giving back: sharing “berried” knowledge in <i>The Berry Book</i>	97
4.1	Introduction	97
4.1.1	The Inuit language	98
4.1.1.1	Inuit language writing systems in Nunavut	98
4.1.1.2	Inuit language and the Nunavut education system	100
4.2	The Berry Book	102
4.3	The establishment of the Arctic Berry Project in Kugluktuk, Nunavut	102
4.4	The process of creating <i>The Berry Book</i>	104
4.5	Conclusion	112
Chapter 5:	Synthesis	114
Bibliography		122
Appendices		144
Appendix A	What do students think about using Inuit Qaujimajatuqangit (IQ) and scientific approaches in outdoor environmental classes?	144
A.1	First Survey	144
A.2	Second Survey	146
Appendix B	The Berry Book	148

List of Tables

Table 1.1 Principals of <i>Inuit Qaujimagajatuqangit</i> (Arnakak, 2001).	18
Table 2.1 Summary of research sites with associated berry productivity monitoring plots (400 m ²) included in this study along with their specific locations, the year of establishment, slope aspect and berry species composition (<i>V. uliginosum</i> (VULI), <i>V. vitis-idaea</i> (VVIT), <i>E. nigrum</i> (ENIG), <i>R. chamaemorus</i> (RCHA) and <i>Arctostaphylos</i> spp. (ARCT)).	41
Table 2.2 Code for percent cover estimates conducted at Kugluk/Bloody Falls Territorial Park, NU August 2013.	43
Table 2.3 General climate variables for Kugluktuk, NU and Daring Lake, NT.	44
Table 2.4 Ordination axes values and correlation of environmental vectors used in the NMDS ordination.	50
Table 2.5 A list of identified vascular and non-vascular plants with associated species codes used in analysis.	51
Table 2.6 Results of a linear regression model with a quadratic function for the relationship between percent cover of berry producing plants and the cover of <i>B. glandulosa</i> for all sites combined.	55
Table 2.7 Linear model of total fresh berry weights and production of <i>E. nigrum</i> , <i>R. chamaemorus</i> , <i>V. uliginosum</i> and <i>V. vitis-idaea</i> harvested in 2011-2013 from all three sites.	56
Table 2.8 Linear model of total fresh berry weights and production of all sites together between 2011-2013.	57
Table 2.9 Linear model of the relationship of total fresh berry weights and production of all four berries species harvested in 2011-2013 from all three sites with measured environmental variables.	58

Table 3.1 A summary of youth responses to the programming questionnaire of the Kugluktuk High-School outdoor environmental CTS course, August 2013. Students answered the question by using a scale from 1 (strongly disagree) to 3 (neutral) to five (strongly agree).	77
Table 3.2 Codes identified from student surveys developed in HyperResearch.	79
Table 3.3 Three major themes and sub-themes emerging from the analysis of the open-ended questions from the questionnaires filled out by high-school students participating in the land-based CTS course in Kugluktuk, Nunavut, August 2013.....	80

List of Figures

Figure 1.1 The study region (outline on the map of Canada) and the location of Kugluktuk, Nunavut (67°49'32"N 115°5'42"W), Kugluk/Bloody Falls Territorial Park (67°44'24"N 115°22'12"W), NU and Daring Lake, NT (64°50'01"N 111°38'04" W) (inset map).....	5
Figure 1.2 Young Kugluktukmiut fishing at Kugluk/Bloody Falls Territorial Park August 2013 (photo by Sarah Desrosiers).	6
Figure 1.3 Inuit with Father Lapointe, RC in Kugluktuk (Coppermine), Nunavut spring 1953 (photo taken by Mabel Walter and used with permission).....	14
Figure 1.4 Etna Bolt (left) and two young girls in Kugluktuk (Coppermine), NU spring 1953 (photo taken by Mabel Walter and used with permission).....	15
Figure 2.1 Images of the berry plant species used in this research; a) <i>Empetrum nigrum</i> (Paun'ngat, Crowberry), b) <i>Vaccinium uliginosum</i> (Kigutigirngnat, Blueberry), c) <i>Vaccinium vitis-idaea</i> (Kingminat, Cranberry), d) <i>Rubus chamaemorus</i> (Aqqiit, Cloudberry), e-1) <i>Arctostaphylos rubra</i> and e-2) <i>Arctostaphylos alpina</i> (Kablaq, Bearberry).	34
Figure 2.2 Field site locations: Kugluktuk, NU (67°49'32"N 115°05'42"W), Bloody Fall Territorial Park (67°44'24"N 115°22'12"W) and Tundra Ecosystem Research Station (TERS) at Daring Lake, NT (64°50'01"N 111°38'04" W) shown with the dominant zonal vegetation type (CAVM 2003). The areas not included in the vegetation classes are below treeline. Map was produced by Sarah Desrosiers.	36
Figure 2.3 Photographs of field sites: a) Kugluktuk, NU b) Kugluk/Bloody Falls Territorial Park; c) Tundra Ecosystem Research Station (TERS) at Daring Lake, NT.	40
Figure 2.4 Photographs of example vegetation cover samples from (a) Kugluktuk tower plot (Q1), (b) Daring Lake plot 2 (Q1) and (c) Bloody Falls plot 1 (Q1).....	47

Figure 2.5 (a) Nonmetric Multidimensional Scaling (NMDS) ordination of vegetation composition and abundance measurements conducted in August 2012 in berry research plots at Kugluktuk, Bloody Falls and Daring Lake. Points represent individual quadrats (70 cm x 70 cm). Species codes are shown in Table 2.2. (b) NMDS ordination of vegetation data from each of the three sites with significant environmental variables including latitude, soil moisture, and temperature and precipitation (mean temperature for June and July + mean precipitation for May and June).....49

Figure 2.6 Box plots of percent cover of *Arctostaphylos* spp. (Arc_spp), *B. glandulosa* (BET_gla), *E. nigrum* (Emp_nig), *R. chamaemorus* (Rub_cha), *V. uliginosum* (Vac_uli), and *V. vitis-idaea* (Vac_vit) by site: Kugluktuk, Bloody Falls and Daring Lake. Percent cover data are the midpoints in the codes in Table 2.2.52

Figure 2.7 Regression with quadratic functions of percent cover of berry producing plants *E. nigrum* (purple), *R. chamaemorus* (red), *V. uliginosum* (blue), *V. vitis-idaea* (green) and *Arctostaphylos* (brown) with the cover of *B. glandulosa* . Percent cover data are the midpoints in the codes in Table 2.2 and were compiled from all berry research plots at the three sites Kugluktuk, Bloody Falls, and Daring Lake. Points represent each 70 cm x 70 cm quadrat samples. The dotted lines indicate that none of the regressions were significant at $P < 0.05$. *Arctostaphylos* spp. was significant $P = 0.02445$54

Figure 2.8 (a) Mean berry production (no./m²) and (b) mean fresh weight (g/m²) of berries from all four species monitored from 2011-2013 by site: Kugluktuk, Bloody Falls and Daring Lake. 56

Figure 2.9(a) Berry productivity (no./m²) and (b) berry weight (g/m²) of *E. nigrum* (Emp_nig), *R. chamaemorus* (Rub_cha), *V. uliginosum* (Vac_uli), *V. vitis-idaea* (Vac_vit) at Kugluktuk, Bloody Falls and Daring Lake from 2011 to 2013. Data are means with SE bars.60

Figure 3.1 Berry plant mural developed during the Kugluktuk High School environmental CTS programming in August 2013.....	82
Figure 3.2 Kugluk/Bloody Falls Territorial Park with the Coppermine River, Nunavut (photo by Sarah Desrosiers).....	88
Figure 4.1 Sarah Desrosiers, interpreter Betty Ann Kadlun and assistant Kate van Ballegooyen organizing consent forms during the first day of the oral history workshop at the Kugluktuk High School, August 2012 (photo taken by Dale Skinner and used with permission).	106
Figure 4.2 Elder Kate Inuktalik with great granddaughter Darla sitting face to face during the first day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Sarah Desrosiers).....	107
Figure 4.3 Elders Mamie Oniak, Kate Inuktalik and Laura Kohoktak working on Inuinnaqtun berry vocabulary during the second day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Sarah Desrosiers).....	108
Figure 4.4 Audio, video and written recordings documenting the second day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Hikok Ivarluk and used with permission).	109
Figure 4.5 Elders Alice Ayalik, Jack Ovilok and Mary Kellogok and Mamie Oniak validating Inuinnaqtun vocabulary of berries at the second oral history workshop at the Kugluktuk High School, January 2013 (photo by Sarah Desrosiers).....	110

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Dedication

This thesis is dedicated to all Kugluktukmiut especially the Elders and youth who have taken part in the research. You have inspired me in all aspects of life and have shown me how to be more resilient and adaptable. You have also taught me to never lose hope. Quana.

Chapter 1: Introduction

Arctic communities are experiencing the effects of climate change. Empirical research and Inuit Knowledge have documented observations of environmental change affecting northern Canada (McCarty 2001; Walther et al. 2002; Post et al. 2009; Krupnik & Jolly 2002; Gérin-Lajoie et al. 2016). These observations include reductions in sea-ice cover, increases in temperature, changes in timing of ice freeze-up and break-up, changes in snow conditions, permafrost thaw, changes in vegetation composition and structure, increases in erosion and the rise in sea levels (Fox 2002; Jolly et al. 2002; Corell 2006; Comiso et al. 2008; Larsen et al. 2008; Wang & Overland 2009; Rowland et al. 2010; Callaghan et al. 2011; IPCC 2013).

Unpredictability in weather conditions increases risk, making travel on the land and the harvest of country foods a difficult task (Nickels 2005; Huntington et al. 2007; Ford et al. 2008; Tremblay et al. 2008). As climate change persists these impacts are expected to intensify, which will create new challenges and opportunities for adaptation (Furgal & Seguin 2006; White et al. 2007; Ford et al. 2008; Huntington et al. 2009; Prowse & Furgal 2009).

Indeed, the capacity for northerners to adapt to the changing climate is currently being affected and will continue to be tested. Inuit employ coping abilities, resulting from recent climate change, and demonstrate significant adaptive capacity for responding to the changing environment (Thorpe 2000; Fox 2002; Nickels 2005; Ford et al. 2008). Responses tend to involve avoiding, minimizing and sharing risk (Ford et al. 2007). Furthermore Inuit knowledge, land-based skills, strong social networks, flexibility in seasonal hunting cycles, and institutional support can facilitate adaptive capacity and help build resilience (Ford et al. 2007).

Young northerners pursuing land-based activities are the most vulnerable to the impacts of climate change (Prowse & Furgal 2009). Studies have documented a weakening of land-based skills amongst younger generations in Northern communities (Thorpe 1998; Aporta & Higgs 2005; Ford et al. 2008). Furthermore, Elders have mentioned that fewer youth show the same degree of commitment or interest in harvesting country foods (Ford et al. 2006) and although subsistence activities remain important to youth, few are considered active hunters (Ford et al. 2008). This disconnection is linked to an intergenerational segregation caused by language differences, the formal educational system, impacts of residential schools, a general shift in social norms and the expense of hunting (Takano 2004; Henshaw 2010; Kral et al. 2011).

Concerns have been raised about the ability of young northern residents to adapt to future environmental change (Nickels 2005; Ford et al. 2006). Yet, there are very few published studies that recognize youth as important stakeholders in identifying research priorities, recommendations and opportunities for adaptive capacity building programs (Ford et al. 2010). Although there is a gap in research, youth in northern Canada have demonstrated that they have valuable knowledge and perspectives regarding the recent and future impacts of climate change (Petrasek MacDonald et al. 2013). Northern youth should be provided with the opportunity to take roles in research where stakeholders understand, value and actively include them in the research process (Petrasek MacDonald et al. 2013). In order to increase awareness of safe land-based practices, policies that promote and facilitate transmission of intergenerational knowledge and cultural programs are necessary (Laidler & Elee 2008; Ford et al. 2010; Schlosberg & Collins 2014). In turn, a more engaged, knowledgeable and skilled population of youth will help

to strengthen northern communities from future socio-economic and socio-psychological impacts caused by climate change (Petrasek MacDonald et al. 2013; Schlosberg and Collins 2014).

The ability of northerners to adapt to the changing environment not only varies between generations but amongst regions and communities and even within communities due to differing geographies, histories, as well as social, political and economic situations (Duerden 2004; Ford & Smit 2004; Adger et al. 2005; Adger et al. 2009; Pearce et al. 2009). To better understand the changing environment and assess the adaptive capacity of northern communities, research must continue to be conducted across Arctic communities. Research should also recognize local, social and cultural conditions, understand economic and political environments of each place and most importantly involve local knowledge and experiences by working with people in the community (Turner et al. 2003; Ford et al. 2007; Pearce et al. 2009; Armitage et al. 2011). Communities in the Canadian Arctic need to be actively involved in community based participatory research.

To learn more about the impacts of climate change and address pressing issues they bring to Nunavut, community-supported environmental monitoring rooted in *Inuit Qaujimagatuqangit* is necessary. By connecting *Inuit Qaujimagatuqangit* with scientific data we can expand knowledge of natural systems and develop new strategies for environmental monitoring and sustainable resource management (Jolly et al. 2002; Berkes et al. 2007; Gagnon & Berteaux 2009). Elders and people who leave the community to hunt and travel are engaged with the environment and make experienced observations of changes to the land. Long-term scientific monitoring of Arctic ecosystems is expensive and logistically complicated (Pearce et al. 2009; Henry et al. 2012).

Many northerners express interest in contributing to scientific research (Kofinas et al. 2002; Aporta 2004; Laidler & Elee 2008; Huntington et al. 2009). Land users have the potential to make significant contributions to environmental monitoring programs.

Researchers working with communities need to consider the challenges, including (Gearheard & Shirley 2007): trends in employment, local activities taking place at the time of research, cultural differences, poor historical community-researcher relations as well as financial and time constraints (Inuit Tapiriit Kanatami (ITK) & Nunavut Research Institute (NRI) 2007; Gearheard & Shirley 2007; Wolfe 2007). While improvements have been made, the ways in which community-researchers relations are established and maintained calls for improvement (Nickels 2005; Noongwook et al. 2007; Wolfe et al. 2007; Aporta, et al. 2011). Ultimately, to find a balance between the researchers and community needs, interests and expectations, communication is essential (ITK & NRI 2007).

Listening to local observations, knowledge and concerns widens our understanding of environmental change (Riedlinger & Berkes 2001; Berkes et al. 2007; Armitage et al. 2008).

Researchers need to consult with communities located within their regions of study, take comments seriously and adjust their research approaches by starting with active listening as methodology (Price 2000; Kincheloe & Steinberg 2006; Nicol 2006). Moreover, effective community-research collaboration implies an exercise in relationship-building founded on mutual trust and respect, as well as an investment in time and resources (Berkes 2007; Pearce et al. 2009). Formal and informal communication and reciprocity between researchers and community stakeholders is fundamental to develop this partnership.

Kugluktuk, Nunavut, formerly known as Coppermine, is located in the West Kitikmeot region and is the location of this research project (Figure 1.1). Kugluktuk, roughly translating to “a place of moving water and ice”, is situated at the mouth of the Coppermine River along the Coronation Gulf. The hamlet of roughly 1,450 residents relies on local country foods such as seal, caribou, musk ox, geese, Arctic char and berries as major sources of subsistence. To Kugluktukmiut (the inhabitants of Kugluktuk) the area is seen as a land of plenty because of its richness in flora and fauna. Some of the best fishing locations, found close to the community, are within the waters of the Coppermine River between Kugluktuk and Kugluk/Bloody Falls Territorial Park (Figure 1.2).



Figure 1.1 The study region (outline on the map of Canada) and the location of Kugluktuk, Nunavut (67°49'32"N 115°5'42"W), Kugluk/Bloody Falls Territorial Park (67°44'24"N 115°22'12"W), NU and Daring Lake, NT (64°50'01"N 111°38'04" W) (inset map).



Figure 1.2 Young Kugluktukmiut fishing at Kugluk/Bloody Falls Territorial Park August 2013 (photo by Sarah Desrosiers).

Inuinnaqtun is the dialect of Inuktitut spoken in the Kitikmeot region. Since Inuinnaqtun evolved in the Kitikmeot, specific environmental terms described in Inuinnaqtun are bound to this particular place. The environment including weather, winds and ocean currents is a force that would “push or pull a person through life” as described by Elder Naqi Ehko (Leduc 2007:239). Understanding words of the Inuit language used to describe the environment would evolve throughout a persons’ life. This acquired wisdom is no longer fully understood by Inuit youth as many not only have weakened land skills but they also struggle with the Inuit language (Leduc 2007).

Today, in Kugluktuk, the dominant language spoken at home, workplace and school is English. Although recent Inuinnaqtun revitalization programs have been initiated to teach younger generations the written and spoken language, there is a lot of work to be done to recover what has been lost (Kuliktana 2013). Kugluktukmiut share concerns about the loss of Inuinnaqtun amongst the younger generations, especially regarding language used to describe the land (Susie Evyagotailak, personal communication September, 2012).

This research was designed to contribute to the enhancement and maintenance of current community-supported monitoring efforts of culturally important berry species including *Arctostaphylos* spp. (bearberry), *Empetrum nigrum* (crowberry), *Rubus chamaemorus* (cloudberry), *Vaccinium vitis-idaea* (cranberry) and *Vaccinium uliginosum* (blueberry) in Kugluktuk, Nunavut. My research involved delivering weeklong Career and Technology Studies (CTS) environmental outreach programming with the Kugluktuk High School. The programming was designed to: 1) gain a better understanding of how the changing environment effects berry productivity by training youth in environmental monitoring and through the facilitation of oral history workshops; and 2) create space for youth to reconnect with the land as a way for healing and wellbeing. The evaluation of place-based outreach programming is key to understanding how to build meaningful capacity for Inuit youth to connect to the environment.

To conduct this research, I worked in close partnership with the Kugluktuk High School. In addition, relationships between researchers from the Tundra Ecology Lab of the University of

British Columbia¹ and the Government of Nunavut Department of Environment (DOE), Nunavut Territorial Parks and Special Places Division and Wildlife Division as well as the Hunter and Trappers Organization (HTO) were fostered.

This research is organized around two main questions and is written in three research papers. The first paper investigates the following question: How does productivity of culturally important berry species vary annually and across the Kugluktuk region? To answer this question, analyses were performed of annual berry productivity data from 2010-2013 through community-supported monitoring from the study sites located in Kugluktuk and at the Tundra Ecosystem Research Station (TERS), Daring Lake, Northwest Territories. These analyses are presented in Chapter 2.

The second research article, as Chapter 3, explores the question: how can engaging Inuit youth in culturally responsive outdoor environmental programming facilitate a more meaningful connection to the environment? To answer this question students were invited to fill out written surveys and participated in the “from the ground up” activity delivered during the CTS outdoor environmental programming. I also observed the participants and performed a personal reflection of my experience through storytelling.

Chapter 4 discusses the community collaboration of this research project by describing the process of developing bilingual education material: *The Berry Book*- a collection of oral histories

¹ Several licenses were required in order to conduct this research. They included: Nunavut Research Institute (NRI) Social Science Research Permit (04 007 13R-M), Government of Nunavut Department of Environment Wildlife Research Permit, UBC Behavioral Research Ethics Board (H12-01943-001), Nunavut Territorial Park Use Permit (2013-10PU) and Northwest Territories Scientific Research License (15113).

about berries from Elders and youth. As a way to give back to the community, the book was developed through the facilitation of three sets of oral history workshops that took place during the CTS courses. The workshops created a gathering place and provided an exchange of knowledge between Elders, knowledge holders, high school and middle school students and university researchers. The Elders and knowledge holders who participated in this project were selected after speaking with the High School staff. *The Berry Book* compiles Inuinnaqtun vocabulary used to describe berries as well as *Inuit Qaujimajatuqangit* including stories from Elders and youth, recipes, songs and artwork. The final chapter, Chapter 5 provides a synthesis of the key findings from each paper.

1.1 Literature review and research context

The remainder of this introductory chapter aims to provide additional background and context fundamental to this research. The section begins with a brief history of the *Kitlinermiut* (Copper Inuit) from traditional life to the modern day. The community where this research took place, Kugluktuk, is of interest not only because the surrounding land is rich in flora and fauna but also because it is currently experiencing impacts of climate change. There has been little terrestrial research conducted in the Kugluktuk area especially when compared to other regions in Nunavut and across the Canadian North. In addition, Kugluktukmiut have expressed an interest in developing capacity building opportunities for their youth to engage with the environment (Thorpe 1998; Kugluktuk Community Wellness Plan 2011).

Education plays a role in this research. Therefore, additional background is provided to better understand the history of Nunavut's education system as well as education in the modern day. The principals of *Inuit Qaujimagatuqangit* are also defined.

This research focuses on the monitoring of berry production and vegetation to better understand the impacts of environmental change. Thus, literature reporting the effects of climate change on Arctic vegetation is introduced. This section ends with a description of the Arctic Berry Project, a collaborative environmental monitoring program between university researchers and northern communities, and the genesis for this research project.

1.1.1 The Kitlinermiut

1.1.1.1 Traditional life

The *Kitlinermiut*, known as the Copper Inuit, are descendants of the Thule (Rasmussen 1932). During the Thule period, distinct Inuit groups were formed across the North as a result of the development of social and economic activities influenced by regional climatic change (Condon 1996). A warming trend began about A.D. 1200 and lasted for a couple of centuries, and was followed by a gradual cooling event (Condon 1996). Around 1450 this cooling gained strength and lasted until ca.1850 (McGhee 1996). Depending on the intensity of the changing climate in each region, the Thule people adapted to their altered environments accordingly. In the central Arctic, the change was such that people had to adapt to new hunting activities, including the loss of whaling, giving rise to the Copper Inuit (Condon 1996).

Copper Inuit is an anthropological term that was adopted to describe the people living in the westernmost regions of the Canadian Arctic as they made use of local copper deposits (Condon 1996). The traditional territory of the Copper Inuit extends from Stapylton Bay to the west and Perry River to the east, the south coast of Banks Island to the north and the eastern shores of Great Bear Lake, Contwoyto Lake and Lake Beechey on the Back River to the south, roughly equating to 207,000km² (Condon 1996). Several subgroups composed the Copper Inuit; some groups relied on seal and polar bear while other groups focused on caribou and musk oxen (Condon 1996). People moved between groups relatively fluidly and in winter it was common for several families to get together in groups on or near the sea ice hunting seal or inland subsisting on terrestrial mammals and fish from lakes (Jenness 1923; Stefansson 1927; Rasmussen 1932). At the time of early contact with Europeans in the early 1880s, the total population living in the territory was estimated to be around 800 to 900 (Condon 1996).

During the time of pre-European contact, education was integrated into the daily lives, responsibilities, and relationships of families (McGregor 2013). Older generations would provide youth with the knowledge and skills necessary to harvest country foods, make tools and sew clothes (McGregor 2013). People taking on the roles of educators shaped education in terms of their own skills, cultural background and interests and the interest demonstrated by the youth (Bennett and Rowley 2004; Arnaquq 2008). Education would evolve as the relationship between the environment and the people changed (McGregor 2013). As Jose Amaujaq Kusugak explains in *Speaking My Truth* (2012:103): “the whole basis of learning was through observation and through bettering what had been observed while respecting the environment”. The most critical

aspects of traditional Inuit education include environmental knowledge, experiential learning and the respect held between the teacher and the student (McGregor 2011).

1.1.1.2 Transition from old ways to new ways

Due to the isolation of the region, the Copper Inuit were amongst the last Canadian Inuit groups to be contacted by outsiders (Condon 1996). Samuel Hearne was the first recorded contact between the Copper Inuit and Europeans (Hearne 1958). Hearne travelled down the Coppermine River in 1771 with a group of Chipewyan guides in search of copper deposits and fur trading partners (Hearne 1958). Hearne's well known published portrayal of a historical account of the massacre of sleeping Inuit at Bloody Falls is not considered reliable. It has been in question for several centuries and research suggests that it was a fabricated story (Cameron 2016). Further encounters did not occur until the period of 1820-1853, which included the Sir John Franklin expeditions of 1821 and 1825 (Bunyan 1993). John Rae met Copper Inuit at Rae River in 1847, and at Cape Flinders and Stromness Bay in 1851 (Bunyan 1993). In the 1850s further contact occurred but remained brief when two British naval expeditions entered Amundsen Gulf in search of the Northwest Passage (Usher 1965).

By 1905 the presence of Europeans in the Coronation Gulf intensified (Condon 1996). Klengenberg, Mogg and Stefansson (1908-1912) spent several months living with the Copper Inuit (Usher 1965). By 1915, Bernard Harbor became the centre of activity and was where researchers, traders and Anglican missionaries settled (Usher 1965). The first Hudson's Bay Company (HBC) trading post (Fort Bacon) in the area was established at Bernard Harbour in

1916 (Condon 1996). That same year Klengenberg built a post south of Cape Kendall, near the mouth of the Coppermine River (Condon 1996).

The HBC relocated to the mouth of the Coppermine River in 1928, as did the Anglican Mission. The Catholic Church established its first mission a year later. Several establishments followed including: a Northwest Mounted Police post in 1932, a nursing station in 1948 and the first school, radio station and meteorological station in 1950 (Damas 2002). By the spring of 1951 there were 30 Inuit living in the new settlement (Hicks 1955).

1.1.2 Residential Schools

Formal schooling for children was very limited prior to the 1950s. A few mission day schools teaching a curriculum based on religion, English and Euro-Canadian subjects were scattered across the territory (General Synod Archives 2008). During these times, most children still learned from their parents and family who continued to live off the land. Therefore, the Inuit language, cultural practices and tradition have been maintained by Elders and through oral tradition, in ways that other Indigenous communities that were significantly affected by earlier colonization and the residential schooling system have not (McGregor 2011).

The federal government officially initiated a program to educate Inuit children in 1955 (King 1998). In 1955 the first full season of schooling in Coppermine registered 28 Inuit children where eight tents served as dormitories (General Synod Archives 2008). By 1957 the maximum capacity of 44 was reached by building a total of 11 tent residences. The catchment area expanded with students enrolled from Bathurst Inlet, Bernard Harbour, Cambridge Bay and Holeman Island (General Synod Archives 2008). By 1959 the tent hostel closed and the

involvement of the Anglican Church in the education of Inuit youth ended (General Synod Archives 2008). Some students were transferred to Stringer Hall residential school in Inuvik while others remained in Coppermine boarding with local families to attend the Federal Day School (General Synod Archives 2008). See Figures 1.3-1.5 for original photographs taken in Kugluktuk by Mabel Walter, a school teacher from Port Radium who traveled to Coppermine for a day in the spring of 1953.



Figure 1.3 Inuit with Father Lapointe, RC in Kugluktuk (Coppermine), Nunavut spring 1953 (photo taken by Mabel Walter and used with permission).



Figure 1.4 Etna Bolt (left) and two young girls in Kugluktuk (Coppermine), NU spring 1953 (photo taken by Mabel Walter and used with permission).

The intent of the schools was to educate young Inuit and have them integrate into the settler / colonial society. Their culture was denigrated in the process. The effects of residential schools damaged Inuit families and society. Attendance at various forms of residential schools meant a disruption of youths' traditional land-based education, relationship with family members (Irniq 2011; Jordan-Fenton and Pokiak-Fenton 2012). Administrative responsibility for education was transferred from the federal government to the government of the Northwest Territories in 1979-1980 (McGregor 2013). It was in the 1970s and 1980s that Inuit leaders began to emerge, from across the territories, including John Amagoalik, Pitta Irniq and Tagak Curley. They were among the first generation to attend residential schools and became politically active in negotiating greater control over the education of Inuit in the territories (McGregor 2013).

1.1.3 Brief history of education in Nunavut

With the advent of Nunavut in 1999 came an expectation that the new government would function with a rejuvenated momentum that would seek to meet Inuit goals and needs (Berger 2006). The Nunavut Land Claims Agreement (NLCA) was the largest aboriginal land treaty in the history of Canada. Inuit values became one of the most important factors in deciding government policy, including those policies relating to education (Berger 2006).

However, education was not addressed in the NLCA, which was the foundation for the *Nunavut Act* and the creation of a representative public government (McGregor 2012). The NLCA only specified the needs for funding related to adult professional training to reach employment targets (McGregor 2012). Start-up programs for on-going funding for K-12 education were not supported in the NLCA (McGregor 2012). In addition, there was no priority placed on the transformation of schools to include more *Inuit Qaujimagatuqangit* in k-12 education (McGregor 2011).

In his 2006 report, Justice Berger described the state of education in the first decade of the formation of Nunavut as being in crisis (Berger 2006). Territorial employment objectives, as stated in Article 23 of the NLCA, were set to reach an 85% Inuit participation rate. However, this could not be accomplished because there was a lack in adequate educational capital (Berger 2006).

A possible reason why education was not addressed in the NLCA could have been from the result of the successful transformation of schools already underway (McGregor 2014). During

the late 1980s and 1990s schools were well on their way to becoming an education system informed by Inuit language, culture, history, beliefs, desires and goals (Tompkins et al. 2009). Although southern curriculum, resources and assessments remained and graduation rates were low, district education councils and school boards, run by elected individuals, were not only leading the decision-making but also were actively increasing Inuit capacity in education (McGregor 2014).

An *Education Act* was drafted in 2000 by the new government. The government dissolved the previous administrative structure of regional school boards. They replaced them with a two-tiered government administration with regional offices and a territorial headquarter and one tier of elected officials in the form of district education authorities (DEAs) (McGregor 2011). The decision to revamp the system did not stem from public wishes but in an effort to decrease cost and duplicative administrative efforts (McGregor 2011).

The Nunavut *Education Act* came into effect in 2009 and calls for an educational foundation grounded in *Inuit Qaujimajatuqangit* principles (Table 1.1), traditional Inuit views of learning, the development of Inuit societal values and bilingual education. The legislation brought in an additional \$14 million into the school system annually to foster the improvements mandated in the Act (McGregor 2014). Good progress, especially in terms of reinforcing *Inuit Qaujimajatuqangit* through the schools has been accomplished since the advent of the territory. However, it is also important to acknowledge the current challenges the territory is facing including bilingual education, school staffing, Inuit educators and student attendance to name a few (McGregor 2014).

Table 1.1 Principals of *Inuit Qaujimagatuqangit* (Arnakak, 2001).

<i>Inuuqatigiitsiarniq</i>	Respecting others, relationships and caring for people
<i>Tunnganarniq</i>	Fostering good spirit by being open, welcoming and inclusive
<i>Pijitsirniq</i>	Serving and providing for family and/or community
<i>Ajiiqatigiinni</i>	Decision making through discussion and consensus
<i>Pilimmaksarniq/Pijariuqsarniq</i>	Development of skills through observation, mentoring, practice and effort
<i>Piliriqatigiinni/Ikajuqtigiinni</i>	Working together for a common cause Qanuqtuurniq: Being innovative and resourceful
<i>Qanuqtuurniq</i>	Respect and care for the land, animals and environment
<i>Avatittinnik Kamatsiarniq</i>	

Many events, including the challenges discussed above, have affected education in Kugluktuk, Nunavut. However, there are several positive and unique programs occurring at the Kugluktuk High School that stand out and are worth mentioning. One particularly strong priority is its pre-trades optional program, launched in 2005-2006. Another important program is the Kugluktuk High School Athletics Association (KHSAA) (McGregor 2014).

The 2011 population of people aged 15-19 in Kugluktuk, which roughly corresponds to grades 10,11 and 12, includes 85 females and 61 males, making a total of 146 (McGregor 2014).

However, during the same period only 108 students from grades 7 to 12 were enrolled in KHS

(McGregor 2014). Thus a large number of students were not in school. Grade 12 students have the highest rate of attendance at 70% over the period of three years (McGregor 2014). Kugluktuk has celebrated the graduation of 94 students since 1992 (McGregor 2014). There are 20 students who are on the potential graduation list for the spring of 2017 (Haydn George pers. Comm. 2016).

1.1.4 A brief history of language rights after the establishment of Nunavut

The Territory of Nunavut was founded in 1999, following the 1993 signing of the Nunavut Land Claims Agreement (NLCA) (Timpson 2009; Patrick 2012). The *Nunavut Official Languages Act* (2008) and *Inuit Language Protection Act* (2008) were developed to recognize Inuinnaqtun and Inuktitut as official Inuit languages. These Acts also acknowledge the protection and standardization of several Inuit languages (Timpson 2009; Patrick 2012). These laws give Inuktitut, English and French equal status, rights and privileges as official languages in Nunavut (Timpson 2009; Patrick 2012). This was a groundbreaking accomplishment that now allows the people of Nunavut the right to work in Inuit languages in government offices and the right to services and education in Inuit languages (Dorais 2006; Patrick 2012).

The Nunavut Government developed several objectives and targets related to Inuit language rights (Dorais 2006). For example, Article 23 of the NLCA was created to increase Inuit language participation in government employment in Nunavut to 85% (Berger 2006). In addition, the Territorial Government also developed a new *Education Act* (2003-updated in 2008) following the Bathurst Mandate (1999) where Nunavut strives to ensure that by 2020 every student in Nunavut will have the opportunity for bilingual education and that language

instruction will be in an Inuit language and English or French (Tulloch 2004; Timpson 2009; Daveluy & Ferguson 2009; Berger 2006). Nunavut has allocated the responsibility for taking the proper measures to attain these goals to the Nunavut Department of Education and the Department of Culture, Language, Elders and Youth (CLEY) now known as the Department of Culture and Heritage (Timpson 2009). Together these departments are tasked with taking the lead in language legislation and promoting Inuit languages within the educational system and in the service sector by providing bilingual opportunities (Timpson 2009).

In his 2006 report, Justice Burger explained that Inuit of Nunavut have the lowest rate of English literacy in Canada. The Berger Report also stated that a 2001 Nunavut Household survey identified that the pressure for Nunavut's Indigenous population to abandon their Inuit Language and use English is increasing in the workplace but even more so in schools. In addition, Berger (2006) criticized Nunavut's schooling system for having shockingly low high school graduation rates. Schools are not producing graduates competent in Inuit languages. Berger argues that the issue preventing Nunavut from attaining an 85% employment rate of Inuit peoples lies within a dysfunctional schooling system. The statistics presented in the Berger Report go against the goals established in Article 23 and thus confirm that current efforts to revitalize the Inuit language in Nunavut are inadequate.

Language policies that grant Inuit language rights have been enacted by the government and have enhanced the sense of pride amongst Inuit (Dorais 2006). It is agreed that the acknowledgement of language rights was a great accomplishment, setting Nunavut in the right direction for language preservation (Timpson 2009). Yet, the number of Inuit language speakers

continues to decline (Allen 2007; Hot 2009). Granting language rights to Indigenous groups like Inuit of Nunavut does not mean that the group will be capable of revitalizing and maintaining their traditional language independently (Patrick 2005; Dorais 2006). Long-term planning for the strengthening of Inuit languages in school, home and community must be addressed as it can direct Nunavut communities toward becoming a functional bilingual society.

A bilingual Nunavut is important for the future of the Territory, as the Inuit language plays a vital role in maintaining a collective Inuit identity. English and/or French is important for communicating, especially in science and technology sectors, with other areas of Canada and the world (Timpson 2010; Petrov 2008). In addition, the socio-economic future of Nunavut will be heavily influenced by the changing global environmental and economic climates, thus making it vital for the Territory to develop and sustain relationships within and outside of Nunavut (Ford 2009; Ford et al. 2011; Simpson 2002; Downing & Cuerrier 2011). Consequently, Nunavut needs to produce and hire in their public service qualified bilingual high school graduates. This would be a mandatory step toward achieving a functional bilingual society in Nunavut (Berger 2006). Tackling past and current issues related to the instruction of language in the schooling system can be done by implementing a bottom-up approach to create a long-term plan for the revitalization of the Inuit Language.

1.1.5 Inuit Qaujimatqangit

Traditional Inuit Knowledge (TIK) also known as Traditional Ecological Knowledge (TEK) focuses on the relationships of living beings with one another and nature in which the knowledge evolves as it gets passed down through generations by cultural transmission (Berkes et al. 2000).

Inuit Qaujimagatuqangit, a concept used in Nunavut roughly translates to Traditional Inuit Knowledge and encompasses all the qualities of traditional Inuit culture whether they are values, skills, perceptions, and expectations (Tester & Irniq 2008). Tester & Irniq (2008) define *Inuit Qaujimagatuqangit* as “seamless” because “everything is related to everything else in such a way that... nothing can stand alone, even in the interest of gaining an appreciation of the whole” (p49). In this sense the definition of *Inuit Qaujimagatuqangit* runs parallel to those of Traditional Inuit Knowledge.

It is important to note that *Inuit Qaujimagatuqangit* and Traditional Inuit Knowledge do not have the exact same meaning. For example, the perception of “traditional” found in the term Traditional Inuit Knowledge implies the Inuit traditions of the old Inuit ways, which may have a challenging time finding a place and role in modern Inuit society (Ayles et al. 2007). Instead *Inuit Qaujimagatuqangit* as defined, includes all past, present and future Inuit knowledge and thus can empower Inuit culture especially for younger generations. Stevenson (2006) suggests that *Inuit Qaujimagatuqangit* is about remembering the root of Inuit identity and carrying out actions from certain intellectual and spiritual locations. Hence, when applied meaningfully *Inuit Qaujimagatuqangit* has the power to bring together generations of Inuit to tackle a common challenge (Tester & Irniq 2008).

Certainly integration of *Inuit Qaujimagatuqangit* with empirical data can assist in expanding scientific knowledge of natural systems and developing new strategies for sustainable resource management and environmental monitoring (Krupnik & Ray 2007; Manseau, et al. 2007; Berkes et al. 2007; Gagnon and Berteaux 2009; Huntington et al. 2009). By allowing *Inuit*

Qaujimajatuqangit to complement modern scientific research, the livelihoods of people dependent on local natural resources may be sustained. This is particularly true for the development of adaptive management strategies such as community-supported monitoring that involve communities vulnerable to the effects of climate change (Ford et al. 2006; Ford et al. 2007; Downing & Cuerrier 2011). Yet considering their potential, northern research programs that value *Inuit Qaujimajatuqangit* are few.

In recent years, the concept of integrating *Inuit Qaujimajatuqangit* in academic research has gained recognition (Parlee & Berkes 2006; Wolfe et al. 2007; Thornton & Scheer 2012). Researchers who value *Inuit Qaujimajatuqangit* as components of their research should be aware of the limits and challenges in integrating *Inuit Qaujimajatuqangit* into scientific approaches. This is largely due to its qualitative characteristics, its influence from worldviews and the use of metaphorical language by the knowledge holders (Turner et al. 2000; Cruikshank 2002; Natcher & Hickey 2008; Cruikshank 2005). One of the largest barriers to establishing sustainable adaptive research programs in the Canadian North is related to the time and effort needed to develop long-term relationships between scientists and communities (Huntington 2000; Berkes et al. 2007; Manseau et al. 2005; Pearce et al. 2009). By acknowledging and working to overcome these limitations, researchers in partnership with communities can work together to develop a suitable framework for research.

1.1.6 Arctic vegetation

In the past two and a half decades, the Arctic and alpine tundra have experienced a shift in biodiversity especially plant community composition (Chapin et al. 1996; Stow et al. 2004;

Elmendorf et al. 2012a). These changes are associated with a “greening” trend of the tundra biome measured as changes in the peak Normalized Difference Vegetation Index (NDVI) using remote sensing imagery (Jia & Epstein 2003; Bunn & Goetz 2006; Forbes et al. 2010). Increased net productivity corresponds with the rise in air temperatures and has been in part accredited to increases in shrub cover (Raynolds et al. 2008; Sturm et al. 2010; Myers et al. 2012). Although the Arctic is becoming greener, responses of tundra vegetation to climate change are predicted to vary spatially and temporally (Elmendorf et al. 2012a).

Shrubs in the Low Arctic and Forest-Tundra have increased in cover and height (Myers-Smith et al. 2012; Ropars & Boudreau 2012). It is predicted that the increase in shrub density will lead to important feedbacks to the atmosphere and to ecosystem structure and processes (Henry et al. 2012). For example, Chapin et al. (2005) state that darker and denser canopy will lower albedo and thus increase net radiation and contribute to regional and global warming. Sturm et al. (2005) report that taller shrubs will enhance snow depth and affect winter soil temperatures, possibly resulting in greater rates of soil processes and nutrient availability. Furthermore increases in cover and height potentially restrict the growth of other plant species by limiting light availability and thus can alter the structure and function of tundra ecosystems (Chapin et al. 1995; Bret-Harte et al. 2001; Wookey 2009). Hence, shrubbier tundra will have implications for herbivores, like caribou that depend on a combined diet of lichens, herbaceous and woody plants (Henry et al. 2012).

Although the Arctic is becoming “greener”, responses of tundra vegetation to climate change are predicted to vary spatially and temporally (Elmendorf et al. 2012a). Long-term experimental and

observational research assist in understanding the processes driving changes in plant community composition both in space and time but due to funding and logistics, the establishment and maintenance of long-term monitoring projects are no simple tasks (Hudson & Henry 2010). Nevertheless, monitoring programs such as long-term warming experiments are key for understanding responses in vegetation from environmental change (Laudre 1995; Hudson & Henry 2010; Elmendorf *et al.* 2012a,b).

In the early 1990s, the International Tundra Experiment (ITEX) was established where open-top chambers (OTCs) were installed in tundra ecosystems around the world to increase near-surface temperatures by 1-3°C (Henry & Molau 1997). Several publications related to ITEX, report that species are responding to increased temperature within warming plots, especially in phenology and reproductive variables (Henry & Molau 1997; Klady *et al.* 2011; Elmendorf *et al.* 2012a; Bjorkman *et al.* 2016). Elmendorf *et al.* (2012b) conducted a world-wide synthesis of repeated measurements of plot scale studies of natural vegetation including the control plots of 61 ITEX sites and discovered that over the past 30 years there have been significant mean positive changes in canopy height, the maximum observed height of vascular plant growth forms and the abundance of shrubs and litter, as well as negative changes in the abundance of lichen and mosses. Klady *et al.* (2011) reported reproductive effort and success in High Arctic plants were stimulated by a 12 year passive warming experiment, greater seed weight and germination rates, particularly in shrub and graminoid species.

The manipulation of only a few environmental variables such as summer air temperature, length of growing season and snow depth does not account for all factors that influence plant growth in

tundra ecosystems. Changes in soil nutrient pools and pH, precipitation, species composition and density add further complexities to the relationships between plants and climate (Elmendorf et al. 2012b). Fall and winter climate change can have a considerable impact on individual plants in tundra ecosystems and on spatial heterogeneity in plant community composition, especially in shrub communities (Bockhorst et al. 2011; Bockhorst et al. 2012). Growth and fruit production of dwarf shrubs is affected by local factors including plant community microsites, near-ground microclimate, soil characteristics (Shevtsova et al. 1995; Krebs et al. 2009) and the presence of pollinators. Consequently, the differences in berry plant distribution and productivity can be attributed to relatively small-scale variability.

1.1.7 Community berry monitoring

The Arctic Berry Project was established as part of the 2007-2008 International Polar Year (IPY) project “Climate Change Impacts on Canadian Arctic Tundra (CiCAT)” (Henry et al. 2012) and has continued as a project within the Networks of Centres of Excellence (NCE) program ArcticNet. The main goals of this project are to improve ecological knowledge by working with communities in establishing a network of long-term community-based monitoring projects across the Canadian Arctic. This is accomplished by building partnerships with communities in monitoring the annual production of culturally important berry species and shrub growth, which are used as indicators of environmental change.

Other research interests of the Arctic Berry Project include the monitoring of vegetation in response to warming experiments using open top chambers (OTC), documenting *Inuit Qaujimaqatuqangit* regarding the productivity and ecology of culturally important berry species

via semi-structured interviews with elders and knowledge holders, as well as capacity building for youth to engage with science by delivering outdoor educational courses and integrating monitoring protocols within schooling curriculum (currently this occurs in Nunavik, QC only). As of 2013 there were 21 northern communities from Nain, Nunatsiavut (Labrador) to the East, Kugluktuk, Nunavut to the West and Pond Inlet, Nunavut to the North participating in the annual berry productivity monitoring program. Three Arctic research stations: Alexandra Fiord (NU), Tundra Ecosystem Research Station (NWT) and Bylot Island (NU) are also participating in collecting annual berry productivity data.

1.2 Summary

This introduction provided an overview of the history and traditional culture of the *Kitlinermiut*, in addition to a brief summary regarding the current education system in Nunavut and *Inuit Qaujimagatuqangit*. This valuable information shaped the research design of this project by guiding the development of culturally appropriate programming and questionnaires carried out during the high school's outdoor environmental course as explained in Chapter 2.

The Arctic is experiencing an increase in productivity due to the warming climate. In addition, the tundra is becoming shrubbier, which has many ecological consequences. In addition to the effects of warming, encroachment of tall shrubs on berry shrub patches may have an impact on annual berry productivity. This research is a part of the Arctic Berry Project, a community-supported program developed to improve ecological knowledge of important berry producing species by monitoring annual production of berries and shrub growth across the Arctic landscape.

Chapter 2: Environmental influences on berry productivity

2.1 Introduction

There has been significant warming of the Arctic in the past three decades with temperatures expected to continue to rise beyond the 21st century (Bernstein et al. 2007; Euskirchen et al. 2009; IPCC 2013). The Arctic has experienced increased spring and winter surface temperatures, reduced sea-ice cover, increased sea surface temperatures and cloud cover, changes in snow conditions and thawing permafrost (Wang & Overland 2009; Callaghan et al. 2011). Temperatures between 1970 and 2009 increased strongly across the northern Canada, especially in the western Canadian Arctic (Overland & Wang 2005; McManus 2012). The predicted conversion of tundra vegetation in parts of the Low Arctic to greater abundance of shrubs and to wetlands affects numerous biological processes and feedbacks and may have serious impacts on the carbon cycle and the energy balance of the tundra regions and the Earth as a whole (Chapin et al. 2005; Lucht et al. 2006; Wang & Overland 2009; IPCC 2013).

2.1.1 Tundra ecosystems: vegetation change

Arctic regions are experiencing the highest rates of temperature change on Earth (Falkowski et al. 2000; Johannssen et al. 2004; Hinzman et al. 2005; IPCC 2013). There is general agreement amongst vegetation scientists and other researchers that treeline and the forest-tundra are moving both northward and in elevation (Parmesan & Yohe 2003; Aitken et al. 2008; Grau et al. 2012; McManus et al. 2012). It is forecasted that these areas will undergo shifts in ecosystem boundaries and will be greatly influenced by the increased abundance and cover of shrub species. It has been estimated that on average there has been a movement of ecosystem boundaries by 6.1 km per decade northward and 6.1 m per decade upwards in the Northern Hemisphere (Parmesan

& Yohe 2003). The shift from tundra to upright shrub species will have significant effects by shading low growing species, including berry producing plants, altering nutrient dynamics, changing the albedo and the surface energy balance, and the forage for herbivores (Chapin et al. 2005; DeMarco et al. 2011; Myers- Smith et al. 2011). The processes, however, are yet to be fully understood.

There have been several studies that explore migration and expansion of shrubs in northern latitudes (Masek 2001; Sturm et al. 2001; Tape et al. 2006; Lantz et al. 2011; Tape et al. 2012; Tremblay et al. 2012). These inquiries have produced mixed results where some findings conclude that shrub expansion and treeline migration is in fact occurring while others have found no changes. Lantz et al. (2011) utilized aerial photographs to map fine-scale changes in shrub cover in the Mackenzie River Delta uplands, and reported that average stem density and average tall shrub tundra cover have significantly increased since 1972. Tape et al. (2012) also used a form of repeat aerial photography of their sites in Arctic Alaska and showed that while some shrub patches have increased in size substantially others showed little change or no change. A study by Masek (2001) used infrared satellite imagery and found that there has been very little change in treeline position in the Canadian north between the early 1980s and late 1990s, even with a local warming of 0.6° C.

Empirical and observational research shows that the Arctic is indeed becoming shrubbier (Myers et al. 2011; Downing and Cuerrier 2011; Elmendorf et al. 2012b; Cuerrier et al. 2015; Gérin-Lajoie et al. 2016). Results indicate that shrub expansion in Arctic or alpine ecosystems is determined by many variables from large-scale factors such as climate change, to local factors

such as disturbance and pressures from grazing, and to site-specific factors such as the influence of microclimate and soils (Grace et al. 2002; Myers-Smith et al. 2011). The variability in responses to the changing environment, including changes in plant community composition, contribute landscape heterogeneity and to changes in ecosystem boundaries (McManus et al. 2012). More research is needed to better understand the processes driving these changes.

2.1.2 Impacts on berry producing plants

There is rich Traditional Ecological Knowledge of berry producing plants in northern communities that shows their importance to cultural heritage, food security and health and as a vital food resource for northern people (Mackey & Orr 1987; Thorton 1999; Murray et al. 2002; Murray et al. 2005; Karst & Turner 2011; Hupp et al. 2015). Local observations have reported encroaching tall shrubs that shade out berry harvesting patches reducing production of many berry plant species (Downing & Cuerrier 2011; Gérin-Lajoie et al. 2016). Harvesting practices from the community of Fort McPherson, NT show that some people take care of berry patches by returning to them for picking regularly in order to prevent over-growth by shrubs (Murray et al. 2005). Changes in berry harvesting practices could serve as indicators of environmental change.

The impact of climate change on berry producing plants in tundra ecosystems remains uncertain. Berry production is influenced by many environmental factors including climate, the growth of other shrub species, herbivory, pollution, snow cover, permafrost and pollinators (Wallenius 1999; Sturm 2001; Sturm 2005; Brown & McNeil 2009; Blok 2010; Myers-Smith 2011; Holden et al. 2012). A study in the Yukon by Krebs et al. (2009) concluded that changes in berry

production can be explained by spring and summer weather variables of the current growth year, as well as one and two years previous. Changes in the production of berry producing plants can be used as an indicator of the changing climate.

Studies in Scandinavia on *Vaccinium myrtillus* found that the main effects of climate change on berry productivity are expected to be winter (Taulavuori et al. 2013) and spring (Wipf et al. 2009) warming along with a reduction in snow cover (Totland & Alatalo 2002; Tahkokorpi 2007). Warmer conditions during winter and spring months are related to early dehardening, exposure to drought (Rixen et al. 2010; Selas et al. 2015), and frost injuries (Jacquemart and Thompson 1996; Tolvanen 1997). The importance of pollinator activity and environmental stressors on the reproductive success of herbivores are also factors, which is shown by the influence of spring conditions on berry abundance (Boulanger-Lapointe et al. 2017).

The objectives of this study were to: (1) compare vegetation composition of the three research sites at Kugluktuk, NU, Bloody Falls Territorial Park, NU and Daring Lake, NT; (2) explore the relationship between the cover of shrubs and the cover of berry producing plants; and (3) examine the relationship of berry productivity to location and climate at the three research sites using data collected by researchers and high school students during a community supported berry-monitoring project. Berry shrubs at coastal sites should be more productive than those inland because increased shrub cover at inland sites should decrease the cover and productivity of berry producing plants through competitive effects such as shading. Overall, this study was conducted to better understand how the changing environment affects the productivity of berry producing plants.

2.2 Species composition

The following culturally important berry species were studied as indicators of environmental change for this study: *Empetrum nigrum* L. (Paun'ngat, Crowberry), *Vaccinium uliginosum* L. subsp. *microphyllum* (Lange) Tolm. (Kigutigirngnat, Blueberry), *Vaccinium vitis-idaea* L. subsp. *minus* (Lodd.) Hultén (Kingmingnat, Cranberry), *Arctostaphylos* spp. (Kablat, Bearberry) and *Rubus chamaemorus* L. (Aqpiit, Cloudberry). The following species descriptions are based on the Flora of the Canadian Archipelago by Aiken et al. (2003).

E. nigrum is a dwarf evergreen shrub in the Ericaceae family reaching between 5 to 10 cm in height with prostrate stems forming mats. There are two or more flowering stems per individual. Single purple flowers of 1-2 mm in size are produced on short shoots. A fleshy black to purple drupe appearing veinless is produced that is typically 3-8 mm wide containing 2-9 seeds (see Figure 2.1-a).

V. uliginosum is a dwarf deciduous ericaceous shrub, 5-15 cm in height with prostrate stems. Oval glabrous leaves are distributed alternately along the stem. Leaf bud scales are present along the stem. Two or more flowering stems are present per individual. A fleshy berry is produced that is 5-10 mm long and wide, it turns blue at maturity and contains several seeds (see Figure 2.1-b).

V. vitis-idaea is an evergreen dwarf ericaceous shrub, 2-10 cm in height producing prostrate stems that branch extensively. Glabrous leaves are arranged alternately along the stem.

Flowering stems are present on two or more stems. A fleshy spherical berry, 6-9 mm in diameter turning red at maturity and containing numerous seeds is produced (see Figure 2.1-c).

R. chamaemorus is a perennial forb in the Rosacea family. Individuals reach between 6-15 cm in height. One to three deciduous leaves are arranged alternately along the vertical stem. Brown hairy leaves are 5-10 mm long and 3-5 mm wide. Individuals are dioecious. Corolla are white and 2-3 cm broad with five petals that have notched tips. Aggregate of drupelets are produced which are red when immature turning orange when ripe (see figure 2.1-d).

There are two *Arctostaphylos* species present in the research areas: *Arctostaphylos alpina* and *Arctostaphylos rubra*. As they are easily misidentified they are grouped by genus. *Arctostaphylos* spp. are dwarf deciduous ericaceous shrubs 10-30 cm in height. Leaves are present along the stem in an alternate arrangement. Leaves senesce annually but remain attached and build up at the base of the stem. There are two or more flowering stems per individual. A fleshy red (*A. rubra*) or dark purple to black (*A. alpina*) berry, 6-8mm wide appearing veinless is produced containing 2-5 seeds (see Figure 2.1-e-1 and e-2).



Figure 2.1 Images of the berry plant species used in this research; a) *Empetrum nigrum* (Paun’ngat, Crowberry), b) *Vaccinium uliginosum* (Kigutigirngnat, Blueberry), c) *Vaccinium vitis-idaea* (Kingminat, Cranberry), d) *Rubus chamaemorus* (Aqpiit, Cloudberry), e-1) *Arctostaphylos rubra* and e-2) *Arctostaphylos alpina* (Kablaq, Bearberry).

2.3 Methods

2.3.1 Study area

The research was conducted at three locations in the central Canadian Arctic: Kugluktuk, NU (67°49’32’’N 115°05’42’’W) and Kugluk/Bloody Falls Territorial Park, NU (67°44’24’’N 115°22’12’’W) and at the Tundra Ecosystem Research Station (TERS), Daring Lake, NT (64°52’N 111°35’ W) (Figure 2.2). I used the Circumpolar Arctic Vegetation Map (CAVM) to classify the research sites into dominant plant community types (Walker et al. 2005). According to the CAVM, the most southerly site at Daring Lake (Figure 2.2a) is dominated by erect-dwarf shrub tundra. The research site around Kugluktuk (Figure 2.2b) is dominated by tussock sedge,

dwarf shrub, moss tundra and the site at Bloody Falls is dominated by non-tussock sedge, dwarf shrub, moss tundra.

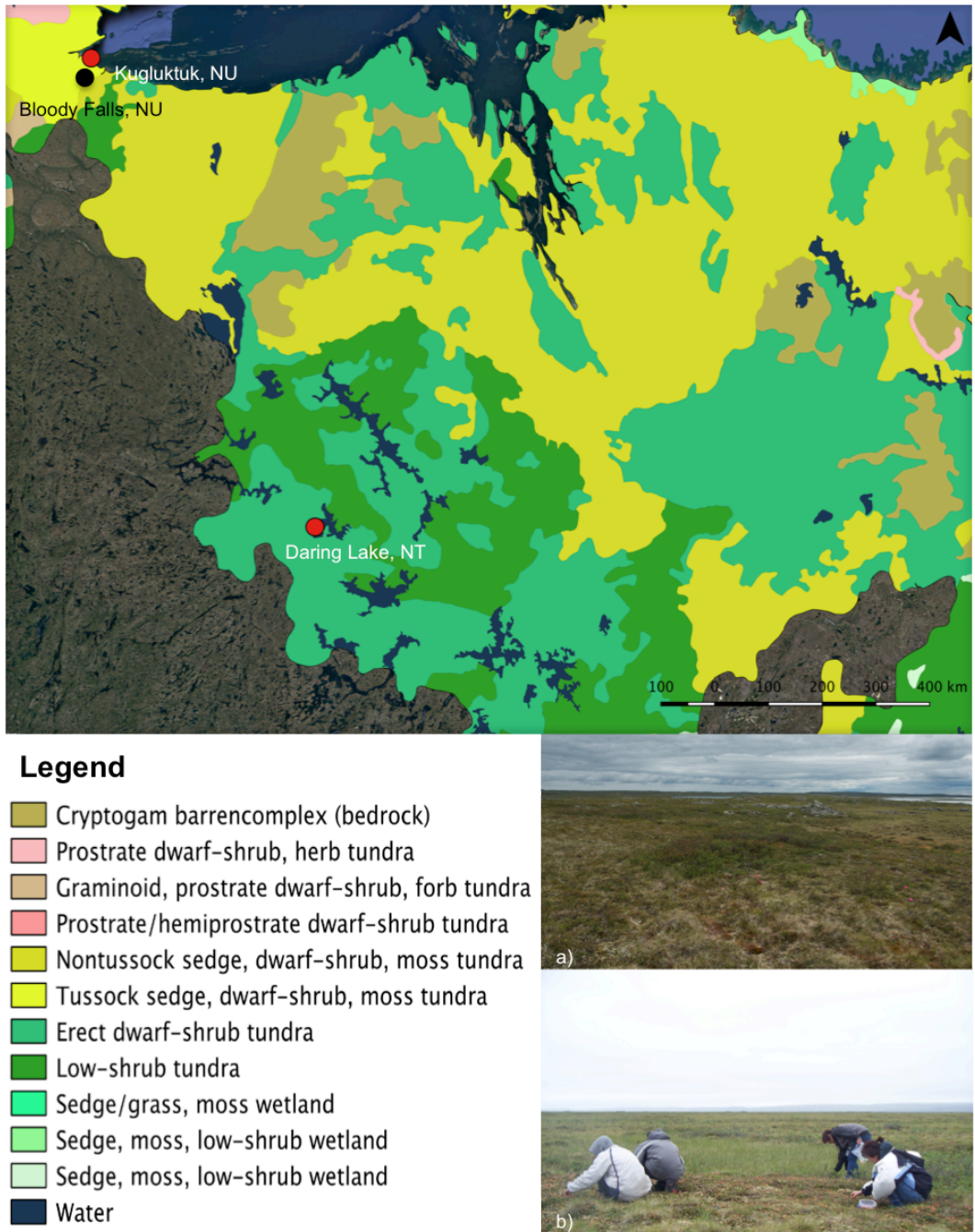


Figure 2.2 Field site locations: Kugluktuk, NU (67°49'32"N 115°05'42"W), Bloody Fall Territorial Park (67°44'24"N115°22'12"W) and Tundra Ecosystem Research Station (TERS) at Daring Lake, NT (64°50'01"N 111°38'04" W) shown with the dominant zonal vegetation type (CAVM 2003). The areas not included in the vegetation classes are below treeline. Map was produced by Sarah Desrosiers.

Kugluktuk is a coastal community situated on the Coronation Gulf, at the mouth of the Coppermine River in the Kitikmeot Region along the western edge of Nunavut. Kugluktuk is one of the only communities participating in the Arctic Berry Project to receive regular visits and consistent annual berry productivity monitoring since 2009.

In 2012, the regional coordinator with Nunavut Parks and Special Places, Becky Torretti welcomed the berry monitoring research into Kugluk/Bloody Falls Territorial Park.

Kugluk/Bloody Falls Territorial Park (8.5 km²) is located on the west side of the Coppermine River, 15 km South of Kugluktuk (Figure 2.2). Inuit refer to the campsite as *Onoagahiovik*: the place where you “stay out all night” because of the great fishing. The park is one of Nunavut’s few parks to have shared a history between the Inuit and Dene First Nations.

The Department of Environment and Natural Resources (ENR) of the Government of the Northwest Territories established the Tundra Ecosystem Research Station (TERS) at Daring Lake in 1994 as a facility for long-term research and environmental monitoring. TERS is located on the central barrens 300 kilometers north of Yellowknife and roughly 700 km south of Kugluktuk. Daring Lake is in the Coppermine River drainage and allowed comparisons of berry productivity between inland and coastal Low Arctic Ecosystems.

2.3.2 Establishment of monitoring plots and site descriptions

In Kugluktuk, monitoring plots (400 m²) were selected based on the following criteria: 1) representative landscape for berry shrubs; and 2) easy accessibility (via walking, All-Terrain Vehicles (ATV) or boat) by students from Kugluktuk. The first monitoring plot in Kugluktuk was originally established in 2008. A second plot was established in 2011 followed by two additional plots in 2012 (Figure 2.3a). Potential berry monitoring plots in Kugluktuk were first visited and then determined on topographic maps. Consultation with participating high school teachers and the Kugluktuk Hunters and Trappers Organization (HTO) followed and became an important step in identifying the locations of the monitoring plots as they needed to be within walking distance for high school students to access and conduct the berry data collection but far enough out of the way from busy ATV and snowmobile trails.

The first monitoring plot in Kugluk/ Bloody Falls Territorial Park was established in 2012 followed by two new plots in 2013 (Figure 2.3b). The berry monitoring plots in Kugluk/Bloody Falls Territorial Park were located with the use of Park maps that highlighted historical berry picking areas identified by local Elders. By referencing maps and in conversation with Park staff we established three plots along a topographic gradient, with a plot on top of a plateau, one on a steep Northwest facing slope (>35%) and the third near the shore of the rivers, each capturing various berry species compositions. In addition to monitoring berry productivity, the park's staff were interested in monitoring the growth of shrubs. Thus, all three sites were established in shrub-dominated areas.

The first monitoring plot at TERS was established in 2008 on a southwest facing slope close to the research station and captures all five berry producing species (Figure 2.3c). Two new

monitoring plots were established in 2013 to capture a larger abundance of *R. chamaemorus* along the shores of Yamba Lake as well on a north-facing slope. Table 2.1 provides a list of established berry monitoring plots used in this study.



Figure 2.3 Photographs of field sites: a) Kugluktuk, NU b) Kugluk/Bloody Falls Territorial Park; c) Tundra Ecosystem Research Station (TERS) at Daring Lake, NT.

Table 2.1 Summary of research sites with associated berry productivity monitoring plots (400 m²) included in this study along with their specific locations, the year of establishment, slope aspect and berry species composition (*V. uliginosum* (VULI), *V. vitis-idaea* (VVIT), *E. nigrum* (ENIG), *R. chamaemorus* (RCHA) and *Arctostaphylos* spp. (ARCT)).

<i>Research Site</i>	<i>Monitoring plots</i>	<i>Location (SE corner)</i>	<i>First established</i>	<i>Slope and aspect</i>	<i>Berry species present</i>
Kugluktuk, NU	Two-mile	67°50'115''N 115°12'271''W	2008	<5%NE	VULI, ENIG, VVIT, ARCT
	Hart Lake	67°48'267''N 115°12'235''W	2011	<1%	VULI, ENIG, VVIT, RCHA
	Tower	67°49'501''N 115°10'540''W	2012	<5% NE	VULI, ENIG
	Kugluktuk Hill	67°49'790''N 115°5'48.37''W	2012	<5% NW	VULI, ENIG, VVIT, ARCT
Kugluk/ Bloody Falls, NU	Bloody Falls 1	67°44'281''N 115°22'248''W	2011	<5% SW	VULI, ENIG, VVIT, RCHA, ARCT
	Bloody Falls 2	67°44'270''N 115°22'262''W	2013	35% NW	VULI, ENIG, VVIT
	Bloody Falls 3	67°44'281''N 115°22'248''W	2013	<5% W- NW	VULI, ENIG, ARCT
	TERS at Daring Lake, NT	Daring Lake Yamba Lake	67°44'270''N 67°44'709''N 115°22'262''W 115°22'419''W	2008 2013	5% SW <1%
	Esker	64°52'2''N 111°34'51''W	2013	20% N	VULI, ENIG, VVIT, RCHA, ARCT

2.3.3 Plant abundance and composition

The standardized point-framing technique developed for ITEX (Molau and Mølgard 1996), was followed to measure plant species diversity, cover and height. Ten random 70 cm x 70 cm quadrats were measured in each plot; however, due to time constraints, two plots at Kugluktuk and two plots at Daring Lake only had five point-frame quadrats surveyed. Plots located at Kugluk/Bloody Falls could not be surveyed using point-frames because shrub heights exceeded the maximum height of the point-frame. Instead, vegetation was assessed by sampling 20 quadrats (70 cm x 70 cm) in the three plots at this location by assigning a percent cover code. The code of one to seven is shown in Table 2.2. An attempt to standardize data from the two methods was accomplished by converting the point-frame top-hits into the same percent cover code. As there were 100 points in each point frame, the percent cover for each species was determined as the proportion of the 100 points. For this analysis the percent cover codes was then transformed back into percent cover and I used the mid point of the code ranges for analyses.

Table 2.2 Code for percent cover estimates conducted at Kugluk/Bloody Falls Territorial Park, NU August 2013.

<i>Code for % Cover</i>	<i>% Cover of Vegetation</i>
1	1-2%
2	3-5%
3	6-15%
4	16-25%
5	26-50%
6	51-75%
7	>75%

Climate data from the local climate stations located at Daring Lake and the Kugluktuk Airport were also used, including mean daily temperature and precipitation (Table 2.3).

Soil moisture was estimated on a scale of one to three by researchers and student participants where observations of soil surface looked and felt dry (1), relatively moist (2) or wet (3).

Table 2.3 General climate variables for Kugluktuk, NU and Daring Lake, NT.

	<i>TDD*</i>	<i>Mean Temp C°</i>				<i>Mean Precipitation (mm)</i>	<i>Mean total summer precipitation (mm)</i>	<i>Mean Snow Depth (cm)</i>
		<i>June</i>	<i>July</i>	<i>Aug</i>	<i>Sept</i>			
Kugluktuk								
2008	138	4.16	10.45	7.86	2.14	19.30	118.20	9.90
2009	122	3.95	8.48	9.44	4.74	28.60	58.40	9.94
2010	129	6.51	10.72	10.38	3.93	24.10	85.60	4.61
2011	127	3.74	12.45	11.14	4.77	8.00	121.50	19.48
2012	135	6.33	12.38	10.81	7.24	15.80	54.70	22.39
2013	139	9.76	9.43	11.85	4.16	13.90	110.00	23.72
Daring Lake								
2008	133	7.06	13.58	10.55	1.66	24.60	80.70	22.43
2009	122	6.14	11.40	10.45	6.25	23.40	87.60	17.45
2010	126	7.95	14.36	11.33	3.75	26.30	94.30	22.17
2011	140	7.75	15.05	11.70	5.54	10.40	45.70	28.33
2012	148	11.64	N/A**	N/A**	N/A**	N/A**	N/A**	N/A**
2013	141	11.67	11.44	12.79	5.36	37.80	61.8	N/A**.

Notes: * Thawing Degree Days (TDD)

** Data were unavailable

2.3.4 Berry monitoring

The annual monitoring of berry production in Kugluktuk was conducted during an outdoor environmental studies course delivered by UBC researchers in collaboration with the local high school. An outdoor environmental studies course was developed to teach youth about the environment using holistic approaches that integrates both science and *Inuit Qaujimagatuqangit* (see Chapter 3).

The measurement of annual berry productivity was the scientific component of the environmental studies course. Kugluktuk High School students were trained to follow the Berry Monitoring Protocol developed by Lévesque et al. (2008) for the IPY-CiCAT project. Berry production was monitored at peak ripeness, in mid-August. The corners of each 400 m² permanent monitoring plot are marked with tent pegs. Students located the four corners and proceeded to flag two axes at one-meter intervals. Working in groups of two to three, students randomly drew x and y coordinates to locate a 25 cm x 25 cm sampling quadrat, and took a photograph. All berries within the quadrat were collected, sorted by species and stored in sealed plastic bags. Each bag was labeled including the quadrat number, the specific location within the monitoring plot, species collected, total numbers sorted by ripeness level, photo number and students initials. A minimum of 25 random samples using the 25 cm x 25 cm quadrat were collected per monitoring plot. Fresh berry samples were counted and weighed by students and UBC researchers back in the classroom within 24 hours of harvesting.

UBC researchers have monitored the TERS berry monitoring plots at Daring Lake annually since 2008 by following the identical protocol. It was intended to incorporate the annual berry

monitoring activities into the ten-day Tundra Science Camp, an outdoor environmental program coordinated by the NT Department of Environment and Natural Resources (ENR) for high school students and teachers of the southern regions of the NT. The camp takes place in early August, near peak ripeness level for berry producing species at Daring Lake but due to an already busy schedule the monitoring protocols have yet to be integrated into the programming. Consequently, with some assistance from student volunteers attending the camp, UBC researchers completed the berry monitoring fieldwork and data entry.

2.3.5 Statistical methods

Non-metric multidimensional scaling (NMDS) ordinations were used to compare plant community composition of the three research sites. Ordinations were conducted using composition and abundance data for each quadrat and plotted using the default settings of the “metaMDS” procedure in the vegan package of the statistical analysis program R. A second NMDS ordination was performed with environmental variables to examine relationships between vegetation composition and the environmental variables.

The relationship between the abundance of *B. glandulosa* cover and the abundance of berry plant cover was explored by performing a regression analysis. It might be expected that *B. glandulosa* and berry cover are positively correlated up to a certain point, but then negatively correlated. To account for this a quadratic term was added to the regression model, which allows for a hump-shaped relationship between cover of berry plants and shrubs. An F-test was used to determine the fits of the different models.

Berry productivity was compared among all three sites. A linear model using the statistical analysis program R was performed using the environmental data as fixed variables and year, site, plot data as random variables. A comparison of berry production across time as well as between berry plots and research sites was performed.

2.4 Results

2.4.1 Vegetation composition

Figure 2.4 is an example of a 70 cm x 70 cm plant cover sample showing examples of the difference in the vegetation cover of the three sites, where erect shrubs were the dominant cover at Bloody Falls.

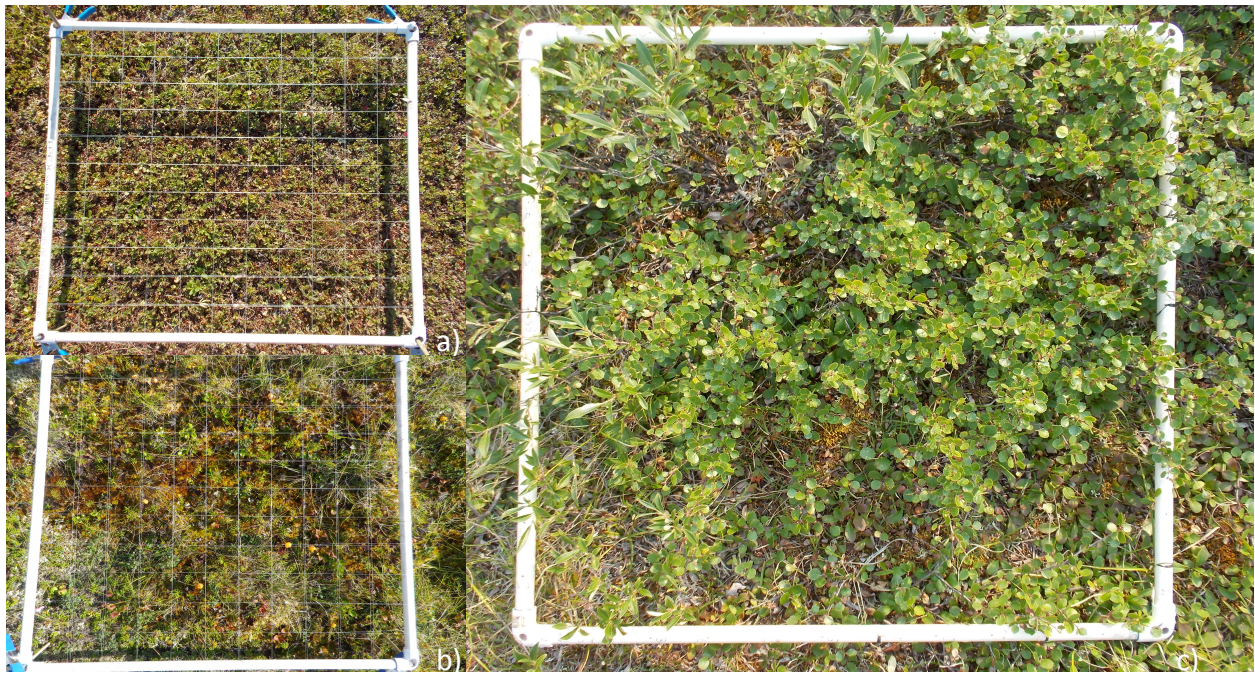


Figure 2.4 Photographs of example vegetation cover samples from (a) Kugluktuk tower plot (Q1), (b) Daring Lake plot 2 (Q1) and (c) Bloody Falls plot 1 (Q1).

The vegetation differed between the three research sites, with vegetation at Bloody Falls notably different from Kugluktuk and Daring Lake (Figure 2.5a). Bloody Falls was the most diverse site with a number of species not found in the other sites such as *Anemone richardsonii*, *Anemone parviflora*, *Equisetum arvense*, *Hedysarum alpinum*, *Lathyrus japonicas*, *Potentilla fruticosa*, *Sheperdia canadensis*, three unknown forbs and tall erect shrubs. Figure 2.5b shows the results of an NMDS ordination of the vegetation data from all three sites with environmental variables that had a significant relationship with vegetation cover of each plot. Bloody Falls was the most dissimilar site. This could be due to sampling biases as explained in the methods section. A different sampling method was used because the shrub heights were too tall to follow the proper point-framing protocol.

Criterion for including an environmental variable into this analysis was that the vector had to produce a P-value ≤ 0.03 . As seen in Table 2.4, mean June and July temperatures and mean May and June precipitation were significant variables in the ordination. In the ordination, the temperature and precipitation vectors were plotted on top of each other. Soil moisture was also significant, and latitude was important. A list of all 66 species (vascular and non-vascular) identified along with their associated codes is shown in Table 2.5.

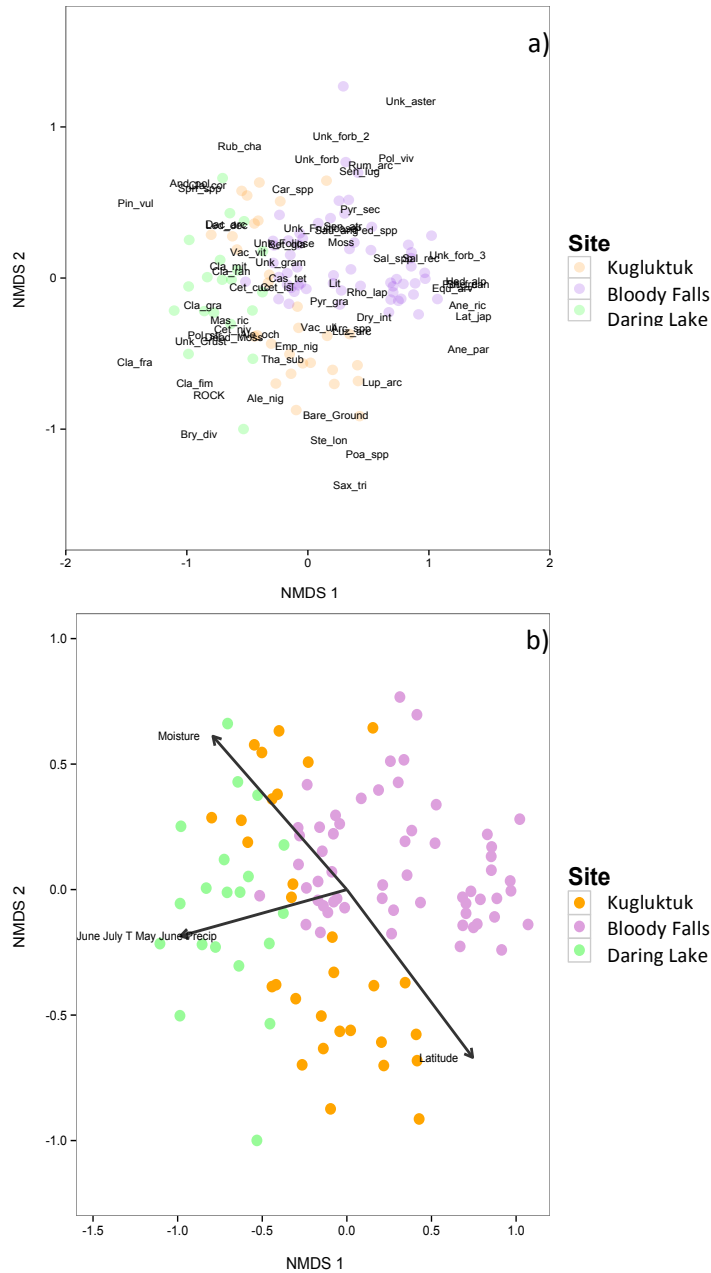


Figure 2.5 (a) Nonmetric Multidimensional Scaling (NMDS) ordination of vegetation composition and abundance measurements conducted in August 2012 in berry research plots at Kugluktuk, Bloody Falls and Daring Lake. Points represent individual quadrats (70 cm x 70 cm). Species codes are shown in Table 2.2. (b) NMDS ordination of vegetation data from each of the three sites with significant environmental variables including latitude, soil moisture, and temperature and precipitation (mean temperature for June and July + mean precipitation for May and June).

Table 2.4 Ordination axes values and correlation of environmental vectors used in the NMDS ordination.

	NMDS1	NMDS2	Pr(>r)
Mean June Temp	-0.98275	-0.18494	0.000999
Mean July Temp	-0.98275	-0.18494	0.000999
Mean June rainfall	-0.98275	-0.18494	0.000999
Mean June snowfall	-0.98275	-0.18494	0.000999
Soil Moisture	-0.79173	0.61088	0.000999
Latitude	0.74353	0.66870	0.016983

Table 2.5 A list of identified vascular and non-vascular plants with associated species codes used in analysis.

Code	Species	Code	Species
Ale_nig	<i>Alectoria nigricans</i>	Lit	Litter
Ale_och	<i>Alectoria ochroleuca</i>	Lup_arc	<i>Lupinus arcticus</i>
Ane_ric	<i>Anemone richardsonii</i>	Luz_arc	<i>Luzula arctica</i>
Ane_par	<i>Anemone parviflora</i>	Mas_ric	<i>Masonhalea richardsonii</i>
And_pol	<i>Andomela polifolia</i>	Moss	Moss
Arc_spp	<i>Arctostaphylos</i> spp.	Oxy_dig	<i>Oxyria digina</i>
Bet_gla	<i>Betula glandulosa</i>	Ped_spp	<i>Pedicularis</i> spp.
Bare_Ground	Bare ground	Pin_vul	<i>Pinguicula villosa</i>
Bry_div		Poa_spp	<i>Poa</i> spp.
Car_spp	<i>Carex</i> spp.	Pol_str	<i>Polygonum specis</i>
Cas_tet	<i>Cassiope tetragona</i>	Pol_viv	<i>Polygonum viviparum</i>
Cet_cuc	<i>Cetraria cucullata</i>	Pot_fru	<i>Potentilla fruticosa</i>
Cet_isl	<i>Cetraria islandica</i>	Pyr_gra	<i>Pyrola gradiflora</i>
Cet_niv	<i>Cetraria nivalis</i>	Pyr_sec	<i>Pyrola secunda</i>
Cla_cor	<i>Cladonia cornuta</i>	ROCK	Rock
Cla_fim	<i>Cladonia fimbriata</i>	Rho_lap	<i>Rhododendron laponicum</i>
Cla_fra	<i>Cladonia fragilis</i>	Rub_cha	<i>Rubus chamaemorus</i>
Cla_gra	<i>Cladonia gracilis</i>	Sal_spp	<i>Salix</i> spp.
Cla_mit	<i>Cladonia mitis</i>	Sal_rec	<i>Salix reticulata</i>
Cla_ran	<i>Cladonia rangiferina</i>	Sau_ang	<i>Saussurea angustifolia</i>
Unk_Crust	Unknown crust lichen	Sax_tri	<i>Saxifraga tridactylites</i>
Dac_arc	<i>Dactylina arctica</i>	Sen_atr	<i>Senecio atropurpureus</i>
Dead_Moss	Dead moss	Sen_lug	<i>Senecio lugens</i>
Dry_int	<i>Dryas integrifolia</i>	She_can	<i>Sheperdia canadensis</i>
Emp_nig	<i>Empetrum nigrum</i>	Sph_spp	<i>Sphagnum</i> spp.
Equ_arv	<i>Equisetum</i> species	Ste_lon	<i>Stelaria longipes</i>
Epi_unk	<i>Epilobium</i> spp.	Tha_sub	<i>Thamnolia subuliformis</i>
Unk_Foliose	Unknown foliose lichen	Unk_aster	Unknown aster
Unk_Fruticose	Unknown fruticose lichen	Unk_forb	Unkown forb 1
Unk_gram	Unknown graminoid	Unk_forb_2	Unkown forb 2
Hed_alp	<i>Hedysarum alpinum</i>	Unk_forb_3	Unkown forb 3
Lat_jap	<i>Lathyrus japonicus</i>	Vac_uli	<i>Vaccinium uliginosum</i>
Led_dec	<i>Ledum decumbens</i>	Vac_vit	<i>Vaccinium vitis-idaea</i>

2.4.2 Total shrub cover and berry plant cover

Figure 2.6 summarizes the percent cover of *B. glandulosa* and the percent cover of berry producing plants *Arctostaphylos* spp., *E. nigrum*, *R. Chamaemorus*, *V. uliginosum* and *V. vitis-idaea* at each site (Kugluktuk, Bloody Falls and Daring Lake). Although there is variability, the percent cover of *B. glandulosa* was highest at the Bloody Falls site, the percent cover of *V. uliginosum* was highest at the Kugluktuk site and the percent cover of *V. vitis-idaea* was highest at the Daring Lake site. The percent cover of *E. nigrum*, *R. chamaemorus* and *Arctostaphylos* spp. did not vary significantly between sites.

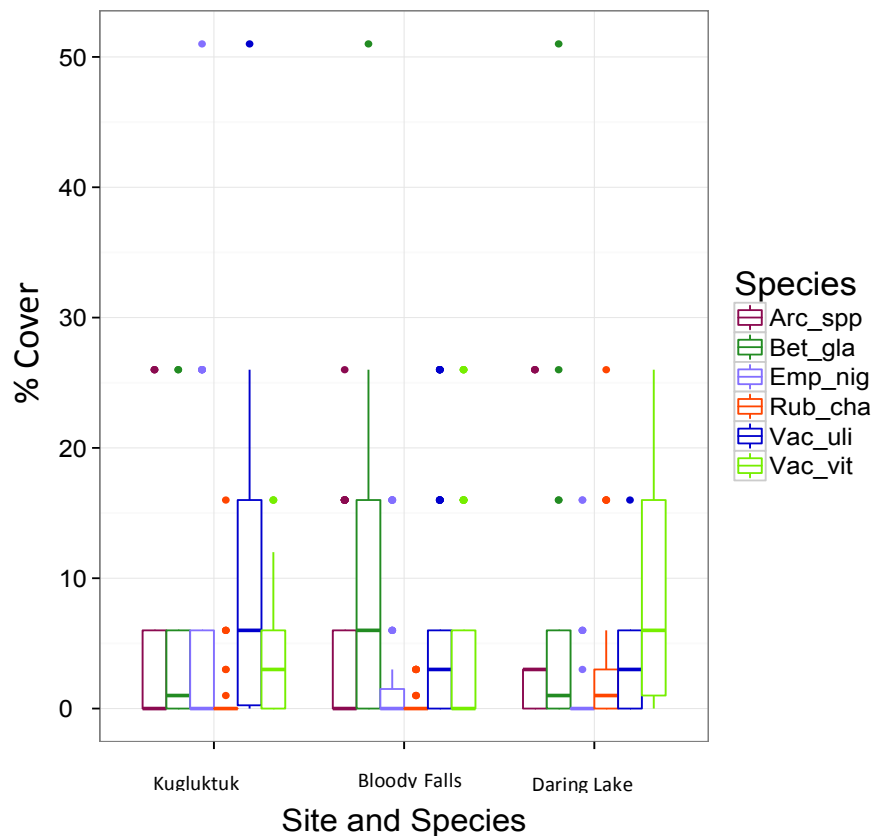


Figure 2.6 Box plots of percent cover of *Arctostaphylos* spp. (Arc_spp), *B. glandulosa* (BET_gla), *E. nigrum* (Emp_nig), *R. chamaemorus* (Rub_cha), *V. uliginosum* (Vac_uli), and *V. vitis-idaea* (Vac_vit) by site:

Kugluktuk, Bloody Falls and Daring Lake. Percent cover data are the midpoints in the codes in Table 2.2.

Figure 2.7 shows the relationship between percent cover of *B. glandulosa* and percent cover of berry producing plants. Percent cover of *Salix* spp. and percent cover of berry producing plants were also tested but with outliers there was no significance. *Arctostaphylos* spp. showed a significant ($p=0.02455$) positive relationship with the percent cover of *B. glandulosa* (Table 2.6). The cover of *V. vitis-idaea* seemed to decrease the most with increased shrub cover although the relationship was not significant ($p=0.146$) (Table 2.6).

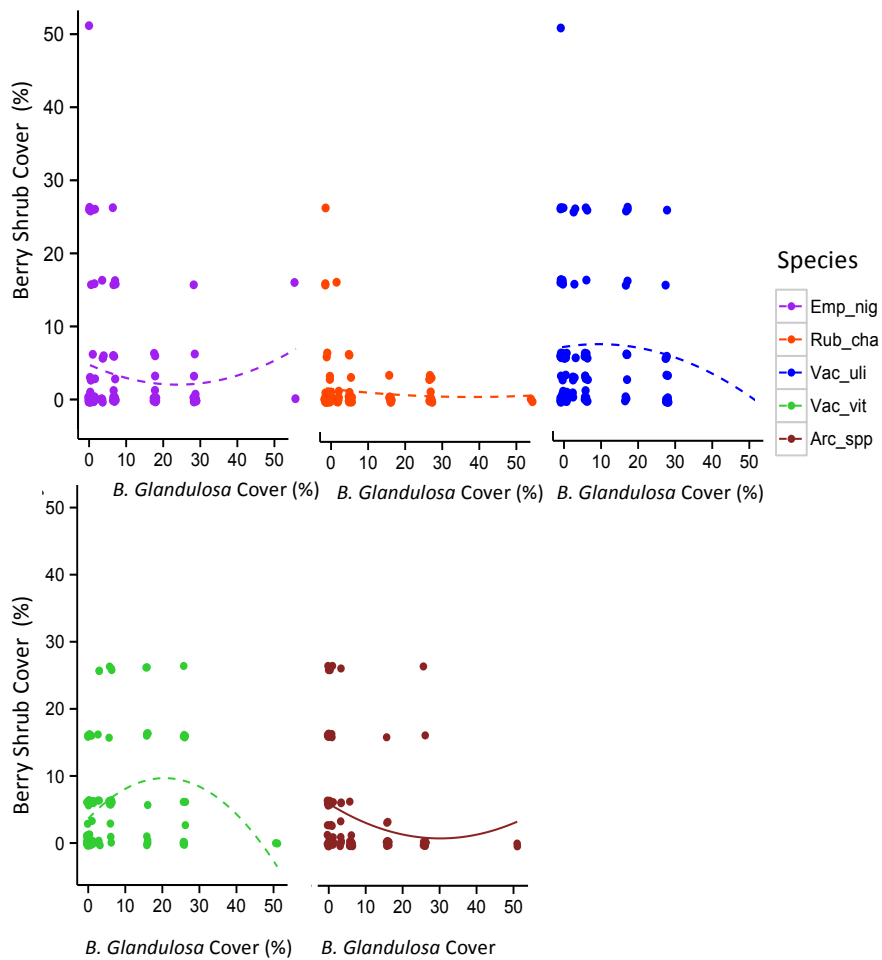


Figure 2.7 Regression with quadratic functions of percent cover of berry producing plants *E. nigrum* (purple), *R. chamaemorus* (red), *V. uliginosum* (blue), *V. vitis-idaea* (green) and *Arctostaphylos* (brown) with the cover of *B. glandulosa*. Percent cover data are the midpoints in the codes in Table 2.2 and were compiled from all berry research plots at the three sites Kugluktuk, Bloody Falls, and Daring Lake. Points represent each 70 cm x 70 cm quadrat samples. The dotted lines indicate that none of the regressions were significant at $P < 0.05$. *Arctostaphylos* spp. was significant $P = 0.02445$.

Table 2.6 Results of a linear regression model with a quadratic function for the relationship between percent cover of berry producing plants and the cover of *B. glandulosa* for all sites combined.

	Adjusted r2	F-statistic	P-value
<i>Arctostaphylos</i> spp.	0.03751	5.209	0.02445
<i>E. nigrum</i>	-0.004504	0.5157	0.4742
<i>R. chamaemorus</i>	0.0008535	1.092	0.2983
<i>V. uliginosum</i>	-0.0005298	0.9428	0.3337
<i>V. vitis-idaea</i>	0.01048	2.144	0.164

2.4.3 Berry productivity across sites

Figure 2.8a shows the mean berry production (no./m²) and Figure 2.8b the mean wet weight (g/m²) of all berries from all five species harvested from 2011-2013 at Kugluktuk, Bloody Falls and Daring Lake. In a linear model, the Kugluktuk site was significantly more productive than the other sites (Table 2.7). Berry production between years was not significant (Table 2.8). In addition, environmental factors (mean June and July temperature and May and June precipitation) were not significant (Table 2.9). However berry weights at Kugluktuk was significantly different than the other two sites (Table 2.9).

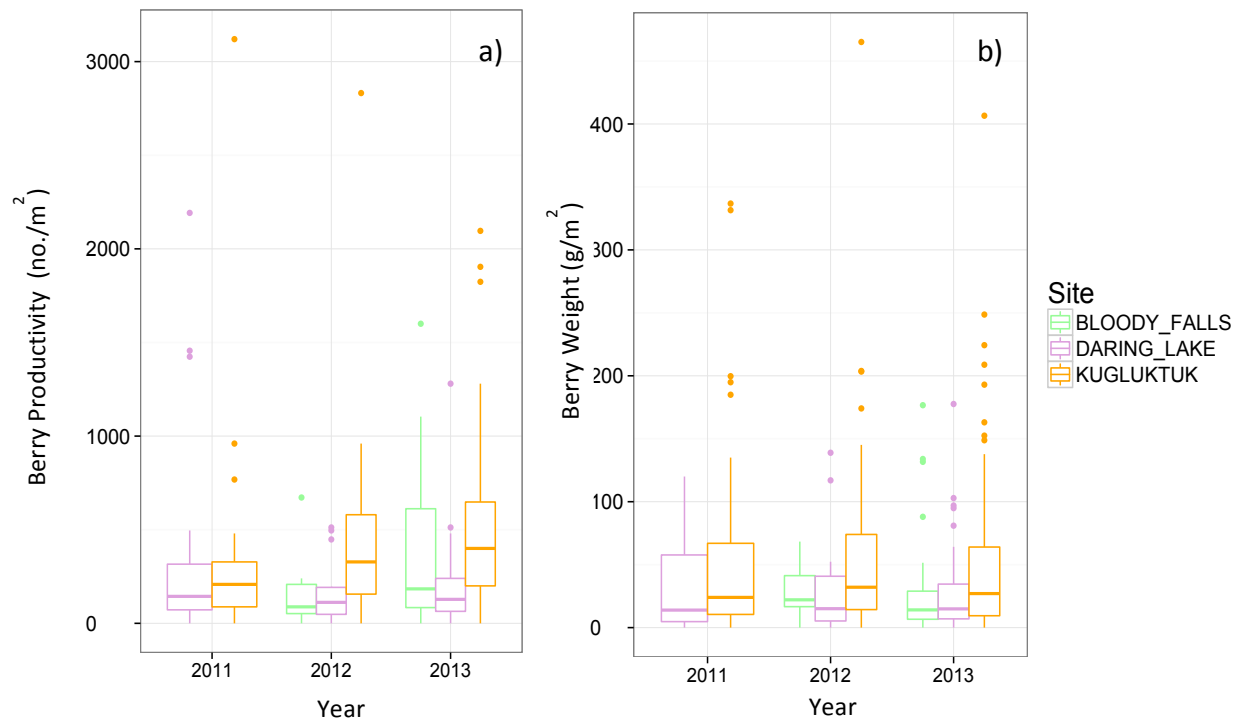


Figure 2.8 (a) Mean berry production (no./m²) and (b) mean fresh weight (g/m²) of berries from all four species monitored from 2011-2013 by site: Kugluktuk, Bloody Falls and Daring Lake.

Table 2.7 Linear model of total fresh berry weights and production of *E. nigrum*, *R. chamaemorus*, *V. uliginosum* and *V. vitis-idaea* harvested in 2011-2013 from all three sites.

Site	<i>Total berry weights</i>				<i>Total berry production</i>			
	Slope estimate	Std. error	t-value	P	Slope estimate	Std. error	t-value	P
Daring Lake	0.04948	0.07021	0.705	0.481	0.06326	0.46402	0.136	0.892
Bloody Falls	-0.44948	0.96663	-0.463	0.644	-2.51007	6.38765	-0.393	0.694
Kugluktuk	0.33524	0.06580	5.095	3.672e-07	1.86961	0.43447	4.303	1.73e-05

Table 2.8 Linear model of total fresh berry weights and production of all sites together between 2011-2013.

Site	<i>Total berry weights</i>					<i>Total berry production</i>			
	Year	Slope estimate	Std. error	t-value	P	Slope estimate	Std. error	t-value	P
All	2011	0.12172	0.11194	1.087	0.277	0.59573	0.73994	0.805	0.421
Sites	2012	0.11216	0.10803	1.038	0.299	0.64046	0.71338	0.898	0.369
	2013	0.10789	0.10321	1.045	0.296	0.80704	0.68201	1.183	0.237

Table 2.9 Linear model of the relationship of total fresh berry weights and production of all four berries species harvested in 2011-2013 from all three sites with measured environmental variables.

Environmental variables	Site	<i>Total berry weights</i>				<i>Total berry production</i>			
		Slope estimate	Std. error	t-value	P	Slope estimate	Std. error	t-value	P
June and July temperature	Daring	-0.067100	0.600089	-0.112	0.911	-5.9369	5.9675	-1.472	0.1412
	Lake								
	Kugluktuk	0.176044	0.542177	0.325	0.745	0.2169	4.0336	0.060	0.9525
May mean snow depth	Daring	1.75704	2.58362	0.636	0.525	24.460	18.5973	1.315	0.188
	Lake								
	Kugluktuk	1.01902	2.76074	0.394	0.693	7.6582	17.4009	0.440	0.660
June precipitation	Daring	-0.22038	0.99565	-0.221	0.825	-4.5877	6.6689	-6.88	0.492
	Lake								
	Kugluktuk	0.05524	0.99892	0.055	0.956	-4.7326	6.7294	10.703	0.482
Soil moisture	Daring	0.19049	0.30392	0.627	0.5309	1.8119	2.0274	0.894	0.371528
	Lake								
	Kugluktuk	0.94982	0.22476	-4.226	2.44e-05	7.4494	1.4988	4.970	6.992-07

Figure 2.9a shows the summary berry production (no./m²) per year and site. *E. nigrum* had the highest production at Kugluktuk compared to the other two sites, where in 2012 and 2013 the mean total was greater than 125 berries/m². Although there was variability at Daring Lake, berry production of *E. nigrum* was highest at this site in 2012 compared to other years. The production of *V. vitis-idaea* was highest at Kugluktuk. However, there was no significant difference between years. The production of *V. uliginosum* remained similar between sites and years.

Figure 2.9b shows the summary of mean fresh weight (g/m²) per year and site. While there was variability, the mean weight of *E. nigrum* was highest at Kugluktuk compared to Bloody Falls and Daring Lake. The mean weight of *R. chamaemorus* was highly variable in Kugluktuk and Daring Lake and in time, however, there were no significant results.

Berry production of *Arctostaphylos* spp. was low and Kugluktukmiut do not harvest the berries for consumption (some use the old leaves for tea). Therefore, berry productivity totals and weights of *Arctostaphylos* spp. were not included in this analysis.

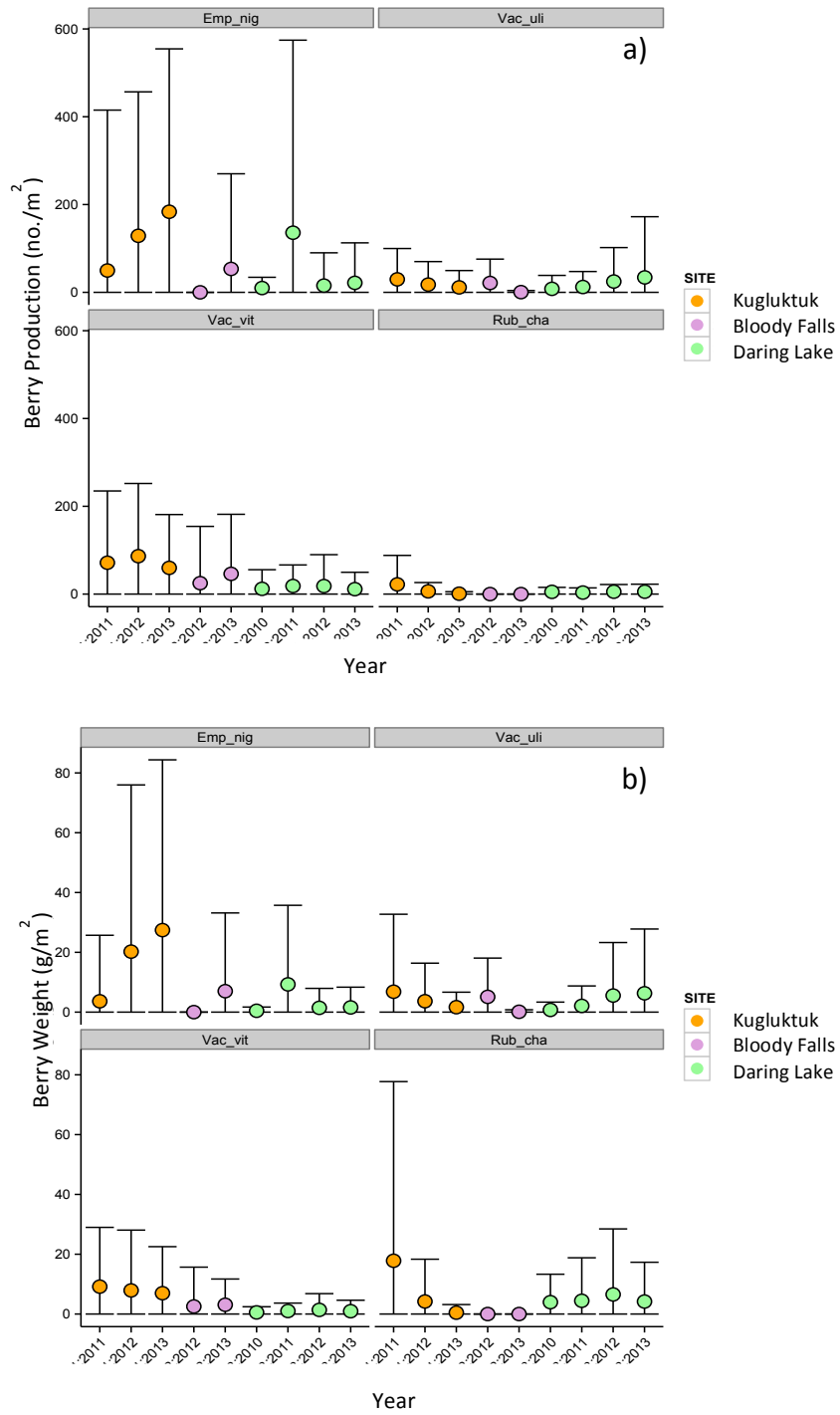


Figure 2.9(a) Berry productivity (no./m²) and (b) berry weight (g/m²) of *E. nigrum* (Emp_nig), *R. chamaemorus* (Rub_cha), *V. uliginosum* (Vac_uli), *V. vitis-idaea* (Vac_vit) at Kugluktuk, Bloody Falls and Daring Lake from 2011 to 2013. Data are means with SE bars.

2.5 Discussion

Bloody Falls was the most diverse site in this study. A number of species, were found only at Bloody Falls, including *E. arvense*, which occurs on a variety of substrates such as clay, gravel, sand and loam that are usually associated with ground-water supplies (Hauke 1963). Having higher moisture content in the soil from a ground-water source could be providing a suitable microclimate for the establishment and growth of tall erect shrubs, as well as other forb species that were not present in other sites.

It is expected erect shrub cover and berry producing plant cover would increase together, to a certain point, after which the shorter berry plants growing in the understory would decrease due to over shading. Berry producing plants at Bloody Falls are not as productive as in Kugluktuk and part of this difference may be the increased cover of tall shrubs at Bloody Falls. Studies show that most likely due to shading, the growth of taller shrubs decreases the cover of mosses and lichens (Walker et al. 2006; Myers-Smith et al. 2011; Elmendorf et al. 2012 a, b). Walker et al. (2006) also found increased height and cover of shrubs due to warming decreases species diversity and evenness across the tundra landscape.

However, this study did not allow a full exploration of the relationship between erect shrub cover and berry producing plants. The berry monitoring plots at Daring Lake and Kugluktuk were deliberately chosen to be in areas expected to have the greatest production; and in Kugluktuk, were chosen based on recommendations from community members. Thus, the plots were chosen to have few or no erect shrubs and therefore the study was not designed to explore this relationship. The plots at Bloody Falls were chosen not only to monitor berry production but also

to allow for the monitoring of shrub growth, which may have confounded some results. As the Arctic is expected to become shrubbier, further long-term research is needed to study the impacts of tall erect shrubs on production of berry producing plants.

Kugluktuk was the most productive of all the sites. This is likely, partly due to climatic factors. The coastal site is affected by air masses year-round and experiences a maritime Arctic climate. Open water in the Coronation Gulf in the summer can result in periods of rain or low-overcast conditions (Dredge 2001). Between the years 2008 and 2013 the mean total summer precipitation at Kugluktuk was 91 mm whereas the mean total summer precipitation at Daring Lake was 74 mm. Temperature differences among the three sites between 2008 and 2013 were not strong. Another possibility could be that the soil around Kugluktuk is more suitable for berry shrub growth; however, we did not investigate physical or chemical properties of the soils in the berry plots. The site at Kugluktuk also had the least cover of tall shrubs, which likely contributed to the higher production at this site.

Berry production was not related to the climate variables used in this study. However other studies have shown otherwise. Krebs et al. (2009) show that rainfall and temperature from years one and two years previous were typically significant predictors in berry production in the southwest Yukon. Selas (2000) used a 50-year dataset of berry production in *Vaccinium myrtillus* to conclude that the best predictor of berry production was the productivity of berries of the previous three years along with climatic variables. Maximum temperature in June and mean temperature in August-September the year prior to fruiting, the maximum snow depth in April, minimum temperature in May and the hydrothermal ratio (total precipitation divided by mean

temperature) in June-July of the current year have also been noted to impact berry productivity of *V. myrtillus* (Selas et al. 2015). Furthermore negative impacts on berry species could be possible if summer precipitation decreases or if summer temperatures substantially increase and affect the sun/precipitation balance (Kellogg et al. 2010). A longer more robust dataset is needed in the Kugluktuk region to better understand the relationship between berry production and climate.

There are a number of studies examining how climate change is affecting plant phenology, which show that unrelated species often have drastically different flowering responses (Inouye and McGuire 1991; Primack et al. 2004; Molau et al. 2005; Menzel et al. 2006; Miller-Rushing et al. 2006; Oberbauer et al. 2013). For example, Miller-Rushing and Primack (2008) found that in Concord, Massachusetts, *Vaccinium corymbosum* flower 21 days earlier than they did 150 years ago, whereas flowering times of *Anemone quinquefolia* have not changed. There is little known about how climate change is affecting flowering of closely related species in genera such as *Vaccinium* and *Rubus*. Flowering times that currently overlap in species-rich genera such as *Vaccinium* and *Rubus* may cease to overlap in the future (Miller-Rushing et al. 2007). If there is a divergence of early and late flowering plants, these plants may provide little floral resources for some pollinators, which rely on overlapping sequences of species. These changes could have an impact on patterns in berry production, which is strongly correlated with flowering time (Gorchov, 1987).

A 40-year study by Boulanger-Lapointe et al. (2017) found that herbivores had a larger impact on flower production than climate, however, both variables were important to understand

reproductive effort. Previous summer temperatures, the abundance of rodents, and the presence of a moth outbreak were factors explaining the abundance of flowers (Boulanger-Lapointe et al. 2017). The abundance of berries was strongly correlated with pollinator activity and the site with the larger pollinator network had the highest reproductive success (Boulanger-Lapointe et al. 2017). More research is needed to better understand how climate change is affecting pollinators of berry producing plants.

2.6 Conclusion

The vegetation composition at the sites at Bloody Falls was more diverse than at Kugluktuk and Daring Lake, with the presence of species such as *Equisetum arvense*. Latitude, soil moisture, June and July temperatures and May and June precipitation all had significant relationships with vegetation cover at all sites. Although there was high variability, the percent cover and the height of the dominant erect shrub *B. glandulosa* was highest at the Bloody Falls site.

All four sites had the five berry shrub species: *Arctostaphylos* spp., *E. nigrum*, *V. uliginosum* and *V. vitis-idea*. The percent cover of *V. uliginosum* was highest at the Kugluktuk site and the percent cover of *V. vitis-idaea* and *R. chamaemorus* was greatest at the Daring Lake site. As expected berry production in Kugluktuk was significantly more productive than at Bloody Falls and Daring Lake, likely due to climate and soil factors, but also to the lack of erect shrubs. Climatic variables, other than soil moisture, did not have an impact on berry production. The maintenance of this community-supported research is necessary to build a longer dataset that would help to better understand the relationship between berry production and environmental change.

Chapter 3: *Akiitug*: “When I’m out on the land I feel free. I feel like a true Inuk”- Perceptions of land-based education in Kugluktuk, Nunavut

3.1 Introduction

Before contact with Europeans and the formation of communities throughout the Arctic, Inuit education was integrated into the daily lives, responsibilities, and relationships of families. Older generations provided youth with necessary knowledge, skills and the context and perspectives for learning from their environment (McGregor 2011; 2013). Critical aspects of traditional Inuit education involved environmental knowledge, experiential learning and the mutual respect between the teacher and the student (McGregor 2011). While this education continues today it has been severely disrupted by education system imposed by the Canadian government.

In the early years of colonization, especially in the Canadian Arctic, formal educators failed to involve parents and Elders in their children’s education, build culturally appropriate programs and teach the Inuit language (McGregor 2011; Truth and Reconciliation Commission of Canada 2012). Residential and day schools established in the 1950s and 1960s damaged Inuit families and society by interrupting Inuit traditional land-based education and relationships with family members (Irniq 2011). Language differences and shifts in social norms developed generational segregation, weakening traditional education between youth and Elders and land-users (Irniq 2011). This has resulted in a lack of balance of both ancestral and modern values: knowledge and skills required to become happy and healthy adults in the contemporary world.

Wellbeing, as described by Inuit, is directly linked to *Inuit Qaujimaqatuqangit*. The connection between *Inuit Qaujimaqatuqangit* and wellbeing is most easily seen through family bonds and kinship, communication with family members and the presence of positive role models (Kral & Idlout 2012, Petruseck Macdonald et al. 2013). *Inuit Qaujimaqatuqangit* roughly translates to Traditional Inuit Knowledge and includes all the qualities of traditional and modern Inuit culture and values. Family and communication are central to *Inuit Qaujimaqatuqangit*. Being out on the land, hunting, camping, eating country foods and spending time with Elders, gathering knowledge and practicing traditions of Inuit beliefs and cosmology are essential to Inuit wellbeing (Kral & Idlout 2012).

From an Inuit perspective, health and wellbeing are as dependent on the physical, spiritual and social environment as they are on individual circumstances (Bjerregaard et al. 2008, O'donnell & Tait 2012, Wexler & Goodwin 2006, Wexler et al. 2013a, Petruseck Macdonald et al. 2013). The wellbeing of Inuit youth is affected by increasing rates of cultural, political, economic and social change along with rapid rates of environmental change, underpinned by a history of colonization (Wexler et al. 2013a, Wexler et al. 2013b). These factors create stressors that increase youth susceptibility to mental health problems, which contributes to rising rates of mental and physical health problems in Arctic communities and has led to one of the highest suicide rates in the world (Kral et al. 2009; 2012, Parlee & Furgal 2012, Allen et al. 2013, Spein et al. 2013). It is crucial to create new opportunities and learning environments for Inuit youth to positively explore such challenges, thereby enhancing adaptive capacity to foster a healthy self and community (Petruseck MacDonald et al. 2013). Furthermore, it is imperative that research be translated into action through culturally appropriate community-level programming.

Place-based education occurring through land-based activities may assist Inuit in attaining a higher sense of wellbeing (Gruenewald & Smith 2007, McInerney et al. 2011). The process of using the local community and environment as a starting point to teach concepts across the curriculum is the basis for place-based educational activities (Sobel 2004). It helps students connect with their particular corner of the world by providing meaningful contextual experiences (Dewey 1915; Kaiser et al. 2011). Place-based education is inherently multidisciplinary and experiential as programming demands participatory action (Knapp 1996, Theobald 1997, Smith & Williams 1999). Education, especially in the northern isolated communities should prepare people to live and work to sustain the cultural and ecological integrity of the place they inhabit (Orr 1994, Thomashow 1995, Theobald & Curtiss 2000).

The 2007-2008 International Polar Year (IPY) increased the involvement of scientists in place-based outreach programming in the Arctic through Education, Outreach and Communication (EOC) efforts (Provencher et al. 2011). The book *Polar Science and Global Change- An International Resource for Education and Outreach* by Kaiser et al. (2011) was created as a guide for educators and visiting scientists intending to work with northern classrooms in circumpolar countries. The final IPY program comprised 170 funded international projects, 38 formal IPY entities such as committees and projects, researchers from 60 countries and an estimated 50,000 participants (Salmon 2011). Each project was endorsed by the IPY Joint Committee on the basis of its outstanding research goals, collaboration across communities institutions and disciplines, commitment to secure and shared data, and active engagement in EOC (Salmon et al. 2011). To meet the needs of participants, the outreach programs developed

during IPY EOC needed to meaningfully engage in consultation between scientists and communities (Salmon et al. 2011). The involvement of communities in research to fit their needs was a hallmark of the Canadian IPY program (Kulkarni et al. 2012).

Generally, the hands-on involvement of scientists in outreach efforts is mutually beneficial. Scientists have reported improving insight in their research, gaining better connections with their communities and increasing their public speaking skills (Provencher et al. 2011). Communities can gain a stronger appreciation of the importance and relevance of research to their daily lives and can feel more comfortable being able to put a face to the research being conducted in their community (Provencher et al. 2011). Program evaluations are an important part of any program, and educators should be engaged in assessing and improving their efforts (Lewthwaite & Renaud 2009; Ross et al. 2011; Tulloch et al. 2012). However, scientists engaging in outreach programs fall short in carrying out such program evaluations (Rueth et al. 2008, Provencher et al. 2011, Salmon 2011). Thus, there is a need for more robust evaluation of outreach programming carried out by scientists.

With these factors in mind, I developed and delivered, in partnership with the Kugluktuk High School, a week-long Career and Technologies Studies (CTS) place-based program. Activities included environmental monitoring and *Inuit Qaujimaqatuqangit*, and an optional camping trip to Kugluk/Bloody Falls Territorial Park. These activities involved teachings from Elders, schoolteachers and scientists. The program was designed to create opportunities for youth in grades 10-12 to connect with the land, develop skills in environmental monitoring and reinforce learning in the classroom. Student participants were invited to reflect on their learning

experience by filling out a program evaluation form and participating in a “Ground Up Mural” activity.

This chapter uses the information gathered from this project to give a voice to Inuit youth about their perceptions of place-based education reflected in the CTS program. My analysis identified three major themes: freedom, identity and respect regarding students’ perspectives on land-based activities. Furthermore, this study allowed me to evaluate the outreach program and navigate the challenges and successes in delivering culturally appropriate programming. Outreach program evaluations such as this one will be beneficial for future young researchers engaging in similar outreach activities.

3.1.1 Land-based programming

Beginning in the fall 2011, as part of an IPY funded program, UBC researchers have been involved with the land-based environmental Career and Technology Studies (CTS) course. The CTS programming takes place in collaboration with the Kugluktuk High School each August. The CTS programming, based on Alberta Education standards, are complementary programs designed for high schools in Nunavut. In Kugluktuk, CTS courses run one week prior to regular classes. According to the Government of Nunavut Education Department (2014), CTS programs must provide learning opportunities for all students to:

- Develop relevant life skills for the present and future
- Refine career-planning skills
- Develop technology-related talents
- Enhance employability

- Apply and reinforce learning developed in the classroom
- Prepare for the transition into adulthood; whether it be taking roles in the family, community, workplace or further education.

In addition to gaining new skills, participants of the CTS courses earn credit towards graduation. Students engaged in the CTS programs receive a grade and one high school credit. Up to five CTS credits can go towards graduation.

In 2011, two research technicians, including myself, tagged along on a week-long environmental CTS program delivered by two high school teachers, Dale Skinner and Danielle Frenette. We assisted in their daily activities and were in charge of taking the students out to two monitoring sites that were established as part of a long-term berry-monitoring program. Students were trained in harvesting berries using the protocol that was developed for use in the Canadian IPY project "Climate Change Impacts on Canadian Arctic Tundra (CiCAT)." Seventeen students signed up for the week. We observed the students and found that they gained many skills in experimental design and field data collection. Students also seemed to enjoy being out on the land in the presence of scientists. We received good feedback from the teachers and were invited back for the 2012 CTS programming.

In August 2012, I delivered the full-week programming for the CTS environmental programming, with the assistance of my field assistant and under the supervision of teacher, Dale Skinner. Twenty students signed up for the week. Activities included the continuation of the berry-monitoring program. With the help of students we established two new berry-monitoring

sites within walking distance of the community. Other activities included the building of a herbarium, an insect field study, natural dyeing workshop using local plants and a small mammal monitoring study in collaboration with the Government of Nunavut Department of Environment. There was no evaluation conducted for this program. However, the program seemed to be successful where 17 students received credit and a letter grade for participating. I was invited back in January 2013, to run a week-long winter environmental CTS program where we travelled to the berry-monitoring sites by snowmobile to measure snow depth as well travelled to Bumper Lake for an overnight fishing trip.

By this time, I had been invited back to the high school on a number of occasions and was regularly communicating with teachers, members of the community, Elders, various government departments and the Hunters and Trappers Association. I thought that with my skill set and through my community connections, I had identified an important gap in the curriculum and could provide a meaningful experience for students that perhaps the high school, through their regular curriculum could not provide. This is when I decided that for my Masters research, I should evaluate my outreach programming because as stated previously, it is not sufficient enough to say that my outreach activities were successful because everyone seemed to enjoy it and it was fun.

During high school registration, students chose and signed up for a CTS course. In 2013, along with the outdoor environmental “berry” program, students had the choice to participate in the “Smoking Has No Place Here” campaign run by the Government of Nunavut, a photography course or the pre-trades program. Twenty-six students signed up for the “berry” program.

The program I created aimed to deliver place-based activities consistent with more holistic approaches of teaching and learning that engage the heart, mind, body and spirit (Archibald 2008; Cajete 1999; Barber et al. 2010; Hare 2011). The activities were developed by following ideologies regarding Indigenous education (Cajete 1994; 1999; 2000), and guidelines on how to meaningfully integrate Western and Aboriginal science education published in Aikenhead (2010). Most importantly, I referred to the Government of Nunavut Department of Education (2007) education framework for Nunavut Curriculum highlighting the values and principles of *Inuit Qaujimaqatugangit*. While developing the program I identified areas that needed to be targeted for decolonization and worked toward creating educational partnerships with local community members.

The program involved daily field trips to established environmental monitoring sites. Students harvested culturally important berry species using the standardized CiCAT monitoring protocol. Throughout the whole programming Elders and land-users were encouraged to participate and use any opportunity to engage the youth in land-based skills. Separate workshops were also held for traditional activities. An optional overnight camping trip to Kugluk/Bloody Falls Territorial Park was also organized with two Elders, Alice Ayalik and Mary Algona; guides Jorgen Bolt and Kevin Ongahak; teachers Sharim Sherriff and Dettrick Hala and nine youth participants. Students who opted out of the camping trip took part in a small-mammal monitoring program during the afternoon and morning that we were at Bloody Falls.

The program was organized in partnership with the high school and could not have been accomplished without the assistance of local organizations such as the Nunavut Departments of Environment, Wildlife, and Culture and Heritage, the Kugluktuk Hunters and Trappers Association as well as many community members. Furthermore, for this research, I received a Nunavut Research Institute (NRI) Social Science Research Permit mandatory for conducting research in Nunavut communities, and approval from the UBC Behavioural Research Ethics Board (BREB).

3.2 Giving a voice to Inuit youth

3.2.1 Perceptions of land-based education

Firstly, I would like to acknowledge that the data collected for this research was from a small sample size of 26 student participants. The research also contains biases because the students who filled out the evaluation form were interested in learning about the environment as they were attracted to and signed up for the program. As previously stated, students had a choice to participate in four different programs. It would have been beneficial to achieve a diverse sample by asking all students enrolled in the various CTS courses to answer the questionnaire.

Unfortunately, this could not be accomplished due to time and organizational constraints.

However, the information gathered from this outreach programming provides insight on the local youths' perception of environmental education, their interest in building a stronger connection with the land, and their overall feelings toward our CTS programming.

Twenty-five out of the 26 student participants gave consent to use their responses from of the evaluation form for this research. All student participants were Inuit born and raised in the

Kitikmeot region. Student participants filled out the evaluation form by answering questions on a scale from 1-5 (1=strongly disagree to 5=strongly agree). See Appendix A.1 and A.2 for a copy of the evaluation forms. The following summary statistics discussed are shown in Table 3.1.

Student participants were asked to rate whether learning about the environment was important to them. The majority of the students (n=22) believed that learning about the environment was important or very important to them. Two students remained neutral to the statement. There were no participants who disagreed with this statement. However, one student did not provide an answer.

Student participants were also asked whether they leave the community to go out on the land to take part in subsistence activities. Close to half of the students (n=12) stated that they leave the community at least once a week to go out on the land. There were seven students who stated that they did not leave the community and six students who remained neutral to the statement. I was curious by these results because I was excited to see that the program attracted youth that were both avid-land users and students who do not go out on the land for various reasons such as choice or perhaps the lack of resources necessary to participate in subsistence activities.

In the evaluation form, students were asked to rate how much they learn about the environment from their family and Elders. Students were also asked how much they learn about the environment in the classroom. The majority of participants (n=20) agreed that they learn most about the environment from family and Elders. There were two students who remained neutral.

One of the student participants (student 7) stated that they do not learn most about the environment from family and Elders (Table 3.1). This student noted that they do not go out on the land on a weekly basis. They further identified that they believe learning about the environment is important and that they learn most about the environment in the classroom.

This program attracted some students, similar to the one above, who do not have readily available access to go out on the land in a home setting. This resulted in many students having different levels of environmental knowledge. The diversity in backgrounds added richness to the overall experience and I was curious to see, throughout the week, if and how the students who had the land experience would teach their skills to the students (and teachers) who did not possess the same amount of experience and knowledge. I was also interested in learning more about how the student participants would navigate through their own place-based learning experience.

Students were then asked how much they learn about the environment in the classroom. Eight students agreed that they learn most about the environment in the classroom, whereas, another eight students disagreed with this statement. It should be noted that there were seven students who chose to remain neutral to this question. Two students chose not to answer this question. The cultural sensitivity of this question in terms of the student participant's comfort level in answering a question that could potentially criticize their teacher, or the schooling system may have played a role in this.

Out of the students who believed they learn most about the environment in the classroom, two students (student 7 and 15) stated that they do not go out on the land on a weekly basis while the

other five (student 4, 6, 13, 19 and 25) stated that they leave at least once a week to go out on the land (Table 3.1). Out of the eight students who did not agree with this statement four students (student 2, 5, 14 and 23) identified that they leave the community on a weekly basis to go out on the land, whereas, one student (student 16) identified that they did not go out on the land on a weekly basis and three remained neutral (student 8, 11 and 12) (Table 3.1).

I expected the students who stated that they did not learn most about the environment in the classroom to be the ones who left the community to go out on the land on a weekly basis but this was not the case. Since our programming was delivered during the first week of school and it is seen as fun and exciting, a higher than normal percentage of our participants were known to the school as non-attenders. The catchment for our program was quite large as we accepted up to twenty-six students whereas the other CTS courses are quite limited usually to just about ten students. Thus, I suspect that the students, who do not believe that they learn most about the environment in the classroom, and do not leave the community on a weekly basis, are the same youth who do not attend school on a regular basis.

Out of the 26 student participants, 24 were awarded a letter grade for completing our program. Two did not receive credit as they missed either a full day or two half days of classes. The teacher ran a group vote on the last day of class where 23 students raised their hand stating that they would sign up for the program again, if available to them, next fall.

Table 3.1 A summary of youth responses to the programming questionnaire of the Kugluktuk High-School outdoor environmental CTS course, August 2013. Students answered the question by using a scale from 1 (strongly disagree) to 3 (neutral) to five (strongly agree).

	Learning about the environment is important to me					I leave the community at least once a week to go out on the land					I learn most about the environment in the classroom					I learn most about the environment from my family						
Student	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5		Total (/20)
1				x				x					x						x			14
2				x						x		x							x			14
3			x				x							x						x		13
4					x					x					x				x			18
5			x							x		x								x		13
6				x						x					x						x	19
7				x			x								x		x					13
8				x				x				x							x			12
9					x				x				x							x		16
10				x						x			x							x		16
11				x				x				x								x		13
12				x				x				x									x	14
13					x					x					x						x	19
14					x					x		x									x	17
15				x		x									x				x			13
16				x			x				x										x	12
17				x				x					x								x	15
18				x			x						x								x	14
19				x					x						x						x	17
20				x					x												x	13
21					x			x													x	13
22							x						x							x		9
23				x					x		x										x	14
24				x			x						x						x			12
25					x					x					x						x	19
Total			2	16	6	1	6	6	5	7	2	6	7	4	4	1	5	7	12			

3.2.2 Youths' connection to the environment

The evaluation form also asked student participants to answer open-ended questions: (1) when I'm out on the land I feel ____; (2) I when I'm out on the land I wonder ____ and (3) when I'm out on the land I know how to _____. This exercise provided the opportunity for youth to express how they perceive their connection to the environment.

By analyzing the surveys a short list of codes were identified by an analysis of words (i.e. word repetition) (D'Andrade 1911) and through *in vivo coding* (Strauss & Corbin 1998)(Table 3.2). These codes provided the basis for my initial coding performed in HyperResearch, a qualitative research analysis software program. By assessing the codes, I categorized the student statements into three major themes: (1) freedom, (2) identity and (3) respect (Table 3.3). The theme of freedom was divided into two sub-themes: freedom of self and curiosity. Three sub-themes: past, present and future were identified in the theme of identity. The theme of respect emerged from students learning from others including family and grandparents. The classification of quotes into themes was performed to provide a more organized display of statements identified by the youth. My intention was not to analyze their thoughts about place-based education but to provide a glimpse into how youth feel when they are out on the land and insight into what they may need out of future programming. Table 3.3 contains selected quotations from the questionnaires exemplifying the three major themes.

Table 3.2 Codes identified from student surveys developed in HyperResearch.

1	Happiness
2	Free
3	Learning
4	Me
5	Safety
6	Traditions
7	Animals
8	Plants
9	The future
10	Back in town
11	IDK (I don't know)
12	Cooking
13	Travel
14	Grandparents
15	Camp activities

Table 3.3 Three major themes and sub-themes emerging from the analysis of the open-ended questions from the questionnaires filled out by high-school students participating in the land-based CTS course in Kugluktuk, Nunavut, August 2013.

Themes	
Freedom	
<i>Self</i>	<p>“I feel free. I feel like a true Inuk.”</p> <p>“I can be free to be whoever I want to be. I feel more sane with all the beauty.”</p> <p>“I feel happy, free, not bored.”</p>
<i>Curiosity</i>	<p>“I feel like exploring the land and getting to know more about it.”</p> <p>“I feel like learning more about the land.”</p> <p>“I wonder about the little things in life. It gives you time to think.”</p> <p>“I wonder how to skin a caribou.”</p> <p>“I wonder about the animals changing.”</p>
Identity	
<i>Past</i>	<p>“I wonder mainly about life and how it was created.”</p> <p>“I wonder about how different and awesome it would be to live out on the land like the old days.”</p> <p>“I wonder about old times and where people used to stay.”</p>
<i>Present</i>	<p>“I wonder what’s going on back in town.”</p> <p>“I wonder what I would be doing if I were back in town.”</p> <p>“I wonder what my boys are doing back in town and if Canada geese are going to fly by.”</p>
<i>Future</i>	<p>“I wonder where I’m going to end up in life. I think about the changes in the world.</p>
Respect	<p>“I know how to respect my parents and help them out.”</p> <p>“I know how to watch for bears and wolves. I know how to cut seal. My grandma taught me.</p> <p>“I know how to hunt and survive with my grandparents.”</p> <p>“My grandparents taught me how to give and not be greedy.”</p> <p>“I’ve learned that the land can be a very resourceful place to find food and to be useful is a big resource.”</p>

By summarizing the program evaluations, I not only affirmed that the students feel a strong sense of identity when being out on the land but I learned about the strength of their connection to the land. Although they feel a kind of freedom, they are concerned about their friends back in town and what they are doing. Students are curious about learning more about the land especially in terms of animals such as caribou and geese. Students also voiced the teachings learned from their family and Elders, and expressed respect for their Elders.

3.2.3 The “Ground Up Mural” activity: finding a balance between *Inuit*

***Qaujimajatuqangit* and science in land-based education**

The creation of a berry plant mural was an on-going activity delivered throughout the CTS course in 2013. Each plant part: roots, stems, leaves and berries symbolized a form of knowledge and engaged students in thinking about the different forms of environmental knowledge they have gathered throughout their lives. Producing a mural to illustrate different origins of knowledge was inspired by the African Tree of Knowledge workshop as described in Clover *et al.* (2013).

Each morning participants were given a cutout piece of the cardboard mural corresponding to something they have learned about the environment from family and Elders, teachers, themselves and their peers. For example, on Monday, students wrote a statement about “what they have learned from their families about the environment that is valuable to their lives today” on a piece of construction paper that symbolized the roots. On Tuesday students wrote down a statement about “what they have learned in school about the environment” on a piece of construction paper

that symbolized the branches. On Wednesday students wrote, on a piece of construction paper in the shape of a leaf, about “what they have learned on their own about the environment”. We went camping on Thursday and on Friday, the mural was completed by the students writing a final sentence, on a piece of construction paper in the shape of a berry, about what that they had learned during the week-long course. Once the mural was completed students were encouraged to read, reflect and admire the quotes located on the mural (Figure 3.1).



Figure 3.1 Berry plant mural developed during the Kugluktuk High School environmental CTS programming in August 2013.

By focusing on the youth's process of knowing through the creating the mural, which highlighted their own knowledge, students were allowed to build self-esteem and confidence (Grenier 1998; Ball 2004; Archibald & Dewar 2010). For program evaluation purposes the mural became a visual representation. It was instrumental in giving me an idea of what learnable moments the students retained during the CTS programming. Moreover, I could use the mural to assess the programming successes in providing both *Inuit Qaujimaqatuqangit* and science aspects into the activities.

On our last day together, fifteen students took part in this activity writing their statements onto the cardboard berries and placing them onto the berry plant mural. This was the last activity that occurred during the week and unfortunately we were rushed to get it done because there was a school rally to attend. Some student did not want to be late so they opted out of this activity.

The following are selected statements from the mural activity, which are representative of the other statements gathered. Student participants gave a variety of answers that reflected both western and Indigenous worldviews. For example, some of the students' most memorable learning experiences included the following statements about berry ecology:

"This week I learned that berries come in different shapes and sizes."

"This week I learned that each year it depends on the climate and how much rain there is to determine if there will be a lot of berries or just a few berries in the fall."

Other students' most memorable learning experiences included the following statements about technology:

"This week I learned how to put a Coleman stove on."

"This week I learned how to use a GPS."

While the majority of students' most memorable learning experiences included the following statements that closely reflect *Inuit Qaujimagatuqangit* values as, for example, students developed skills through observation, mentoring and practice:

"This week I learned to always be prepared. You never know what animals could show at any moment."

"That if you're just learning about the land you need to know all the places you went to and the true stories behind them, rivers too."

"That you can't say wait to anyone because if you say that to someone and you go out hunting, animals will say wait to you."

"That you should not go out of a tent backwards because your baby might come out backwards."

The statements recorded from this activity were learned experiences that were not common learning experiences provided by the schooling system in Kugluktuk. I learned that the youth were both interested in learning about their culture and science. For example, through several conversations students mentioned that their environment can be a resourceful place. Some went on to say that they want to learn how to travel the land and respectfully harvest animals and plants using old ways of knowing (i.e. navigating using the stars and learning Inuinnaqtun place names) and new technologies (i.e. traveling by snowmobiles and using a GPS to record changes to the land and). From this mural activity, students seemed to retain information from both aspects of *Inuit Qaujimaqatunangit* and science. We concluded that we were on the right track to finding a balance between both aspects.

3.3 A personal reflection on outreach programming

In April 2014, the Canadian Polar Commission (now Polar Knowledge Canada) released a report that recognizes that there may be gaps in Arctic research in Canada. Polar Knowledge Canada (2015-2016) has funded a number of research projects that are driven by local concerns, engage the community and help in building capacity. This relatively new way of doing work in the Arctic is, indeed, strengthening the link between researchers and community members. However, the gap in research that evaluates the outcomes of the outreach programs needs attention in order to better plan and deliver community based research and education programs in the North (Barber et al. 2010; Carlson & Salmon 2010).

The programming that took place for this research was considered non-formal activities in the sense of Eaton (2010) because they were delivered with some degree of organization. They did maintain an air of flexibility that allowed for participants to explore their own process of

knowing. All participants, including instructors and students had something to teach and something to learn (Cowan 2004). When evaluating a program it is vital for educators to identify learning experiences that went well and the ones that did not, and to reflect on their own learning process (Lewthwaite & Renaud 2009). It is imperative that educators work on their abilities to self-reflect open heartedly and with an open mind (de Leeuw et al. 2012). Self-reflections should make educators and researchers question their motivations, which may not always show their best qualities (de Leeuw et al. 2012). This humbling and transformative exercise is crucial in building and maintaining meaningful and ethical relationships (Battiste 2000, Ermine 2007, Archibald 2008, Wilson 2008, Hatcher et al. 2009).

This section is an attempt at a self-reflective critical ethnography drawing from Foley (2002) and Madison (2006). Foley (2002) expresses that he “is an ethnographer who is trying to use common sense, autobiographical experiences, ordinary language, irony, satire, metaphor, and parody to understand everyday life” (487). I will explore my learning experience through observation and storytelling by focusing on the overnight camping trip to Kugluk/Bloody Falls Territorial Park. I will be drawing from my journal entries as well as the notes taken by my assistant, Nimisha Bastedo. Notes were recorded by referencing Emerson et al. (2011) *Writing Ethnographic Fieldnotes*. Our notes were then transferred nightly into journal entries that reflected back on the day’s activities.

The overall objective of this section is to explore my own challenges and successes of delivering a culturally appropriate land-based program by myself, a young non-Indigenous female

researcher. The following may also be used as a guide for future researchers, as it provides an idea of what to expect when working on outreach programming with a Northern community.

3.3.1 Kugluk/Bloody Falls camping trip

At Kugluk/Bloody Falls Territorial Park the Coppermine River carves through thick bedrock. Spectacular rolling hills vibrant with lime green horsetail and sphagnum mixed with different shades of green and hazy browns surrounded us (Figure 3.2). Some of the students had never been to the falls before, even though Kugluktuk is only 13 km to the west. On the boat ride to Kugluk Park, several students were speechless. They expressed later that they were taking in the beauty of the landscape and looking for animals denning along the steep eroding sandbanks.



Figure 3.2 Kugluk/Bloody Falls Territorial Park with the Coppermine River, Nunavut (photo by Sarah Desrosiers).

Midweek during the CTS course, I hired boats to transport the nine students and educators, and their equipment to Kugluk, Bloody Falls Territorial Park for the optional overnight camping trip. It truly looked as though we were going to be camping out for a week and we probably could have. If I have learned one thing on my trips up North it is that you can never be too prepared! We unloaded the wall tents, action packers stuffed with food and cooking supplies, backpacks, sleeping bags, bedrolls and pillows, Coleman stoves, fuel, and fishing rods. Beside the heaps of

camping equipment stacked along the shore idled two jet boats. They were stationed at the base of the rapids, waiting for the remainder to unload. I did warn the students to pack light!

Kugluk seems so close to the community that I expected all the students to have been to this historical place before. However, I was wrong and as an outsider, I did not take into account the environmental and economical variables that would restrict access to the area. With the water levels of the river lowering it becomes difficult to access without a jet boat. There is also an All Terrain Vehicle (ATV) trail to the park, which is maintained by Territorial Parks and Special Places. Maintenance of the trail is a challenge due to erosion of the riverbank and the thawing of the permafrost. People would also need access to an ATV, which not every family can afford or access.

It was a mere 200 m to the camping pads so we made our way up the bedrock to the campground situated on higher ground. Two students assisted Elder Alice Ayalik, a bit worried about falling due to her bad knees, as she made her way up the slippery rocks. They carried up all of her belongings at the same time, as Alice wanted to keep her things close. An hour elapsed before we finally started to set up camp. I could tell that everyone was getting hungry since we were all becoming a bit sluggish. Alice kindly opened up one of her bags and shared dry meat with everyone. While students were recuperating from their hard work, Elder Mary Algona prepared tea and other snacks. The Elders set important ground rules, for example, students were expected to wear a life preserver if they were going to be fishing on the cliffs, to walk in groups of at least two and always be within sight of camp.

Once we began to set up camp it came to my attention that the Elders were not happy. Apparently they did not intend to camp on the assigned Territorial Park camping area but instead right along the river where we had been dropped off. The river area was the traditional camping site that was used for many years. I had a quick conversation with Alice and Mary about the possibility of staying up higher where we had by now dropped our gear. I thought it would be better because we were closer to the outhouses and we could use the picnic tables for cooking. It was a bit challenging trying to gauge what they wanted as I only know a few words in Inuinnaqtun and English is their second language. With the help of Alice's grandson, who was on the trip, I gathered that they weren't too thrilled about it but would compromise and agree to stay at the designated camping area. I assumed that they did not want to make everyone go back down to the river level with all the gear.

I felt so uneasy about the whole situation, because I knew that they were upset with me, that in my mind I was ready to give up and call off the camping trip. "Let's just call the boats back and head back to town!" I thought to myself. This was the first encounter that I had experienced in the North where I felt truly ignorant about Inuit traditions. I should have been more sensitive to the Elders cultural practices of camping out on the land compared to the western idea of camping at a park in designated camping pads with tables, fire pits, outhouses, etc. At this moment I felt humbled and knew that such conflict could have been avoided had I included such conversation in our pre-trip group meeting and prior consultation. It just honestly did not cross my mind.

Regardless, the day went on and the male participants found flat ground to set up the Elders' tent. The Elders insisted on having some of the girls stay with them, along with Alice's

grandson. Once they had moved in and were making up their beds we could hear Alice begin to sing. The walls of the tent started to shake briefly and she came out smiling from ear to ear. She then rested cross-legged in front of her tent and started to pick *Paun' ngat* (crowberries) and *Kigutingirnat* (blueberries). "I can pick berries from my bed!" she said loudly and everyone began to laugh. She was thrilled, because as she explained it is now a challenge for her to go out on the land due to her health and she does not get many opportunities to go out berry picking.

Later on that night she told me that she hadn't been to Kugluk for at least 25 years, since her husband had passed away. She is too scared to go up the river these days because the water level is so low now and the boats often hit rocks. The new jet boats that they use to go up the river are scary and she can no longer ride on an ATV for long trips. She further explained that, even though she was uncomfortable about the ride, she agreed to go on this trip because she loves teaching and being around the youth. Later that evening I noticed she had put a line of string around the berry patches to deter people from trampling the berries by her camp.

"Can I help with anything?" I asked Alice while preparing a soup. In English she responded: "The true Inuit way, you never ask. You just do!" It was officially my second scolding of the day. As a graduate student wanting to be accepted I quickly grabbed my pocketknife and started to chop carrots. I copied her cutting technique as she sliced the potatoes using her ulu. A hearty soup was on the go. While the students were fishing and were given time to berry pick and simply be with the land, I decided to go on a walkabout to collect driftwood for the campfire with a couple of students and a teacher. We came back to prepared bannock, caribou soup, fish and hunting stories from Alice and Jorgen. Jorgen was our lead guide and bear monitor. Alice

explained to the youth the importance of respecting Elders, to always help out when you can, to remain modest with your achievements and share what you have no matter how much you have.

After the stories, a student sitting at the table asked to the group: “you know another way to survive?” She explained how one of her aunties had taught her that you can take the inner part of the willow bark and suck on it to keep you alive in case of an emergency. They were also teaching my field assistant, Nimisha, some Inuinnaqtun words and string games. At one point the same student said “I wonder what it would be like if we only spoke Inuinnaqtun?” A student nearby responded with: “freaking awesome!” and another student agreed.

Late in the evening we had a fire going and some students eventually dispersed into their tents leaving a few left around the fire. The fire provided a gathering place for the youth to share and they began to have a conversation about their surroundings: the sky, willows, rolling hills, rocks, berries, char and grayling spawning up river, caribou migrating five miles south, bears, etc. They were wondering if there were animals nearby and if so what were they doing.

The discussion around the fire took a turn and became a reflection on the past. “Imagine what it would be like if we still lived out on the land like our ancestors did” a student said. “Think of the risk of starvation and how difficult it would be to survive but at least we would still have our culture and our language” replied another. Violence, abuse and suicide were also discussed. I felt ill-equipped and unskilled to facilitate such conversation so I just listened and tried to be a positive role model. One student then said “What about arranged marriages? You would have to marry someone 40 years older than you. Imagine having to give a hickey to an old man! What

about having to make a baby with an old wrinkly man!” Laughter erupted and the topic of conversation shifted just in time for curfew.

The following morning we got to work. After talking with the Elders we divided the working group by having the young men tear down the camp and set up the three berry monitoring plots. It was very important for Alice to have a division of labour where the boys would tear down camp and help clean up the park and the girls would help harvest the berries at the monitoring site. I was not expecting this but I wanted to respect her wishes.

While the girls were collecting the berry samples for the research, the young men were having their last fishing session. They caught several char and whitefish to share with their families and friends and to donate to the senior’s home upon their arrival back in Kugluktuk. While we waited for the boats to return to take us home, Rebecca Torretti of the Nunavut Parks division delivered a presentation about willow ecology and resource management within the park.

When we came back to the community that afternoon, a few students were left hanging around the classroom. We were sitting around a table and one student who was at the campfire the previous night revisited their conversation and said to comfort another student: “You can lose your friends, and you can lose your family but you can never lose hope”.

As mentioned above, there were several moments where I felt humbled by my lack of knowledge for Inuit ways of being. During the trip, students taught Nimisha and I about their culture, both the old ways and new ones. For example, students demonstrated how to play Inuit string games

and showed us the basics of throat singing. They taught us about their strong community bonds and deep respect for Elders by always lending a hand. Students displayed their skills while being out on the land, where young men taught the less experienced students how to light a Coleman stove, set up the wall tents and fillet fish. Through this experience I learned that youth and Elders are willing and inclined to teach their culture to people who show a keen interest, engage with the community and display a sense of humility.

These moments that occurred on the camping trip provide youth a safe space to share, explore their identity, heal and grow. The link between place, language and cultural identity plays an essential role in the wellbeing of not only an individual but also a community. The experiences discussed above emphasize hands-on, real-world teachable moments, which I believe led to the successes of the programming.

A lot of effort, both time and money was needed to make this camping trip happen. Various community members, Nimisha and I had to spend overtime hours to ensure a safe, educational and enjoyable trip. Honestly, I ran on little sleep, where for example I spent my late hours in the kitchen preparing muffins, cookies and other snacks for the students, just to cut down on food costs. I was then up early mornings to go through the camping inventory and take students to the grocery store with their shopping lists! In addition, days prior to the trip, while carrying out the CTS course, I also sought out extra funding to make sure we would have enough funds to pay for the boat rides. As a very active person who enjoys putting in all my energy when working on such activities, I caution young scientists interested in community driven outreach programs that intend to complement their research projects. The biggest lesson learned from this project is that

in preparing for cultural engagement in land-based programming, one must be prepared to have more Western ways challenged. When working on outreach activities like this one, one must also prepare for additional hands-on work, practice good time management skills, and if needed seek appropriate additional funding and training.

3.4 Conclusion

I developed and delivered a week-long CTS Program that complemented my Masters of Science research project on the productivity of culturally important berry plants. The goal of the CTS course was to provide a land-based learning program that could help promote wellbeing and foster a healthy active community. Moreover it was important that the outreach program attempted to find a balance between *Inuit Qaujimaqatuqangit* and science.

The evaluation of place-based outreach programming is key to understanding how to build meaningful capacity for Inuit youth to connect to the environment. Program evaluation is necessary because there are not enough researchers who engage in outreach programs that actually conduct a thorough program evaluation. I performed three types of evaluations: program evaluation forms, the “Ground Up Mural” activity and a self-reflective critical ethnography.

The program evaluations showed that students feel a strong sense of freedom, identity and respect for their family and Elders when being out on the land. When youth are out on the land they can be curious about the plants and animals around them. They wonder about the past, present and their future and they know that it is useful to be resourceful. The majority of students felt that learning about the environment is important. Not all students; however, have the same opportunities to go out on the land. Neither do they all learn most about the land from their

family and Elders. Some students learn most about the environment in school. These were the students who stated that they did not leave the community to go out on the land on a weekly basis. By providing students with opportunities in participating in land-based programs during school through outreach programs such as this one, not only do youth exercise practices in wellbeing but perhaps we can also inspire students to continue with their education especially in environmental fields of study. Thus the government of Nunavut should consider investing more capital into meaningful community-supported place-based programming for youth.

The “Ground Up Mural” activity was successful in getting the students to write down their thoughts on paper and was helpful in the overall evaluation of our outreach programming. This activity showed that students seemed to retain information regarding both *Inuit Qaujimagatuqangit* and science. The integration of both ways of learning was a goal of our outreach programming, which we were on the right track in achieving.

When working on outreach activities that complement research goals, I learned that scientists must prepare themselves for extra hands-on work, practice good time management skills, and if needed seek appropriate additional funding and training. It is also necessary to have a sense of humility and researchers must be prepared to have their Western ways challenged. It is important to know what it is you want to accomplish through your outreach programming, understand why you think it is important and recognize the issues of priority. Challenges arise when you are conducting research and outreach, as to which takes top billing. It can become quite a struggle to accomplish both successfully because under strict time restraints, one could take away time and effort from the other.

Chapter 4: Giving back: sharing “berried” knowledge in *The Berry Book*

4.1 Introduction

Language plays a crucial role in personal and cultural identity, connecting people to their ancestral roots (McCarty et al. 2006; Norris 2011; Guèvremont & Kohen 2012). This link between language and identity is an important component of community wellbeing that sets a foundation for current social structures (McCarty & Wyman 2009; Guèvremont & Kohen 2012; Mccarty *et al.* 2012). It is imperative to understand how people see themselves in the context of language (Meek 2008).

If Elders from an Inuit community speak their traditional language but the majority of youth do not, there has been a shift in the language (Meek 2008). The process of language shift is inevitable in all cultures, through time, as there is always room for the development of new words and meanings created by the next generation of speakers (Meek 2008). Furthermore, external drivers such as colonial laws and policies, residential schooling and the prevalence of English and French have lead to the loss of language and culture in First Nation and Inuit communities in Canada (Norris 2011; Patrick 2012). Language shift is a serious issue relating to human rights and the welfare of Indigenous communities (Patrick 2005; Mccarty *et al.* 2012).

Language and the loss of Inuinnaqtun amongst Kugluktukmiut youth was a theme that emerged in Chapter 3. As a way to give back and reciprocate knowledge discovered from this project, we self-published a bilingual (standardized Inuinnaqtun and English) educational book about the main topic of my studies: berries. The book includes information regarding the vocabulary, ecology, nutrition and *Inuit Qaujimajatuqangit* of culturally important blueberries

(*Kigutigirngnat*), bearberries (*Kablat*), cloudberries (*Aqqiit*), cranberries (*Kingmingnat*) and crowberries (*Paun'ngat*). The book also includes artwork, student stories and recipes. I compiled and wrote the English sections of the book. It was crucial that my Masters research project produce a meaningful component that could be utilized by community members for years to come. My intention for this book is to contribute to the growing collection of bilingual reading material as a way to promote Inuinnaqtun literacy.

To provide a larger context regarding Inuit languages in Nunavut, I begin this chapter with a brief history of Inuit language writing systems in Nunavut and the impact of colonialism on Inuit languages by focusing on Nunavut's education system. I then offer a brief history of the Arctic Berry Project, the project out of which my Masters project was founded. The main focus of this chapter is to describe the process of working with the community of Kugluktuk to produce *The Berry Book*, which can be referenced as a successful for community-supported literacy initiative.

4.1.1 The Inuit language

4.1.1.1 Inuit language writing systems in Nunavut

Inuktitut and Inuinnaqtun use two distinct Inuit language writing systems in Nunavut. Inuktitut is widely spoken across the central and eastern regions (Qikiqtaaluk and Kivalliq) and uses a syllabic orthography created by missionaries who adapted the Cree syllabics to writing in the 1850s (Timpson 2010; Harper 2002). Inuinnaqtun, on the other hand, uses roman orthography derived from Anglican missionaries (Harper 2002). Most people who speak Inuinnaqtun do not know how to read syllabic orthography and most Inuktitut speakers do not know how to read Inuinnaqtun (Harper 2002). This division of Inuit Language writing systems has become a

dispute over language rights in political and educational sectors separating the Territory's east from the west (Harper 2002). This division makes it challenging to develop a schooling system with bilingual educational material that includes both Inuktitut and Inuinnaqtun writing systems.

Although Inuktitut speakers have been successful in language instruction to youth where 90% of children are taught Inuktitut as their first language, there have been disputes over language instruction of Inuinnaqtun speakers (Hot 2009). Inuinnaqtun is in critical danger, where speakers are exclusively located in the Kitikmeot Region (Timpson 2009). Of the total Kugluktuk population, 15.6% indicate Inuinnaqtun as their mother tongue, 4.9% state Inuktitut as their mother tongue and 75.3% report English as their mother tongue (McGregor 2014). At the time of the 2011 census, 89.2% report that they speak English most often at home (McGregor 2014). There are very few individuals under the age of 35 who can speak or write Inuinnaqtun (Berger 2006). All of the communities within the Kitikmeot region indicate a higher level of English usage in the home than other communities in Nunavut.

The Kitikmeot Region's current attempts to revitalize Inuinnaqtun have so far been unsuccessful. One of the possible challenges blocking their revitalization efforts may lie within the lack of agreement regarding the standardization process (Nunavut Tunngavik Inc. 2010). Not only are Inuit languages important symbols of pride but also, individual dialects are valued because they provide a symbolic link to family and community history. As a result, Inuit languages serve also as identity markers (Tulloch 2006). In Nunavut there is a remarkable diversity of Inuit dialects where communities have their own separate speech forms, which to some individuals is recognized as a dialect specific to their community (Tulloch 2006).

It would be unrealistic to imagine that we can preserve all dialects of the Inuit languages. There are just not enough resources or time to produce written educational material translated into six or more dialects (Tulloch 2005). Instead speakers are encouraged to maintain their dialects and use a standard form of Inuktitut or Inuinnaqtun written language (Harper 2003, Tulloch 2005, Tulloch 2006).

The complexities within the Inuit language writing systems have created a substantial obstacle for language preservation and revitalization efforts in Nunavut. Individual dialects are encouraged but the standardization of the written forms of Inuktitut syllabic and Inuinnaqtun roman writing systems is necessary. This is seen as one of the strongest techniques to promote literacy (Harper 2003; Tulloch 2005; Tulloch 2009;). By better understanding the merits of the standardized writing system through community consultation, we decided that it was necessary for the berry book to contain Inuinnaqtun in the standardized form.

4.1.1.2 Inuit language and the Nunavut education system

The influence of residential schools in Canada Far North, has significantly contributed to the complex social issues of poverty, mental health and violence (Patrick 2012). Residential and day schools in the 1950s interrupted Inuit traditional land-based education and relationships with family members. Language differences and shifts in social norms developed generational segregation, weakening traditional education between youth and Elders (McGregor 2011). The legacy of residential schools still remains apparent in the daily lives of Inuit. The tension seen in the way language and culture are taught in school will be apparent for many years to come

(Patrick 2005; Aylward 2007).

In order for Nunavut to maintain and revitalize the Inuit language in current times and for the future, the instruction of the Inuit language needs to be successfully implemented in schools and at home with proper support for teachers and parents. This can be accomplished using bottom-up approaches that reflect the evolution of the current Inuit culture (Berger 2006). By encouraging community-based initiatives, active and passionate community members emerge. These participants become invested and can help to sustain the efforts and fuel the momentum of the project.

Several culturally appropriate programs have been initiated in Kugluktuk. For example, at the Kugluktuk High School a pre-trades program was started in 2005-06, where enrolled students are required to complete core academic courses. These are specific courses related to a trade, with a practical application of skill and experience (McGregor 2014). The program takes in ten new grade 9 students each year who become cohorts. Students are expected to remain committed throughout their high school years (McGregor 2014). The objectives of this program are to increase attendance, make connections with education, attain a career, become high school graduates and pass pre-trades exams (McGregor 2014). Other notable initiatives are the Iglu Building Project taking place at the Kugluktuk High School and the Hunters and Trappers Associations cultural camps to Bernard Harbour and Basil Bay. Both programs involve the sharing knowledge and traditions of Elders and active land users.

Significant efforts placed towards language revitalization have been implemented in post-

secondary education. For example the Nunavut Arctic College is currently in their second year of the Inuinnaqtun Interpreter Program. The University of Victoria has also partnered with Nunavut Arctic College in Cambridge Bay, Gjoa Haven and Kugluktuk in developing a language revitalization program where graduates receive a certificate in Aboriginal Language Revitalization (CALR). The program provides participants with skills to develop knowledge and practical strategies for language revitalization activities in Nunavut (CALR 2016).

4.2 The Berry Book

The Berry Book is a unique literacy project that progressed naturally through a bottom-up approach. I actively listened to both young and old community voices offering their concerns about the loss of language amongst Kugluktukmiut youth. I knew that I wanted to give back to the community for all their help they had offered me during my scientific research. While conducting berry-monitoring fieldwork with the high school, I put in the additional effort to facilitate oral history and literacy workshops. Through these workshops, community participants decided that we should compile the information gathered into *The Berry Book*. The book was developed through the collaboration of key community members, the Kugluktuk High School, and researchers from UBC as well as with assistance from the Government of Nunavut, Nasivvik and ArcticNet.

4.3 The establishment of the Arctic Berry Project in Kugluktuk, Nunavut

The partnership between the Hamlet of Kugluktuk and the University of British Columbia began in 2009 as an International Polar Year (IPY) Arctic Berry Project with the Hunters and Trappers Association (HTO). Two undergraduate students from UBC established the berry-monitoring site

with the help of a former UBC graduate student who now resides in the community. That summer the HTO hired local students who were trained to monitor berry productivity and vegetation by following the protocols developed for CiCAT. Students also learned how to properly harvest, preserve and identify plants, which were compiled into a community herbarium located at the HTO office. As part of the IPY funding, José Gérin-Lajoie, from our research group also made two trips, in 2010 and 2011, to Kugluktuk to conduct Traditional Knowledge interviews with Elders and knowledge holders about environmental changes, including changes in plants and berries, they had witnessed throughout their lives. These interviews were also conducted in communities across Nunavut, Nunavik and Nunatsiavut as part of the larger IPY and ArcticNet project to better understand the observations of change by Inuit across the Canadian Arctic (Gérin-Lajoie et al. 2016).

Two years lapsed prior to the continuation of the monitoring project due to challenges in recruiting a graduate student. My involvement with the project began in 2011. Before traveling to Kugluktuk, for the first time, I was in touch with two keen high school teachers and we formed a good connection as we shared similar interests and teaching values. Once my assistant and I arrived in Kugluktuk that year, we began to work with the grade 10-12 science and mathematics teachers by assisting in delivering a two-week environmental studies course during their annual Career and Technologies Studies (CTS) programming. Twenty students signed up to establish new monitoring plots and be trained in following the developed scientific monitoring protocols described in Chapter 2.

4.4 The process of creating *The Berry Book*

In 2011, at the end of our initial field season working in Kugluktuk, my assistant, Helen Meier and I put on an informal open house in the high school library. Poster advertisements were placed in local businesses inviting interested community members to attend. The open house allowed us to introduce ourselves to the community and provide basic information about the berry project. We played a slideshow with photos of the CTS programming and audio snippets of *Inuit Qaujimagatuqangit* about the observed changes in the environment that were recorded from the previously conducted interviews by José Gérin-Lajoie.

During the open house, we encouraged people to ask questions and to talk with us while snacks of cookies and tea were offered. Most of the conversations that afternoon ended up being about the joy of berry picking. However, another topic that kept surfacing was the loss of Inuinnaqtun in the community especially when it comes to language used to describe the land. Together we identified that with some effort, as a group, we could assist in an Inuinnaqtun revitalization initiative by facilitating oral history workshops and by publishing bilingual educational material regarding berries and plants. The idea to facilitate oral history workshops came from a group conversation attempting to identify ways to strengthen literacy skills, build self-esteem amongst youth and provide opportunities for the community to be engaged and interested in a research project from start to finish.

We also had various informal meetings with organizations such as the HTO and the Elders Center at Brighter Futures, and had many conversations with community members as we walked about town. The sharing of ideas came naturally when having such a meaningful dialogue. All of

these types of encounters allowed us to collect valuable information about producing the berry book. We decided that the berry book should include a chapter for each berry species (bearberry, blueberry, cloudberry, cranberry and crowberry) with a section in each chapter designated for vocabulary of phenological stages and ripeness levels, *Inuit Qaujimagatuqangit* collected during the oral history workshops and previous interviews, as well as youth contributions and recipes.

I returned to Kugluktuk in August 2012, this time to run the now weeklong environmental studies CTS course with the assistance of the science and mathematics teacher. During the CTS course we facilitated two half-day oral history sessions where we invited Elders and Knowledge Holders to share their plant knowledge. Students were handed pre-formed questionnaires approved by UBC's Behavioral Ethics Board (BREB) related to the ecology, traditional stories and uses of berries and culturally important plants. Participants sharing their knowledge were also given bilingual consent forms. Interpreters, Betty Ann Kadlun and Shirley Hatogina read out the consent forms prior to having the knowledge holders' sign. The consent forms were then organized and filed (see figure 4.1) for our records.



Figure 4.1 Sarah Desrosiers, interpreter Betty Ann Kadlun and assistant Kate van Ballegooyen organizing consent forms during the first day of the oral history workshop at the Kugluktuk High School, August 2012 (photo taken by Dale Skinner and used with permission).

The first day of the workshop, students would individually stand up to the microphone and asked their selected question. Our interpreters, Betty and Shirley, would interpret the question for the Elders. They would then interpret the answers back in English for the youth. We wanted everyone to feel as comfortable as possible so we created small round-table seating arrangements where Elders and youth were able to sit side by side and interact with each other (See figure 4.2).



Figure 4.2 Elder Kate Inuktalik with great granddaughter Darla sitting face to face during the first day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Sarah Desrosiers).

The second day of the workshop was devoted to recording Inuinnaqtun vocabulary for each berry species including phenological life stages and ripeness levels and plant parts. Elders and knowledge holders wrote the berry vocabulary in their traditional dialect onto sticky notes and stuck them onto the associated photos provided (see figure 4.3). Throughout the workshop students were encouraged to listen and take notes on their question sheets. We also documented the events using photos, video and audio recordings (See figure 4.4).



Figure 4.3 Elders Mamie Oniak, Kate Inuktalik and Laura Kohoktak working on Inuinnaqtun berry vocabulary during the second day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Sarah Desrosiers).



Figure 4.4 Audio, video and written recordings documenting the second day of the oral history workshop at the Kugluktuk High School, August 2012 (photo by Hikok Ivarluk and used with permission).

In January 2013, I returned to Kugluktuk to run a weeklong winter environmental studies CTS program. Part of our programming included traveling with students out on the land to measure the snow depth at our berry plots. We also devoted a morning to a mini-oral history workshop where we invited Elders and Knowledge Holders to validate the information gathered from our previous workshop. We also invited participant knowledge holders to elaborate on certain topics (see figure 4.5). The high school students who were a part of the environmental program as well as the junior high Inuinnaqtun classes attended this session. Students were encouraged to listen to the language and converse with their Elders over tea and snacks.



Figure 4.5 Elders Alice Ayalik, Jack Ovilok and Mary Kellogok and Mamie Oniak validating Inuinnaqtun vocabulary of berries at the second oral history workshop at the Kugluktuk High School, January 2013 (photo by Sarah Desrosiers).

After several discussions with the junior high Inuinnaqtun teacher, Helena Bolt, we thought it would be a good idea to facilitate a youth ethnobotany literacy project. We did this with her classes in August 2013, during the second week of classes. Students wrote their own stories with illustrations that included their own knowledge about berry ecology and stories about berry

picking and being out on the land. At the end of our week we put on a celebration where the whole school gathered in the library to listen to the students stories. Posters were distributed throughout local businesses inviting interested community members to attend as well. Students were encouraged to read their stories to the group. Some students who wanted to share their stories but were too nervous to read them out loud asked one of the new teachers or principal to read their story with them, side by side. We selected certain stories to be translated and included in the book. Originally we had planned for the students to translate their own stories. However, as the week went along, we discovered that the skills needed to translate the stories were a little too advanced for the students. Thus, Rosemarie Meyok was hired to complete the translations for the book through funding acquired from the Government of Nunavut Department of Culture and Heritage Official Languages.

In the Fall 2013, we produced our first draft of the five berry chapters. In January 2014, I returned to Kugluktuk to run a weeklong winter environmental studies course. Students had the opportunity to look through the first draft and make comments. It was at this time that the high school students contributed artwork for the book. I also consulted with several community members and organizations regarding the first draft of the book, including the Department of Environment, the Hunters and Trappers Association, and the Kugluktuk women's group.

We also received additional support from the Nasivvik Strategic Grant Initiative to complete the translations, to fund our editors and cover printing and shipping costs. We reached out to local artists for contributions in the fall of 2014. Natalie Griller, a former UBC graduate student now living in Kugluktuk, graciously donated some original paintings that were included in the book.

Prior to my last trip to Kugluktuk in March 2016, I spoke with Edna Elias, Susie Evyagotailak and Millie Kuliktana of Inuinait Services Limited regarding editing the Inuinnaqtun sections of the book. While I visited the community for a final round of consultation, Millie made edits to a hard copy draft I provided. We were able to sit down together and go through the edits page by page. I was extremely grateful for this opportunity as it made me better understand the importance of language to Inuit and it demonstrated how individuals in the community are extremely committed to revitalizing Inuinnaqtun.

The Berry Book was sent to Press in November 2016. The distribution of the 80 copies was completed in December 2016. See appendix B for the PDF version of *The Berry Book*.

4.5 Conclusion

Language shapes a persons' identity and connects them to their culture. This link between language and identity is an important component of community wellbeing that sets the foundation for society. Colonialism has led to the loss of language and culture of Inuit communities in Canada. Language and the loss of Inuinnaqtun amongst Kugluktukmiut youth was an important theme that I could not ignore while conducting my research. This chapter described the organic process of producing outreach material while carrying out field-based research.

As a way to give back and reciprocate knowledge discovered during this project, I self-published a bilingual (standardized Inuinnaqtun and English) educational book about the berry project. *The*

Berry Book includes information regarding the vocabulary, ecology, nutrition and *Inuit Qaujimagatuqangit* of culturally important berries. It also includes artwork, student stories and recipes. My intention for *The Berry Book* is to contribute to the growing collection of bilingual reading material in Inuit languages, and specifically to provide a new opportunity for Kugluktukmiut to access Inuinnaqtun content.

Chapter 5: Synthesis

Climate change is affecting the structure and function of tundra ecosystems. Changes include increases in sea and surface temperatures, decreases in snow cover and changes in precipitation, thawing permafrost and changes in the distribution and phenology of vegetation and wildlife (including pollinators) (Sturm 2001; Sturm 2005; Blok 2010; Myers-Smith 2011; Boulanger-Lapointe et al. 2016). Empirical and observational research shows that the Arctic is becoming shrubbier (Myers et al. 2011; Downing and Cuerrier 2011; Elmendorf et al. 2012; Cuerrier et al. 2015; Gérin-Lajoie et al. 2016), and these changes are especially notable in the forest-tundra and the low Arctic, where shrubs are increasing in density and growing taller shading out plants in their understory. There is, however, a need for more knowledge to understand how berry-producing plants are being affected by these changes to the environment.

Climate change is also affecting the inhabitants of the Arctic. Youth of the North that pursue land-based activities are some of the most vulnerable to these climate change impacts (Prowse & Furgal 2009). This is because younger generations have weaker land-based skills due to a break in the transfer of culturally significant learning practices between Elders, knowledge holders and youth (Ford et al. 2008). Travelling on the land has become more dangerous due to the increased unpredictability of changes in weather (Ford et al. 2008; Laidler et al. 2009). Few youth are considered avid land-users (Ford et al. 2008). This disconnection to the land is linked to an intergenerational separation that is caused by a shift in the dominant language used, the formal education system, a general change in social norms as well as the monetary expense of land-based activities (Takano 2005; Henshaw 2010; Kral et al. 2011). Yet, Inuit youth strongly believe that being out on the land and participating in land-based activities is crucial for their

cultural identity and wellbeing. This research was initiated to create space for Inuit youth to enhance their adaptive capacity to climate change thereby fostering a healthy self and community. My research on the productivity of culturally important berries was translated into action via the integration of culturally appropriate land-based programming that connected Kugluktukmiut Elders and youth.

Inuit youth living in Kugluktuk, Nunavut were involved in this community-supported research that aimed to enhance and maintain the monitoring of berry producing shrubs: *Arctostaphylos* spp., *E. nigrum*, *R. chamaemorus*, *V. uliginosum* and *V. vitis-idaea* (Chapter 2). All activities carried out for this research were centered about the main objectives; 1) to better understand how the changing environment is affecting the productivity of berry producing plants; and 2) to use the ecological studies and cultural importance of berry species as a platform to involve youth in land-based education that combines science and traditional knowledge. Land-based activities took place during the Career and Technology Studies Programming at the Kugluktuk High School, (2011-2013) where students were trained in environmental design by following standardized monitoring protocols (Lévesque et al. 2008). Students harvested samples from the berry monitoring plots located around Kugluktuk and at Kugluk/Bloody Falls. Data collected from the two berry-monitoring sites in Kugluktuk and Kugluk/Bloody Falls along with berry productivity data collected by researchers at the Tundra Ecosystem Research Station (TERS) at Daring Lake, NT were compiled for analysis.

The vegetation composition at the sites at Bloody Falls was more diverse than at Kugluktuk and Daring Lake, with the presence of species such as *Equisetum arvense*. Latitude, soil moisture,

June and July temperatures and May and June precipitation all had a significant relationship with vegetation cover at all sites. Although there was high variability, the percent cover and the height of the dominant erect shrub *B. glandulosa* was highest at the Bloody Falls site.

All of the berry species were found at each of the three research sites. The percent cover of *V. uliginosum* was highest at the Kugluktuk site and the percent cover of *V. vitis-idaea* and *R. chamaemorus* was greatest at the Daring Lake site. Berry production in Kugluktuk was significantly more productive than at Bloody Falls and Daring Lake. This was likely because it was the site with the least abundance of tall erect shrubs.

In 2011, at the Kugluktuk monitoring sites, the production of *E. nigrum* was lowest yet the production of *R. chamaemorus* was highest compared to the following two years. These results could be attributed to slightly cooler temperatures, increased cloud cover and a slightly wetter season in 2011, compared to the other years. However, there were no significant relationships between berry productivity and the measured environmental variables. The productivity of *V. uliginosum* and *V. vitis-idaea* remained relatively steady across the sites and years.

This study did not allow a full exploration of the relationship between erect shrub cover and berry shrubs. The berry monitoring plots were deliberately chosen to be in areas expected to have the greatest production. Thus, the plots were chosen to have little of no erect shrubs, and the study was not designed to explore this relationship. This is an aspect of the changing environment that affects berry production and should be included in future research.

Similar research, following the same berry monitoring protocols, has been conducted throughout the Canadian Arctic. There is an analysis ongoing of these berry data (Boulanger-Lapointe, pers. comm. 2016). I am contributing to this analysis with one of the longest records from Kugluktuk. I am hopeful that monitoring of berry production will continue in Kugluktuk with the help from the high school, as more years of data collected will provide better insight for scientists on how climate change is affecting berry production. Furthermore, research should gain insight from Elders and Knowledge Holders inhabiting the North who have a first hand understanding of the changes in berry production from being out on the land picking berries.

There are two ways of understanding processes in nature: (1) by conducting scientific research, and (2) through Traditional Ecological Knowledge (Berkes et al. 2000). Traditional Ecological Knowledge is defined as the culmination of knowledge, practices and beliefs about the relationships of living beings with one another and the environment that has evolved as it gets handed down through generations by cultural transmission (Berkes et al. 2000; Berkes 2009). Members of Indigenous communities, especially Elders and land users are Traditional Knowledge holders (Downing & Cuerrier 2011). Integrating Traditional Ecological Knowledge with science is crucial because it can assist in expanding the scientific knowledge of natural systems and developing new strategies for sustainable resource management. Most importantly, by allowing Traditional Ecological Knowledge to complement modern scientific research, the livelihoods of people dependent on natural resources may be sustained (Ford & Smith 2004; Ford et al. 2006; Berkes et al. 2007; Cuerrier et al. 2012). Monitoring the productivity of culturally important berries in the Arctic can link Traditional Ecological Knowledge and scientific research, as berry picking is a commonly practiced harvesting activity amongst

northerners (MacKey and Orr 1987; Thorton 1999; Murray et al. 2002; Murray et al. 2005; Henry et al. 2012).

A study by Gérin-Lajoie et al. (2016) recorded observations by Traditional Knowledge Holders through interviews where a number of informants from Kugluktuk stated that they have seen increases in shrubs that seem to be diminishing the productivity of berry producing plants. However, others stated that berries grow amongst shrubs providing the right amount of shade for the production of good quality berries. Reductions in winter snow cover and summer precipitation were widely observed by informants. Some attributed a change in the taste of the berries to the changing environment, as they “don’t get as big and dry up right away.”

Along with high-school students learning skills in sampling design, measurements and data entry from the berry-monitoring studies, the outreach programming intended to assist Inuit youth in developing new land-based skills that would help them build adaptive capacity to the changing environment (Chapter 3). By building a working relationship with the Kugluktuk High School, I developed an outreach program that focused on being out on the land and learning from Elders, land users, teachers, scientists and student peers. There were twenty-six student participants registered in our program that took place in August 2013. We placed a strong emphasis on evaluating the outreach programming by learning about Inuit youth perceptions of place-based education, who they wanted to learn more about the environment from and to gauge whether the programming was able to find a balance between teaching science and *Inuit Qaujimaqatuqangit*. The overall question was how could engaging Inuit youth in culturally responsive outdoor environmental programming facilitate a more meaningful connection to the environment? This

was answered by analyzing written surveys and answers from the “Ground Up Mural” activity as well as through participant observations and by performing a personal reflection through storytelling of my experience from the overnight trip to Kugluk/Bloody falls (Chapter 3).

Students expressed a strong sense of freedom, identity and respect when being out on the land. Even though not all students said that they have the same opportunities to go out on the land, they believed that learning about the local environment is important. Some students stated that they learn most about the environment from their family and Elders while others learn most about the environment in school. The students who learned most about the environment in school tended to be the ones that did not go or did not have the opportunity to go out on the land frequently to participate in land-based activities.

The “Ground Up Mural” activity was a creative method to allow students to successfully reflect on their own learning. It also allowed me to get an idea of what knowledge students retained over the course of the week, as sometimes it is difficult to get constructive responses when handing out standard evaluation forms. For example, on one of my first evaluation forms handed out in 2012 there was a question asking, “What was the most interesting thing you learned during this weeks programming?” The majority of students wrote down: “IDK” meaning “I don’t know”. The “Ground Up Mural” activity allowed for slightly more elaborate answers, which could be categorized. I learned that students did indeed learn about the environment including values that are part of *Inuit Qaujimajatuqangit*, such as being respectful while being out on the land and scientific ways of knowing, such as how berry productivity varies from year to year depending

on environmental conditions. Researchers can use the “Ground Up Mural” or similar activity as an evaluative tool for similar outreach programming in the future.

As a young non-Indigenous female researcher, it was important to reflect upon my personal challenges and successes of conducting research as an outsider in an Arctic community. One of the main lessons that I took away from this experience was that when aiming to deliverer successful outreach activities, that complement academic research, scientists must prepare themselves for extra hands-on work, practice good time management skills, and if needed seek appropriate additional funding and training. It is imperative that researchers question their own ways of knowing as well as create clear goals for the outreach programming. It is important to follow-through with effective program evaluations and to use the results to improve the programs. Results from research such as our study on berry productivity should also be made available to the public. This way, researchers will be able to see and gauge what worked and what did not work for them, further aiding in creating better and more successful research in the future. The same mistakes would less likely be repeated and there would be more meaningful learning outcomes. The results from this study will be made available on a data portal being developed for the larger study in ArcticNet on community-based environmental monitoring. It is expected that the data from this and other studies will be available in early autumn 2017.

By listening to students and the community through various communication outlets (including open-houses, community committee meetings, one-to-one meetings, participant observation, and program evaluations), I learned that language plays a crucial role in the wellbeing of one’s self and community. Kugluktukmiut want to revitalize Inuinnaqtun for themselves and for future

generations. I compiled, wrote and published *The Berry Book*, which was a way to give back to the community for their dedication to this research (Chapter 4). It was important for me to leave a legacy of the research that could be viewed and used by all Kugluktukmiut. *The Berry Book* contained intergenerational knowledge, in Inuinnaqtun and English, with information regarding the vocabulary, ecology, nutrition and *Inuit Qaujimajatuqangit* of culturally important berries gathered from Elder interviews collected during oral history workshops that took place during the Career and Technology Studies Programming. Student work from a Junior High School literacy project regarding students' experiences being out on the land picking berries were also selected to be published in the book. *The Berry Book* also includes artwork and recipes. I hope that the book can contribute to the growing collection of bilingual reading material in Inuit languages, and specifically to provide a new opportunity for Kugluktukmiut to access and reference Inuinnaqtun content.

This research was a case study driven to better understand how the changing environment affects the productivity of culturally important berry species by connecting Kugluktukmiut youth and Elders through land-based programming. Community-supported research, such as this project, that monitors the local environment should become a standard practice and become a part of a larger regional, national and international effort. Programs carried out should aim to integrate training in the natural combination of *Inuit Qaujimajatuqangit* and science. This research has provided a different perspective of teaching that could lead to different ways of teaching other subjects in high school classrooms across the Canadian North. It is not sufficient for researchers to simply carry out outreach activities, as program evaluation is key to understanding how to build meaningful capacity for Inuit youth to connect to the environment.

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Appendices

Appendix A What do students think about using Inuit Qaujimagatuqangit (IQ) and scientific approaches in outdoor environmental classes?

A.1 First Survey

What do you think about Using *Inuit Qaujimagatuqangit (IQ)* and Scientific Approaches in Outdoor Environmental classes?

Date:

Initials:

1. Was the outdoor environmental CTS course your first choice?
If not, please tell us which one was.
2. What do you think about the following statements (place a check mark in the appropriate column)?

Disagree	Kind of disagree	Indifferent	Kind of agree	Strongly agree
1	2	3	4	5

1 2 3 4 5

Learning about the environment outdoors is important to me.

I leave the community to hunt, fish and berry pick often (at least once a week).

I learn most of what I know about the environment in the classroom.

I learn most of what I know about the environment from family, Elders and community members.

I observe the environment enough to notice changes, make predictions and make travel decisions.

3. When I am out on the land I feel like:

4. When I am out on the land I wonder about:

5. When I am out on the land I know how to:

A.2 Second Survey

What do you think about Using *Inuit Qaujimagatuqangit (IQ)* and Scientific Approaches in Outdoor Environmental classes?

Date:

Initials:

1. Was the outdoor environmental CTS course your first choice?
If not, please tell us which one was.
2. What do you think about the following statements (place a check mark in the appropriate column)?

Disagree	Kind of disagree	Indifferent	Kind of agree	Strongly agree
1	2	3	4	5

1 2 3 4 5

Learning about the environment outdoors is important to me.

I would like to continue the monitoring of the environment to help further scientific researchers.

I would like to learn more about the environment from my high school teachers.

I would like to learn more about the environment from family, Elders and knowledgeable community members.

When I am older, I think will be able to observe the environment enough to notice changes, make predictions and make travel decisions.

3. When I am out on the land I feel like:

4. When I am out on the land I wonder about:

5. When I am out on the land I know how to:

6. This year, in science class I want to learn more about:

Appendix B The Berry Book

Translated by Rosemarie Meyok Edited by Millie Kuliktana



THE BERRY BOOK

Kugluktukmiut Elders and Youth
with Sarah Desrosiers



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CONTENTS

Acknowledgements - xiii

Part One: Introduction - 1

Part Two: The Berries - 5

Aqpiit (*Cloudberry*) - 7

Kigutigirngnat (*Blueberry*) - 17

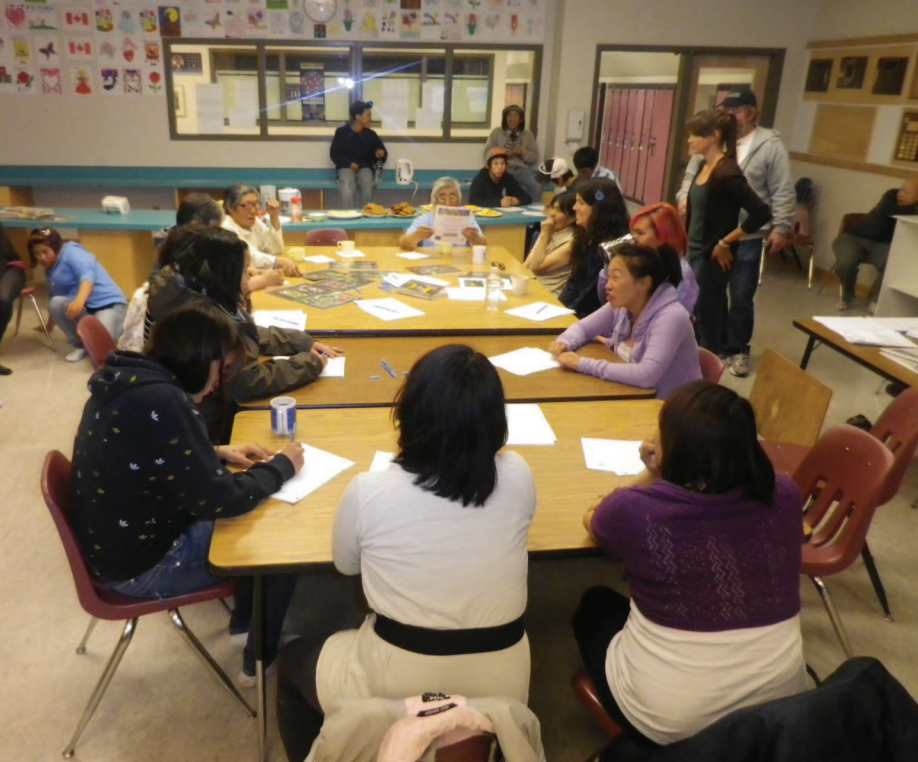
Paun'ngat (*Crowberry*) - 27

Kingmingnat (*Cranberry*) - 37

Kablat (*Bearberry*) - 47

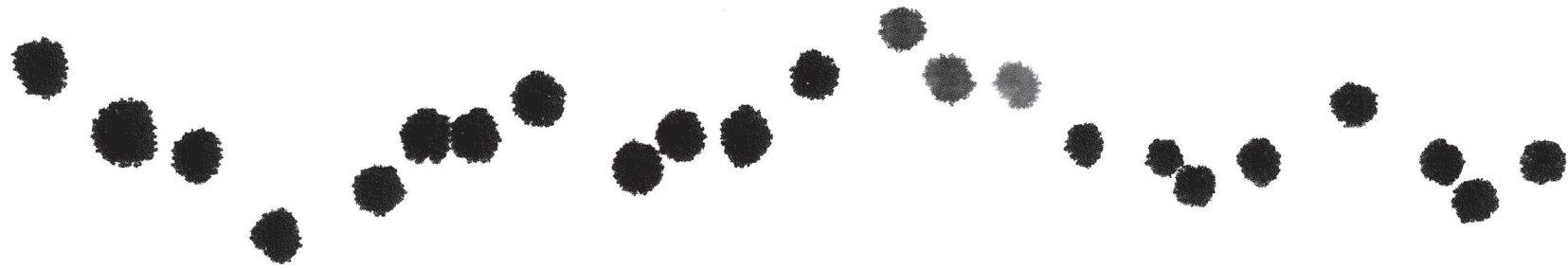
Thank You - 56







This Page: Natalie Griller, *Mother & Child*
Top Right: Natalie Griller, *Picking Berries*



Ilitariyauyukhat

Quyagivatka Mary Algona, Lena unalu John Allukpik, Alice Ayalik, Roger Egotak, Kate unalu Roy Inuktalik, Mary unalu Jack Ovilok, Annie Kigiuna, Laura Kohoktak, Agnes Kokak, Ada Ogina, John Ohokak, Mamie Oniak, Lena unalu Joseph Niptanatiak, Pauline Anomak Niptanatiak, Martha unalu Mark Taletok, Mona Tiktalek-lu. Piqqaguhutigitblugit quyagiyumaqpiqtavut uqaringmatigit qauyimayatik uvaptingnut.

Quyagiyumayavullu amigaittut inuit Kugluktumi ikayurmatigit ivaqhianikkut ayuiqhainikkut ukua Ida-Ayalik McWilliam, Annie Bolt, Helena Bolt, Agnes Egotak, Susie Evyagotailak, Danielle Frenette, Wynter Kuliktana, Allen Niptanatiak, Lisa-Marie Leclerc, Dale Skinner ukuaglu Rebecca unalu Luigi Torretti. Quyagiryuaqavut Richard Akana, Kevin Ongahak unalu Millie Hatogina ikayurmata angayukhiini iliahtunik nunami hangutillugit. Imaaluttauq quyagivavut ukua Shirley Hatogina, Doris Elatiak, Bessie Inuktalik unalu Betty-Ann Kadlun uqaqtiuvangmata ayuiqhaibluta apiqhuigaptalu unaluttauq Rosemarie Meyok numiktirmadjuk taiguakhaq. Quyagiqpiarumayaqqullu Natalie Griller titirauyaqtainik. Kingulipaakkut, quyagiyumayaqqut angayukhiini iliharvianni atan'nguyaq Haydn George unalu Gary Kennedy ikayurmadjuk takuhimayaptingnik.

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Martha Taletok*



Mary Algona



Mary Kellogok*



Mona Tiktalek*



Millie Hatogina



Anomak Niptanatiak



Helena Bolt



Ada Ogina



Betty Ann Kadlun



Bessie Inuktalik

PART ONE

— *Introduction* —

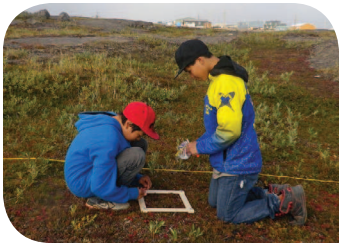


Kugluktumi Paun'ngagut Havaakhauhiq

Kugluktumi Paun'ngagut Havaakhauhiq aulaliqtuq 2009-mi imaa IPY havaakhauhiubluni. Havaqatigiblugit Kugluktuk Angayukhiit Iliharviat imaa iliharumablutik qanuq hilapta aallanguqtirnia qanuritpa paun'nganut. Una kiunahuaqhugu piliqtugut ihivriuhiniaqhuta illitturiniarutikhanik.



Ukiakhami, ilihaqtut ilihaqhutik avatiptigut ihivriuhinikkut pukukhutik qaffiiqtuiblutik uqumailtaaqhutik paun'nganik paun'ngaqtarviinnit hilataani Kugluktumi, Qurlumi Min'nguiqhiviani.



Aallakkuttauq, aallanngurnia atipkaumaniagut uktuutauyuq paun'ngaqauchia ukiuq tamaat. Taimaa, ukiukkut avatiptingnik pidjutainni ilaayunut aallat nunami hulidjutiuyuni, ihivriuqpaktaqqut qanuraaluk aputiqarnia paun'ngaqtarvigivaktavut.



Naalakhugit nunalgit ihivriurumayainik pidjutigiyaqqut ilaupkangniaqtavut nunalgit ilauvihikhaa, hilami iliharniq, aliahuutigiyakha, Inuit Qauyimayatuqangit nalunaqtunik ivaqhianik.

The Kugluktuk Berry Project

The Kugluktuk Berry Project began in 2008 as a project within the IPY program CiCAT . By working with the community, research was conducted to learn more about how the changing environment affects berries. To answer this question we established a long-term monitoring program with the help of the community.

In the fall, students had the opportunity to gain training in environmental monitoring by harvesting, counting and weighing berries from permanent plots established around the community and at Kugluk/Bloody Falls Territorial Park.

Amongst other factors, changes in precipitation has an impact on the annual berry productivity. So, as part of our winter environmental programming in addition to other land activities, we also monitor snow depths at our berry plots.

Listening to the community's research desires ensures our programming integrates community involvement, outdoor education, adventure, Inuit Qaujimajatuqangit and scientific research.



Unipkaaqtayunik Ayuiqharniq Katimablutik

Kangiqhittiarnahuaqhugu avatipta aallanguqpalliania uqaqatigilugit inirnikhaat qauyimayaqaqtut ilihimayumayaptingnik. Katimaqatigiqattaqaakhugit, unipkaaqtayunik ayuiqhautiqaqtugut paun'ngatigut nauvaktutigut nunami angayukhiit iliharvianni.

Niqiliqivik 2012-mi, inirnikhaat, qauyimayullu inulrammiit ilayut katittut angayukhiit iliharviata taiguaqarvianni ublungni malruungni atuhiup nappaanilu. Hivulliq ubluq kangiqhiyuumiyaqhugu paun'ngat nauvagviit, taimani atuqpauhiit, qanurlu tutquqhimavauhiit ukiumi paun'ngat nauvaktullu nunami, imaalu unipkaanik pihirnik atuuyautinik nauvaktut nunami paun'ngatigullu. Ilihaqtut apiqhuiblutik, imaalu uqaqatigiinginaqhutik, uqaqatigiiktillugit qun'ngiakhaq nipiliuqtauyuuq ilihaqtut tuhaayamingnik titiraqtillugit

Oral History Training Workshops

To better understand environmental change a dialogue with elders and knowledge holders is required. In depth interviews with community Elders, were conducted by José Gérin-Lajoie of our research group. The questions in the interviews were used to identify changes witnessed on the land caused by the changes in the environment.

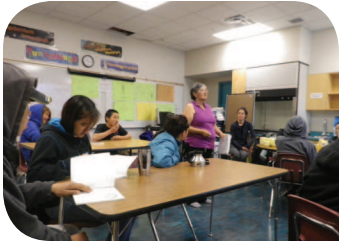
Following the interviews and after consultation and several meetings, we carried out oral history training workshops about berries and plants at the high school.

In August 2012, elders, knowledge holders and youth participants gathered at the high school library for two half-day sessions. The first day was devoted to better understanding berry ecology, traditional uses and winter storage of plants and berries, as well as to discover stories and songs related to plants and berries. Students asked questions, which was followed by an open table dialogue. Discussions were video recorded while students made notes.



Megan A. | Student Artwork

Tugliani ubluani tainiinik paun'ngat naunaiqhahiyut. Inirnikhaat naunaiyaqtait piksat, titirarvingnut nipittaagtunuanut, titirauhiit atiita tamaita paun'ngat qanuraaluglu auyuhikhaa. Uqaqatigiblugillu ilihaqtut Apiqhuutigut ihumagiyaitigut. Ilihaqtut apiqhuiblutik illitturiyumayamingnik.



Ubluqtuhiviani 2013-mi, ublup nappaani katimangmiyut. Qaitqublugit taapkua inirnikhaat ilauhimayut kitululiqaak ilauyumayut havaakhauhirmut. Uvani katimagamik illitturiyumablutik katitiqtatik malruungni ilaupkaititaigamik ihuariakhaita uqarihimangitaniglu tuhaayaamingnik taapkunuuna. Akulliit ilihaqtut Inuinnaqtun ilihaqtut naalagiaqtuqhimayullu uqaqtunik.



Ukiakharmingmat 2013-mi, havaqatigiyavut akulliit ilihaqtut Inuinnaqtun. Akulliini ilihaqtut havakpaktut taiguyukhinikkut titirayukhinikkut havaakhauhirmingnik titiraqhutik unipkaanik paun'ngaqtarnikkut. Ilangit unipkaaliuqtait titirauyaqtait atuqtauniaqtut uvani taiguakhami.



Ilitturiyayut katitiqtait ukua uvunga Kugluktup “Berried Knowledge” taiguakhaq tigungiaqtat. Quviagilugu.

The second day was intended to focus on Inuinnaqtun berry vocabulary. Elders labeled photos, on sticky notes, the traditional spelling for each berry plant and their ripeness levels. They were also given time to share with students any other comments or concerns. Students were also given the opportunity to ask other questions that were peaking their curiosity.

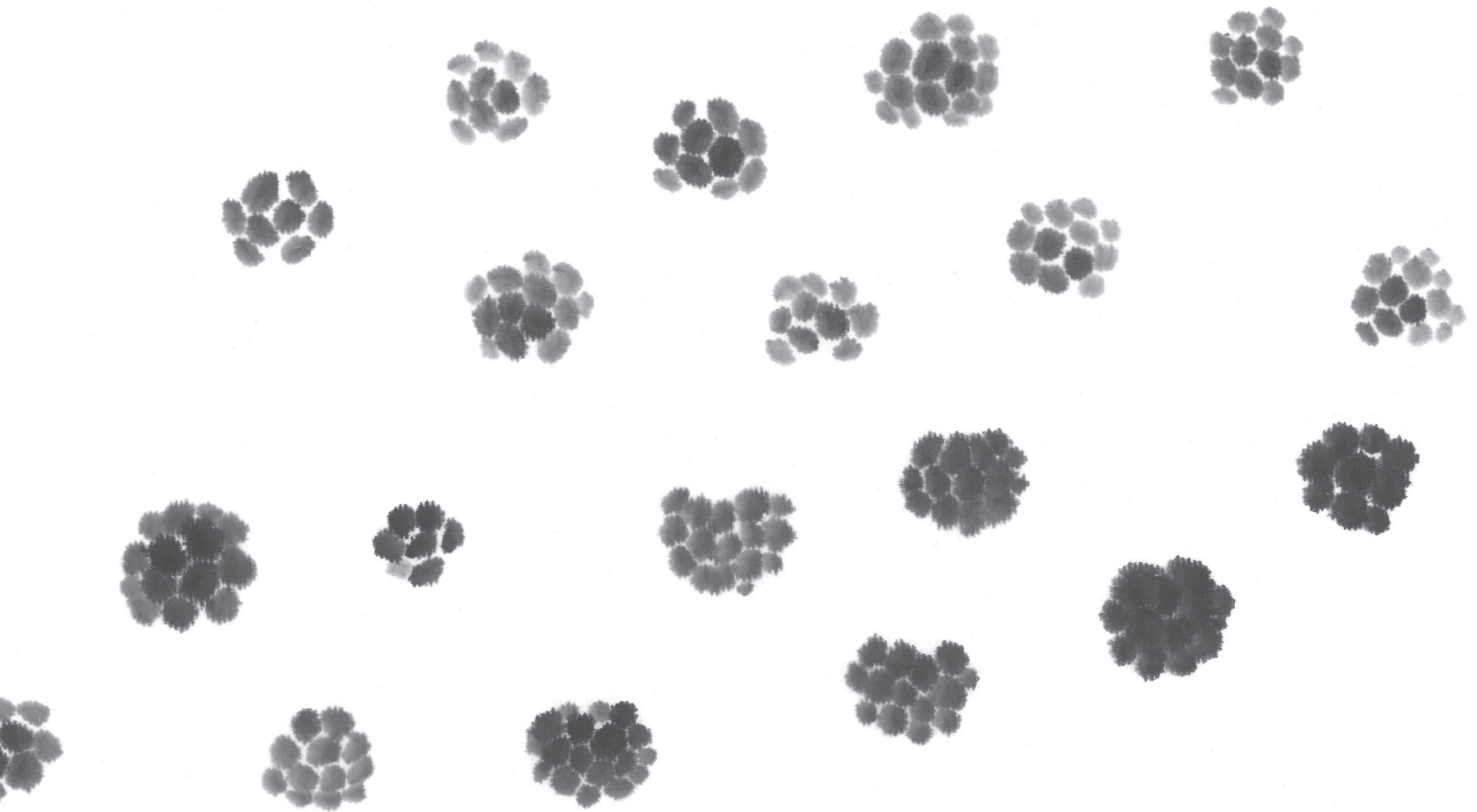
In January 2013, a follow-up half-day session was organized. We invited back the participating elders along with others who might be interested in the project. The purpose of this session was to validate the information gathered during the first two sessions and to elaborate on interesting topics previously brought up. The junior high’s Inuinnaqtun classes were invited to listen in on the conversation.

The following fall 2013, we planned to work with the junior high Inuinnaqtun classes. The junior high students worked on a literacy project that involved writing stories about berry picking. Selected stories and illustrations were chosen and have been included in the book.

The information gathered from these events have been collated into The Berry Book that you are holding! We hope you enjoy.

PART TWO

— *The Berries* —







AQPIIT

Cloudberry

Big, yellow, good to eat, food, pick with mom, happy, delicious, Fall - Autumn

Aqpiit (*Rubus chamaemorus*) uqauyait ukiuraaluk uumavaktut nauttianiik ilaqaqhutik. Hivulliuqatauvaktut nauyuktunit nunainaqmi. Nauttiangit tallimanik qakuqtanik uqauyalik angiyaaqhutik. Aqpiit nutaqqiuyuktutut ittut taimaa ahiaq nauyuq arnallurmit ihigtitauyariaqqaqtut angullurmit nauttiamit. Ahiaq nauyut amihuuplutik atauttikkut nauliqpaktut, aupayaaqhutik naulihaaraangamik quringayunnguqpaghutik nauttaraangamik. Tamangnik nauyut atauhirmik pingahunikluuniit amirtut atungauyalgit kikliit kigutinnguqaqhutik.

Laura Kohoktak unipkaaqhimayuq Aqpiit nalvaaqtauvaktut “kinipalrungmi nunanit; hinaani tahtit kinipayumi.” Taamna nauttiaq amihunik mahulik nunap ataani ilaliutivaktut nunamut uryukpaluktumut.



Cloudberry (*Rubus chamaemorus*) is a perennial herb part of the rose family. It is one of the earliest plants to bloom on the tundra. The flowers have five white petals and are medium to large in size. The cloudberry is dioecious meaning the fruit produced by the female plant requires pollination from a male plant. The fruit produced is referred to as an aggregate drupelet, which is red when immature turning orange to pale yellow when ripe. Each plant has one to three leathery leaves with toothed edges.

As Laura Kohoktak explains “cloudberrys are found around the areas where it’s moist; along the areas of the lake.” The plant sends out runners underground to root itself tightly in the peaty soil.

The cloudberry is the most prized because they are the first to ripen, they are large, sweet and easy to pick and they keep very well. They are rich in benzoic acid, a natural preservative. Nutritionally, cloudberrys contribute significant amounts of vitamin C. People need vitamin C because any excess is lost from our bodies; our body doesn’t store it. Vitamin C also protects us from infections and keeps our immune system strong.

Stages of Life



Apqiit nuvuyatut
ittut. Nauvaktut
hungayaaqtuni
ivingni. Hiirnaqpiaqtut
auryuanngitkaangamik.
Angiyuuttaaqtuq
mikkaublutiglu.
Ayuridjutinnaqtut.
Taimaalimairnaqtut.
- Darien

Cloudberry look like
clouds. They grow on
green grass. They taste
really sweet when they
are not too ripe. They
can be big to small in
size. They are addictive!
You can never quit
having the cloudberry.
- Darien

Cloudberry Flower
Akpikut naotiaq*
Aqpiqut naottiaq**

* Local dialect
** Standardized
Inuinnaqtun



Cloudberry are budding
Akpiin naoliktut
Aqpiin nauliqut



Blooming (growing)
Naoyuk
Nauyuq



Ripe Cloudberry
Aoyuk akpik
Auyuq aqpiq

Reddish-orange, taste good,
soft and juicy,
- Kendri -
the stem is green, vitamin C

Aqpiq puu-ka-
taatut ittut kihimi
auyangaangugumik
roses-tut ittut. Akhat
aqpiktuqpaktut.
Quryiqtau yut
mamaqhutik
sukalirlugit. Imigaa
hiirnaqtuq. Aqpiqtariami
alianaqtuq.

- Angel

The Cloudberry looks
like poke-a-dots but if
they are still red from
far they look like roses.
Bears eat Cloudberry.
They are yellow and
taste good with sugar.
The juice is really sweet.
It is lot of fun to pick
Cloudberry.

- Angel

Inuit Qaujimajatuqangit



Avrana | Student Artwork

Qayaqtuqtugut
hiqinnaqtillugu. Ilangit
inuit utiffaaqtukhat
havakkamik kihimi
itiuqatiginngatavut
Darlalu Darcy-
lu. Unnuaraaluk
iqqaqhaqhunga
iqalukhiuqaktunga
Darla
paun'ngaqtaraaqtillugu,
qikiqtamiittugut
ikaarnini qulini
malruungni.
Imairutiyugut kihimi
aniga Silas aiyaatigut.
- Keeran

Mark & Martha Taletok

Aqpingnulu taimailiuqpektut
(juusiliuqhutik unnakhugit)
hatqarliraangamik. Hatqarliirnaqtuq. (ahiat)
havautauttaaqtut aannialiraangat.

Mary Kellogok

“Qingaungmi aqqiqaryuarami
kigutingirnaqaryuarami. Puigulimaitara.
Taavunga nuuttukhaugaluqtaunga qakugu.
Niuvirviup (HBC) haniani, kuukkap
akiani. Pinniqpiaqtuq. Aqqiktaqpektugut,
kingminaqtaqpektugut mahutaqpektugut;
qakuqtauyut. Kiarittut ittut. Ilaanilu
niuvrutigivagait (aqpiit) umiaq tikitkaangat.”

Alice Ayalik

Ilaani nipaluluayuittuq. Paun'nganikpektuq nipalliqpakkaangat, taimaa aadjikkiik. Aputinullu atayuq nipalungmut. Ukiuqtamaat aallangayuq. Ukiuq qanurinninganut atayuq. Aippaangani aputiqalluanngittuq nipallilluanngittuq auyaq paun'ngaqaniarunaqtuq nuna atipkaumangmat. Aippaangani aputiqalluannginmat taimaa paun'ngat mikkauyut. Itqaumayuq nuna paniinnaqtuq. Taimaa nauyuqalluanngittuq.

Laura Kohoktak

“Nipallilluanngitkaangat nauyuquqalluyuituq paun'nganik. Nipallinngitkaangat paniqpektut. Hila aallanguqtiniagun'nguuq kiaq. Aallanguqpalliyuq. Hamanilu avataani nauvaktuugaluit nauyukhaiqtuq. Taimanitut ittungnaiqtuq amigaitpiaqtuugaluit taavani avataani paun'ngatarvikput. Taimaittungnaiqtuq. Paun'ngat ikigliyut. Taimailiyuq ahinilu kihimi ilaani aqqigiakhivaktugut. Ilaanilu ikittuublutik nauvaktut aunariqpakhutiglu. Aulluaqhimaittumik iyukkaraqpektut.”

John Ohokak

“Hamna alianatqiyaaq paun’ngaqtaraangat. Itqaumayunga tuktunik malingnikhunga. Tuvyiblugit, maliktuqhugit, hamunga nunannuamut tikittuta. Kingmingnaqhuyugut. Tuktut puiguqhugit. Akuvruangiqhuni. Pikuliqtuq. Pukuguirami uqumaiqtun’nguuq. Mamaqpiaqtut. Tahamna paun’ngaqtarvittiaqatuuq Tahiryuami.”

Joseph Niptanatiak

Paun’ngaqalluannngittuq hamani kihimi aqpiigiaktuq humiliqaak. Hamna uqaqtauvaktuq aupadjakpiaqpaqtuq. Qattaryuaqaruvit tahamaniitkuvit ubluraaluk tatattaqat qattat. Mayuqqat akpani. Nuna atipkangainarniani. Kugluktumiinnngittuq nunami takpaani naimannaqtuq hilap halumana. Nauttiat nauyut tamaita naimannaqtut. Hamani ilaa tuktuhiuqpaqtut tahit haniani. Imaqut inngittuq takpaanga pivaktaannit. Imaq mamaqtuq imadjariktuq. Imaq hamani marluinaugami. Imaq taavani mamatqiyaaq.

Taimaa imiqtarvikharhiuqpakkapta talvannga imiqtaqpaqtuq. Taimaa takpaani imaq imadjariktuq kihimi hamani imadjarilluannngittuq. Kuugarnit imiqtaruvit takpaani nakuutqiyaaq hamani imarlutqiyaaq marlungnit. Tahamani imiqayuittut. Nunamit imarluktuq. Inuit amigaittut tuhaahimayaat Kaomaogaktok Lake. Imaq imadjaritqiyayuuq tahirnit aallanit. Hikutiraangami imadjariktuq uyaqqat ataani takunnaqtut. Tahamani qaayurnaitqiyaaq. Qaayurnainnami auyami amigaittut nauvaktut. Taimaa aqpiigiakhivaktuq. Uunaryuumiugami. Qaayurnainnami. Ivivaluillu. Tarium hinaaniittunngittuq takpaunngayuumiraangat uunatqiyayuuq, nuna hunalliqaat nauvaktut. Kikturiagiaktuq takpaani. Uunarami. Nayurnaittuq. Takuguvit inungmik qaiyumik taunanga tunun’nga qirnariktuq nuvuyaaq takuniaqtat. Nuvuyaa kikturiaraaluk.”



Megan | Student Artwork

Aqpiit hiirnaqpiaqtut.
Takunaqhutik nunami.
Mamaqtut sukaliqhugit.
Angitqiyayut
paun’nganit
ilihimayamnit. Nauvaktut
tahit tahiqqallu hinainni.
Rose-nut ilaayut.

- Evaglok

Inuit Qaujimagatugangit

Mark and Martha Taletok

“When you have heartburn cloudberries cure the heartburn. They did not have medicine the land would be like medicine to them to cure them from sickness.”

Alice Ayalik

“We get more berries when it rains. It depends on the snow and the rain. Every year it changes. It depends on how it is that year. Last year we didn’t get a lot but this year we will probably get a lot of berries because it has been moist. Last year we did not get very much snow. That is why the berries were so tiny. She remembered that the ground got dried very fast that is why there was not much vegetation.”

Laura Kohoktak

“There is hardly any rain and not very much growth in berries sometimes. No rain and they dry up. It has something to do with the climate change I guess. It is not the same. Even up here behind where we used pick berries they do not grow anymore. Not like long ago there used to be lots of berries behind where we used to go pick berries. It’s not like that anymore. Less berries. It is same with everything but sometimes we do not get lots of cloudberries. Sometimes they grow just only a few and then they start falling off right away. They are about to get ripe and then they fall off right away.”

Mary Kellogok

“There was too much cloudberries and blueberries at Bathurst Inlet. I will never forget that. I should move there sometime. Near Hudson Bay store. You cross the river it is really shallow it is really nice. We would pick cloudberries, blueberries, mahok; they are white. They are just like carrots. Sometimes they would even sell them when the ship came.”

We went boating out on a nice sunny day. Some people had to go back for work but I stayed back with Darla and Darcy. I fished all night while Darla was berry picking the whole time. We were out on the island for 20 hours. We ran out of water but my brother Silas come to pick us up right on time.
- Keeran

John Ohotak

“He remembers he was chasing a caribou. He was tracking it, chasing it and he ended up going to this little ground. He found cloudberry. He forgot about the caribou. He took his shirt off. He started picking. And then after he finished picking he said they were really heavy. They were so tasty. So that is the best place to pick berries in Contwoyot area.”

Jospeh Niptanatiak

“There is a place inland that sometimes gets really red. The islands too sometimes they get really full. If you have a really big great big pot if you were there the whole day you would probably fill the whole bucket. It is a place where the landscape is really healthy with more moisture. It is not like in Kugluktuk. If you go inland you can smell the fresh air. You can smell the plants, everything. You know around this area they went out caribou hunting around the lakes. It’s not like the water you get from up there. The water is tastier. The water here is too muddy. The water tastes different there. That’s

why they’ve been hunting all over to find fresh water so they said we might as well get water from there. That’s how fresh it is up there but when you get to this area it’s not as fresh. Even just around this area when you go around here the water in the rivers is clearer but here it’s really muddy. You can’t get water in this area. It from the kind of soil. A lot of people know about this place they call it Rocking Horse

Lake. It is really good drinking water and clearer than all the lakes they have up there. Even when it kind of freezes up it’s really clear you can see the rocks that are under. It is always warm there. It doesn’t get cold that is why a lot of plants grow in the summertime. That is why the cloudberry they grow lots. There is always a lot of heat there. It’s never cold. Even shrubs. There is so much blackflies in that area. It’s so hot. He can’t stand that area. If you see a person coming from that way and from behind you see big black clouds just like smoke. Big clouds of blackflies.”



Carrie | Student Artwork

Cloudberry are very sweet. They are easy to spot. They are very yummy with sugar. It is the biggest berry I know. They are mostly by small lakes and big ponds. They are related to roses.

- Evaglok



Kendrick | Student Artwork

Aqpiit
mamaritqiyariyatka
hilaryuami.
Puigulimaitatka aqpiit.
Ilaa. Alianaqtuq
aqiktariaraangat
auyaqtamaat.
Aliattakpiaqpaktunga
maamangma
unniutigaangaptigut
aqiktariarnialigtugut.
Nirihuirurunaitatka
hapkua mamaqpiagtut
aqpiit.

- Florianne

Aqpik Jam

2 aluutinnuaq olive uqhuq
1 ainak, haatunik
avguaqhimayuq
2 garlic hingaqtihimayuq
nappaa aluutinnuaq au-
payaaqtuq papak
¼ qallut vinegar
¼ qallut honey
1 aluutiryuaq paniupayuq
mustard
1 qallut aqpiit
taryuq papaglu

uqhuq uunnakhirlugu angiyumi qattarmi qitqanut uunakhirnianut.
Ainak ililugu garlic-lu. Igalirlugu ayakhaqattarlugu, ainak aqilittirlugu.
Aupayaaqtut papak ililugu, vinegarlu, honey-lu, mustard-lu. Igalugu 2
mininmi.

Uunarnia akparlugu, ilalugu aqpingnik, igalugu ayakhaqattarlugu, aqpiit
ahiruqtiliqhuni kiniqtittunilu, 20-30 minini. Taryurlugu papagluglu.

Mamaqtuq ilauyaami quviahungnirmi tingmiaqturaangat
tuktuturaangaluuniit aallaniglu niqinut algiqhiqhimayunut.

“Ublaakkut Hiqinnaaq” Imigaq

1 qallut aqpiit
½ banana
¼ qallut yogurt
¼ qallut juusi

ayakhautimut ayakhaktirlugu una qapunnguqtiqtilugu.

Ikayuut: tutquumayaami aqpingnik ukiuraaluk iliurarlugit hikuliurutinut
qaliriiktirlugit qiqtirlugit. Tallimat kikkariktunnuat aadjikkutaa atauhiup
qallutimikiaq.

Savory Jam

2 tbsp (30 mL) oil
 1 onion, thinly sliced
 2 cloves garlic, minced
 1/2 tsp (2 mL) red
 pepper flakes
 1/4 cup (60 mL)
 vinegar
 1/4 cup (60 mL) honey
 1 tbsp (15ml) grainy
 mustard
 1 cup (250 mL)
 cloudberry
 Salt & pepper

Heat the oil in a large pot over medium-high heat. Add the onions and garlic. Cook, stirring often, until the onions are golden brown. Stir in the red pepper flakes, vinegar, honey and mustard; cook for 2 minutes. Reduce heat to medium and add the cloudberry. Cook, stirring occasionally, until the cloudberry start to break down and the chutney has the consistency of a thick sauce, another 20 to 30 minutes. Season with salt and pepper.

A good substitute for cranberry sauce at holiday meals over turkey and with caribou or other game roasts.

Tasty, jam, juicy, cloud, only a few, orange, not too small, not so much around - Preston

“Good Morning Sunshine” Smoothie

1 cup of cloudberry
 1/2 banana
 1/4 cup yogurt
 1/4 cup of fruit juice

Blend this drink until it's smooth and frothy.

Tip- to store cloudberry to use in smoothie drinks over the winter month fill berries into ice cube trays and stack them in your freezer. Five frozen berry cubes equals roughly one cup.

Cloudberry are my favorite fruit in the world.
 I will never forget about the cloudberry. Never. It is fun to go Akpik picking every year. I get very excited when my mom tells me that they are going to pick Akpiks.
 I will never stop eating these delicious most precious cloudberry.
 - Florianne





KIGUTIGIRNGNAT

Blueberry

sometimes you can freeze them
are growing - Anu
are gre
sometimes can't be

Kigutigirngnat (*Vaccinium uliginosum*) mikiyuni naittuni nauvaktut taimaa qiyuinarnirmi qaffini nakaviini atauhiinaunngittuni. Nakaviit takhittaaqtut kihimi nunam qaangannuangani natirnannguqhuni. Uqauyait aryiqtavyauyut hungayaaqtut upin'ngaami auyamilu aupayaanguqhutik ukiakhami. Nauttiangit atauhiinauttaaqtuq malruungulutik pingahuulutiglu. Mikkauyut, hivayautinuautut aupangablutik qakuqtaqaqhutik.

Kigutigirngnat nauvaktut amigaittutik natirname. Paun'ngaqaryuaraangat auyami, natirnaq aryiqtannguqpaqtuq kigutingirnanit, Marthalu Mark Taletoklu uqaqtuk: "Kigutigirngnat nauvaktut uqpiqarnirni." Lena Niptanatiak uqaqtait: "nauvaktut nunami atipkarniini nipaluluanggitkaangat nauyunaittut.



The blueberry (*Vaccinium uliginosum*) is a dwarf shrub meaning that it is a small woody plant with several stems as opposed to a single trunk. The stems can grow upright but can also lie close to the ground forming a mat. The leaves are bluish green in the spring and summer but turn red and fall off in autumn. The flowers can be solitary or in a cluster of two to three. They are small, bell-shaped and usually pink with some white.

Blueberries grow abundantly on the tundra. In a good berry year, the tundra has a bluish hue from so many berries. Martha and Mark Taletok explain that: "blueberries sometimes grow around willow and birch." Lena Niptanatiak notes that: "they grow where there is moist soil but when there is hardly any rain they do not grow."



Algek | Student Artwork

Stages of Life



Blueberry Flower
Kigutaginakotik
Kigutangirnaqutit

Kigutigirngnat mamariyatka mamarmata. Algaga tatattugik nirivaktatka kigutitka aryaqtannguqaktut. Kigutigirngnat matqiyayut juusiqaramik. Huurlikiaq paqituminaittut Kugluktumi. Kugluktumi kigutigir-nagiaktuhayuugaluag nakuutqiyaumata.

- Joshua



Unripe
Kigutagitnak naolihaliktut
Kigutangirnat naulihaaliqtut



Turning
Aohimaitok kigotagitnak
Auhimaitut Kigutangirnat

Blue. Soft. Taste better
than candy - Elvo G



Ripe
Kigotagitan
Kigutigirngnat

I like blueberries because they taste good and are nice and tasty. I like eating handfuls until my teeth are blue. Blueberries are the best because they are nice and juicy. I wonder why they are hard to find near Kugluktuk. I wish there was only blueberries around Kugluktuk because they are the best.

- Joshua

Inuit Qaujimajatuqangit

Mona Tiktalek

“Ublumi illitturiliqtugut paun’ngat
aallanguliqtut hiirnarniilu.
Mamalluarungnaiqtut taimanimit
ilaanilu augaangamik ilangit
paniinnaqpektut.”

Laura Kotoktak

“Kigutigirngnat taimanimit aallanguqtut. Taimani
angiyuugaluit. Hadja nipalliluarungnairami
mikkanguqtut kigutingirnat. Iptialu aallanguqhutik.
Hiirnaivyaktut (...) kuqallu tahiqqallu imairamik.
Ihumayunga paniqpalliagamik naulluarungnaiqtut.
Nuna imaqqalluarungnairami nauyungnaiqtut nauttiat
paun’ngallu. Nipallilluannginnami aippaangani taimaa
nauttiat naulluanngittut paun’ngaqqalluanngittuni.”

Mamie Oniak

“Qikiqtaniiliqpektut iqalliqiblulik kuvyaqtuqhutik. Iglunnuqaqhutik. Aippaata
paun’ngaqtaquyuitaa imailibluni, ‘Paun’ngat pihurlugit tingmiat paun’ngakhait. Paun’ngaiyarungni
tingmiat mittunaittut.’ Taima tingmianut niriyaqhait tingmiariamini. Paun’ngat tingmianut
niqikhaarivagait tingmiat paun’ngaqturiangata. Ilaani paun’ngaqtaliqpektuq kihimi pukuyuitait
paun’ngat qanittut imaa qanitikumik makainnarialgit.”

Annie Kigiuna

“Itqaumayuq mikiyumik paun’ngaqtarnikkut Tahiryuami. Ilaani ihumaliqpektut akkuqtaugumik
akhanit angayuqqaangita unghahiktiquyuitait akhaqtaarmat. Hunanigliqaak pukukpektuq tahamani.
Maamaa amigaittunik paun’ngaqtaqpektuq. Quyaqinnaq. Tatattivaktugut qattaryuaptingnik...
ukiuraaluk paun’ngakhavut.”

Pukugiami ayurnaittut
pukuttiaruminaqtut.
Kaimalluriktut.
Hungayaaqtut
auhimaikaangamik.
Aliattakpakpunga
amigaitkaangata ilaani
paqinaiqpangmat.
Quvianaqtuq
nunamiitkaangat
kigutingirnaqtaqhuni.
Sukaliraangata
hiirnaryuumivaktut.
Aryiqtauyut
augaangamik.

- Kendal

Agnes Kokak

“Hamani apqutinikkami hiuraq titqalaanginnaqtuq. Hiuraq humiliqaak nunamit titqalaanginaqtuq. Apqutillu marluinanguqhutik. Apqutit paniupagaangat titqalaanginaqtuq. Hamaninnuaq paun’ngaqtayuuqaaqhuta, igluqannginmat hinaani. Takpaungaunginaqhuta paun’ngaqtaliqpaktugut hadja tahamangainnaq paun’ngaqtalimaiqtugut hiuraraalunngurmat... paun’ngaqtariaguma hadja nauyuriakhiyut uqpingni. Aqpilik takpaani taavani kihimi paun’ngaqtarvigaluaru uqpiinannguqtuq. Takhilutigli.”

Martha and Mark Taletok

“Aippaangani (2010) paun’ngaqaalluanngittuq kigutingirnaqaalluanngittuq. Nauyut hadja naulluanngittut. Nakuulluanngittuq. Apilluannginami ukiumi. Apiryuaqtugut ukiuq. Naunialiqitut apiqpiarmat hadja. Aippaangani anuqhiinarami taimaa aputiqalluanngittuq. Uunnakkaangami nipalliqpakkaangami paun’ngaqaqpaktuq. Hiqinirmit uunnakkaangami nauyukhaqaqpaktuq paun’ngaqaqpakhunilu. Ilihimayuhi ikualaaqtuqarmat napaaqtunik ausaimi 1968-mi. Hamunga tikitpaktuq puyuraaluk hamani ikualaaqtunit taimaalu nauyuqalluanngittuq. Talvanga atagami, puyuraalungmit nauyukhat hila nakuulluannginmat. Uqaudjauvaktugut tuktubarupta hilaunngaqtailiblugu nakuun’ngiqhunngungmat niqaa. Uunnakpiarmat, kikturiaqaalluanngittunilu. Ilaani uunnakpallaaraangat kikturiaqallualimaittuq.

Mona Tiktalek

“humuliqaak qayaqturupta paun’ngaqtapaktugut. Aupayaaqtunik kablaqaqpaktuq ukiakhami. Kigutingirnagiakhibluni kinguliublutik paun’nganut kihimi kigutingirnaqaalluanngitpuq. Kuungnahirmi taavani uataani kuukkap. Kigutingirnaing ilaani haataqhutik taavunngauvaktut. Angunahuaraangapta paun’ngaqtaliqpaktugut. Hamanga paun’ngaqtaliqpaqaaqhuta taimani kihimi paun’ngaqtalimaiqtut hamaninnuaq. Iglugiakhivallaarmat taavungalu iqqakuurviup mikhaanut paun’ngaqtaliqpaktugaluat. Paun’ngaq amihumik kihimi nakuulluanngittut.

Kigutigirngnat amiga-itpiaqtut Kugluktumi. Hiirnaqtut. Aallangayut ukiuq tamaat. Auyami kigutingirnanik niuviriit-tuq. Nauvaktut mikiyuni uqpiqarnirni. Vitamin C-qaqtut. Aallatqiit. Almatit kalaningnaqtut. Mamatqiyat niuvirvingmit niuviqtanit. Juusi-iaqtut mamaqtut.

- Coral

Inuit Qaujimajatuqangit

Mona Tiktalek

“Nowadays we see the ripeness of the berries is changing and the taste. They do not taste so good as they used to be and sometimes when they ripen some of them dry up right away.”

Laura Kohotak

“The blueberries are not like long ago. We used to get really big blueberries. Now we do not get very much rain and we just get small little blueberries. The tastes are different. They are not as sweet. The rivers and lakes hardly have any water. I think they are drying out that is why our plants are not growing much. There is not enough water flowing to the land reaching the vegetation and berries. That is why we did not get very much rain last year and that is why the vegetation did not grow much and we did not get very much berries.”

Mamie Oniak

“They used to stay on these little islands when they were fishing with fish nets. This place they had a cabin. Her husband would tell her not to pick berries. He used to say “just leave the berries because all the berries are for the ducks” because if you pick most of the berries the ducks would not land. It was like bait for him so that he could get ducks. The berries used to be like bait for the ducks so he told his wife not to pick the berries so the ducks would come over to pick the berries. Sometimes she would pick them anyways but she did not pick up the berries that were close by because if they land close by they are easier to be targeted.”

Annie Kigiuna

“She remembers a little bit about picking berries at Contwoyto Lake area. Sometimes they think they are going to get caught by bears because their parents told them not to go too far because there are bear around. Everything she picked there. Her mom used to pick lots of berries. Anything. We sometimes filled up our big pots...we used to keep them for winter.”

They are easy to pick.
The shape of it is round.
They are green when
not ready. I feel excited
when they are in a
bunch that I couldn't
find for a long time.
It's fun to go out on the
land for blueberries.
Sugar makes them very
sweet. The color is
bright blue when ripe.
- Kendal

Agnes Kokak

“There are roads here and the sand just flies. There is dust all over the ground flying around the ground. The roads are muddy. If the roads are dry they just fly by. We used to pick just berries around here. There used to be no houses along the shore. We would just go up there to pick berries but now we cannot go because it is too dusty.... If I go where I pick there would be willow shrubs everywhere now. There are cloudberry growing up there that way but if I go where I used to pick berries there would be willow. The branches are growing taller.”

Martha and Mark Taletok

“Last year (2010) we didn’t have many blackberries and blueberries. The plants that you see didn’t really grow. It was really poor. There was less snow that winter. We got lots of snow this year. I think it is really going to grow because there is lots of snow now. Last year we had too much wind that’s why we didn’t get much snow. The heat and rain is a good indicator for berries to grow. When there is a lot of heat from the sun that is when there is a lot of vegetation and berries that grow. You know we had that forest fire from the south in 1968. It came here and we had so much haze from the smoke and that is why we did not get much growth in the vegetation. It really affected, not enough air to keep these plants growing. They used to tell us that if you get caribou meat do not put it outside it can spoil the meat. It was really hot. We didn’t get very much mosquitoes at that time. Sometimes when it’s really hot there are no mosquitoes.

Mona Tiktalek

“Anywhere we go boating there are berries all over. Red berries are in the fall. Blueberries are the most abundant after the crowberries but there are hardly any blueberries. Richardson area is on the west side of this river. Mostly blueberries even sometimes people go Honda over there. When we go hunting we end up picking berries. We used to pick around here too long time ago but you cannot pick anymore. There are too many houses and towards the dump they used to pick cloudberry but the sewage lagoon and garbage dump now. There are lots of berries anyway but they aren’t good.



There are tons of blueberries in Kugluktuk. They are very sweet. They are different every year. You don’t have to buy berries in the summer. They can come in small bushes. They have lots of vitamin C. There are all different kinds. They make your hands colorful. They taste better than store bought berries. They are very juicy.

- Coral

Berry Explosion Muffins

3 qallutit muqpauyakhag
2 1/2 aluutinnuat publak
1/2 aluutinnuat taryuq salt
3/4 qallut pata (margarine-
luuniit) mahakhiqhimayut
1 1/2 qallutit suka
2 manniik
1 teaspoon vanilla
1 1/4 qallut miluk
3/4 qallut Kigutigirngnat
3/4 qallut kingmingnat – su-
kaliqtuqhimayut 1/4 qallunmik
sukamik
Ilangainaq havigaliup ahiangi-
naq paikhaq
1 aapuu haattunnuanik
avguaqhimayuq

Milunguqtirlugit urviuyarmi:
pata aukalu... avulugit manniit vanillalu
aallami urviuyarmi ayakharlugit:
muqpauyakhag, puplak, taryurlu

Avulugit milunguqtiqhimayumut atauhiillaaqtarlugit
milungmut – ayakhaqpallaaqtailugu
qayagilutit iliurarlugit kigutingirnat kingmingnallu

Qaliqtakhanik makpiraanik maffinnut iggatitit ilulirlugit
tatallugit (uqhuqtirlugit qaangit mafinnut iggatit) qaangagullu
aluunmut tamaita (qaangaguut qalatirniaqtuq qaangagullu
haattunut avguaqhimayunik aapuunik illirittaagtat
atauttimiuyaangat).

Utirlugu uunarniani 375°F 25 minits-ni.

Ataagut illirilutit haatumik hiqulauyautiliurunmik kiviaktaqat
tahamungainaq kiviynaittuq.



Berry Explosion Muffins

3 cups flour
 2 1/2 teaspoons baking powder
 1/2 teaspoon salt
 3/4 cup butter (or margarine)
 softened
 1 1/2 cups sugar
 2 eggs
 1 teaspoon vanilla
 1 1/4 cup milk
 3/4 cup blueberries
 3/4 cup cranberries – coat with
 1/4 cup sugar
 Partial can of berry pie filling
 1 apple thinly sliced

Cream together in the mixer:
butter and sugar, then add eggs and vanilla.

In a separate bowl mix together:
Flour, baking powder and salt

Add to creamed mixture above alternately with the milk – do not over mix. Gently stir in blueberries and cranberries.

Fill paper lined muffin cups to the brim (grease the top of the muffin pan). Put a dollop of pie filling on the top of each one (the batter will bake over top of it so it helps to put thin apple slice on top to hold it in place).

Bake at 375°F for 25 mins.

Put a cookie sheet below in case any drips over so it won't hit the element.

I make blueberry bannock. It tastes sweet.
Julianne
Pie -
We can drink the juice. Sweet. Round.







PAUN'NGAT

Crowberry

Paun'ngat (*Empetrum nigrum*) nunam qaangannuani nauvaktut ilaktittutik natirname. Hungayaanginaraangitaqtut uqauyait atavaktut haniraangni atauhiulaaqhutik. Mikkauyut amigairutiblutik nakavianut. Nauttiangit naukaffukpaktut naunaqhigaangat. Nauttiat nauvaktut mikkannuani nakavinnuani uqauyaini takunnaittutik. Ahiangit qiblarikhivaktuq augaangami. Amiraa hirnaqarnia haunaaqaqhuni atauhirmik iluani cherry-tut peach-tut. Ahianga allatqiyauyuq imaa haunaaqaqtuq malruungnik naitut marlungayut.

Lena Allukpik uqaqtuq: “Paun'ngat nauvaktut uyaraqarnirni tahamaniinarlu nunami iviqarniit haniani. Nuna kinipagaangat naammagiya. Nipalliraangalu nauraanginaqtut.”



The crowberry (*Empetrum nigrum*) is a low-growing shrub forming tangled mats. Its evergreen leaves attach directly to the stem in an alternate fashion. They are tiny and waxy and are densely packed on the stem. The flowers grow for a very short time early in the growing season. The blossoms grow on little stems in among the leaves and are very difficult to notice. The fruit turns into a shiny berry-like drupe when ripe. A drupe is a fleshy fruit with an inner stone or pit that usually, but not always, surrounds one seed just like a cherry or peach. The fruit is an unusual drupe because it contains two to nine brown seeds.

Lena Allukpik explains that: “Crowberries grow mostly near the bedrock and just on the ground and near some bushes. They like mostly moist soil. Even when it rains they grow.”

Black, round, great, purple, soft, sugar, to some in town are gross, dusty, grayden



Iris | Student Artwork

Stages of Life



Photo | *Alain Cuerrier*

Flower
Paongakotit
Paun'ngaqutit



Green
Paongakotit aohimaituk
Paun'ngaqutit auhimaittut



Andi | *Student Artwork*



Turning



Ripe
Paogat
Paun'ngat



Hikok | Student Artwork

Inuit Qaujimajatuqangit

Martha unalu Mark Taletok

“Tuktut amiit mitquiyaqhimayut puuliurutauvaktut. Ukiakhami apitiqtinnagu anaanattiarra aqpiktaliqpaktuq ukiuq atuqtakhanik. Puuriblugit. Tutquqpagait ukiakhami. Ukiuraaluk atuqtakhaq. Mamaqturvikput(...) Apitilirvik atulihaaliraangat tutquqpaktavut qaraqtiqtinagit. Ilihimayahi taapkua sukanut puuraluat taapkuninngalu puuqaqpaktut. Taapkuninnga puuqhugit nunamut ilivagait. Ilaanilu kalikutik puurivagait puukhaitkaangamik. Kalikuugamik paun’ngat nakuunginaqtut. Ilaani puukhairaangamik akuvruatik atuqpagait puuriblugit. Taapkualu havigaliit miluqarviugaluit puurivagait.”

Mark Taletok

“Uqpiit ikualaaqtittigiami atuqtauvaktut. Anaanattiarra uqautivaktaanga ihirmitqublunga. Iyikka nakuun’ngiqpiaraanganik ihirnipkaqpaktanga. Iyikka nakuuhipkaqpagaa. Iyikka nakuulluanngitkaluarmanik nutaraublunga. Taimaa inuuhimagama. Hinikkaangama iyikka quryiqtat paniqpiaqpaktut iyimnut. Taimailuqpaktugut nunamiinnapta. Ingniuqhuta ihirmut haattuta iyikka takpikhiinaqtuk.”





Elonghok | Student Artwork

Lena Niptanatiak

“Uluagulliit nirivagait paun'ngat. Ilaani ausaimut aulayaaliraangamik tamatqiutivaktut paun'nganik. Taimaa paun'ngaqtarnariqtuhauyugut tingmiat niritinagit. Paun'ngat uumadjutigiyaat.”

Joseph Niptanatik

“Taimaniraalik inirnikhaat qauyimayut kanguyanningnialiraangat ilihimablutigliu paun'ngariangniarmat auyami. Imaa uqaqpektut kanguuyat takunnaqhigaangamik naunairaangamik qakuqhiblutik ilihimablutik nauyuni nakuuyuq paun'ngariangniaqtuq nauyukhani nakuuyuq (...) nuna nauvaligaangami hungayaanguqpaktuq taimaa ilihimayugut nakuuniaqtuq nauttianut. Naunaitkutauyut kanguuyat takunnaqhigaangamik. Takuttaaqtahi. Nauqpiaraangamik naunaittut nakuuyumik nauniaqtut. Aupayaanguqpaktuq. Apitirvingmi tamaat nuna aupadjaalaqivaktuq quryiqtannguqpaktuq. Nakuuyuq tuktunut ukiakhami niriniaramik tunnunigiangita.”

Black, round, yummy,
happy, delicious,
shiny, circle -
Hitkaqoy

Inuit Qaujimajatuqangit

Martha and Mark Taletok

“The caribou hide that has the hair removed was used like a little basket. In the fall time before the snow comes his grandmother used to collect berries and cloudberry for the winter. They used it just like a little basket. She would put them away in the fall time. It is just like for the whole winter in the basket. It was just like a treat (...) just at the beginning of September they would put the berries away so they would not get crushed and stay fresh. You know those old sugar bags they used them too. They used to put them in those and put them under ground. Even ones they used their covers too when they got no bags. It is material so the berries would stay fresh. Sometimes they had nothing to put the berries in they just used their shirt to put them in. Even those cans that used to be for milk containers. They used to put those in the milk containers to keep them fresh.”

Mark Taletok

“You know those branches are used to start a fire. My grandmother used to tell me to come for the smoke. When my eyes get really bad she used to make me stay where the smoke is. It would kind of cure my eyes. My eyes were not too good when I was young. I was born like that. When I slept I got lots of yellow stuff. That is what we do when we go inland. We make a fire and face the fire and our eyes got clear after that.”





Preston | *Student Artwork*

Lena Niptanatiak

“The geese eat the blackberries. Sometimes when they are going down south they finish all the berries. That is why you have to pick berries right away before the ducks come. They depend on berries.”

Joseph Niptanatik

“Long time ago some elders knew when the cottongrass really blooms and they know that there is going to be a lot of berries in the summertime. They would say when they look at the cottongrass it is just like them telling them it gets really white and they know it will be good plants and berries and growth of vegetation (...) the vegetation when it grows it gets really green that is when we know it is a good time for plants to grow. It is only a sign to see the cotton grass. You look at them. If it is really grown you know there will be good growth. It gets red. Sometimes in September all the vegetation it gets red and yellow. It is a good thing for the caribou because in the fall time the vegetation that they eat they produce more fat.”

Black, yummy, happy, sweet, circular, shiny, good with sugar, too much seeds! - Megan



Paun'ngat Juusi

hitamanik
qallutiliuqtaaqtuq

Atauttimut paun'ngat atauhirmiglu qallunmik imaq. Qaraqtirlugit paun'ngat. Purriqhirlugu 10 minits-ni, kuviqtarlugu kuhiqtautiqlutit, kiviqhirlugu juusia urviuyarmut.

Imarigiangat, ivyuktuqtaililugu naqitartaililugu jalia puuq kuhiqtautit. Tutquumakhaagiangani, juusi qiqittiqaagtat.

Paun'ngat Qiqumayut Jelly

8-nik qallutiliuqtaaqtuq
3 qallutit paun'ngat juusianik
4½ qallutit suka
1 puuq powdered pectin (1¾ ounce)
½ qallutit imaq
2 aluutiryuak lemon juice

Avuurlugik sukalu 1¼ qallut paun'ngat juusi, ayakhattiarlugu hanirarnunngarlugu atuqtakhat.

Kayumiittumik avuurlugu pectin imarmut; uunnakhirlugu purrivyalihirlugu, ayakhaqattarlugu. Kuvilugu pectin avuughimayuq ilakkuanut 1¾ qallut paun'ngat juusia. Ayakhattiarlugu. Tahamaniipkarlugu 15 minits-ni. Ayakhaqpaglugu. Avuurlugit juusi sukhalu pectinqaqtumut. Ayakharlugu sukaa mahattiaqhirlugu.

Kuvilugu qiqittiqaagtunut urviuyarnut. Matuttiarlugit.

Tahamani ilihimallaglugu nakuuhittirlugu, ikaarnini siksini unnuaraalugluuniit. Titirlugu nipitiaqtaaqtumut ubluani hanagangni hunauyaakhaalau, qiqittirlugu. Niglaumavingmut ililugu angmaqtauhimakpat. Qiqitinngitpat, niglaqhiivingmiittukhaq atuqtaulunilu siksit havailaat aniguqtinagit.

Crowberry Juice

8 cups crowberries
1 cup water

Combine 8 cups of crowberries and 1 cup water. Crush the berries using a masher. Bring just to a boil and simmer 10 minutes. Strain through a jelly bag or several layers of cheesecloth in a colander. Let the juice drip into a bowl.

For clear juice, do not twist or press the jelly bag or cheesecloth. For long-term storage, the juice should be frozen or canned. Makes 4 cups.



Crowberry Freezer Jelly

3 cups crowberry juice
4½ cups sugar
1 package powdered pectin
(1¾ ounce)
½ cup water
2 tablespoons lemon juice

Combine the sugar and 1¼ cups crowberry juice; stir thoroughly and set aside.

Slowly mix the powdered pectin into the water; heat almost to boiling, stirring constantly. Pour the pectin mixture into the remaining 1¾ cups berry juice; add the lemon juice. Stir until the pectin is completely dissolved. Let pectin mixture stand 15 minutes. Stir occasionally.

Add juice and sugar mixture to the pectin mixture. Stir until all the sugar is dissolved.

Pour jelly into freezer containers. Cover with tight lids.

Let stand at room temperature until set, which will be from 6 hours to overnight. Label containers with date and contents, and freeze. Refrigerate after opening. If not frozen, keep refrigerated and use within 6 weeks.

Makes 8 cups.



Aimee | Student Artwork





KINGMINGNAT

Cranberry

Kingmingnat (*Vaccinium vitis-idaea*) nunam qaangannuani nauviit qituyuni uqauyani. Nakaviit tuattut nunam qaangagut naublutik. Nauttiangit mikkauyut aupavyakhutik. Ahiangit aupayaaqpiagtut hirlungablutik. Ukiuqtaqturmiut pukukpagait qaayurnaqhiliraangat hiirnannguraagnata.

“Kingmingnat nauvaktut qaiqtut hanianni. Uqqiqarnini hanianni” uqaqtuq Mary Kellogok. Humiliqaak nauvaktut, uqariyaa Joseph Niptanatiak: “humiliqaak hila uunaumakpat nauyaamingni nuna hiuraqanirmilu.”



The cranberry (*Vaccinium vitis-idaea*) is a low growing shrub with stiff waxy evergreen leaves. The stems are slender and trail along the ground. Its flowers are small and pink

with a shape of a bell. The berries are vivid red and very sour. Most northerners pick cranberries after the first frost when they are sweeter.

“The cranberry grows near the bedrock. Where there are a lot of shrubs, near the birch” as explained by Mary Kellogok. They grow almost everywhere especially, as described by Joseph Niptanatiak: “in moist areas where the weather is warm enough to grow and where there is a little bit of sand underneath.”

sweet and tasty, circle, I feel happy, they are bright, red and grow big - Elisha



Angel | Student Artwork

Stages of Life



Flower
Kingminakut
Kingminaqt



Green
Kingminat aohimaitun
Kingmingnat auhimaittun



Angel | Student Artwork



Yummy, soft, sometimes you put sugar on them and sometimes you can freeze them - savanna

Turning
Kingminat naolihaktun
Kingmingnat naulihaaqtun



left:
Ripe
Kingminat aoyut
Kingmingnat auyut



right:
Over ripe
Kingminat aipaganitan
Kingmingnat aippaanganirnitán

Inuit Qaujimajatuqangit



Kaniak | Student Artwork

Kate Inuktalik

“Tuktuhiuraangata pukuyuittut paunnganik tuktuhiuqtillugit. Tuktuhiulluaqpektut pukukhimittumik qiniqhimainaramik tuktukhamik. Paunngaqtaraangata kihimi paunngaqtaqpektut.

Mona Tiktalek

“Aullaqpaqtilluta qimniqtuqhuta qikiqtanut, aput mahaktiliraangat kablat takunnaqhigaangata jaaliuliqpaqtugut. Igahimaittumik. Sukaliqtuqhugit kihimi.”

Mark and Martha Taletok

“Iggarliuruvit, qalalaqiguvilluunniit uunakhiqhugit kingmingnait imiqtakhaliuqhugit. Maamaata imiqtaliqpagaa uunaqpiqtaqillugu. Imiqtakhaliuqhimayuq kingmingnarnit. Pukukqaarlugit imigaliuliqpagait. Puriqhirhugu imarmut imigaliuqpagait nakuuhidjutigiliqpagait. Imiqpagait niglaqtinnagit.”

Roy Inuktalik

“Hadja nipalugyuarungnaiqtuq. Nipalaanginaqpaqtuugaluaq. Tahamani tabiqaqhimayuugaluaq. Imaqainnaqtuugaluaq nipalaanginnaqhuni imaqainnaqhimayuugaluaq hadja paniqtuq. Ukiuq hadja paunngait nauqpiqtut, aippaangani kihimi nauttiangittut. Nipaluitkaangat nauttiayuunmata nauttiat, taima adjikkutaa aput. Apiqpiaraangat apingitkaangallu.”



Kuptana | Student Artwork

Inuit Qaujimagatuqangit

Kate Inuktalik

“They do not really go berry picking when they are hunting caribou. They rather hunt caribou than pick berries. They prefer to hunt when they go hunting. When they go berry picking they just go berry picking.”

Mona Tiktalek

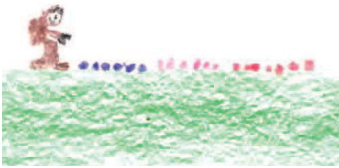
“When we used to travel by dog team to the islands when the snow was melting away and we see red berries that is when we made jam. We never cooked. You just add sugar.”

Mark and Martha Taletok

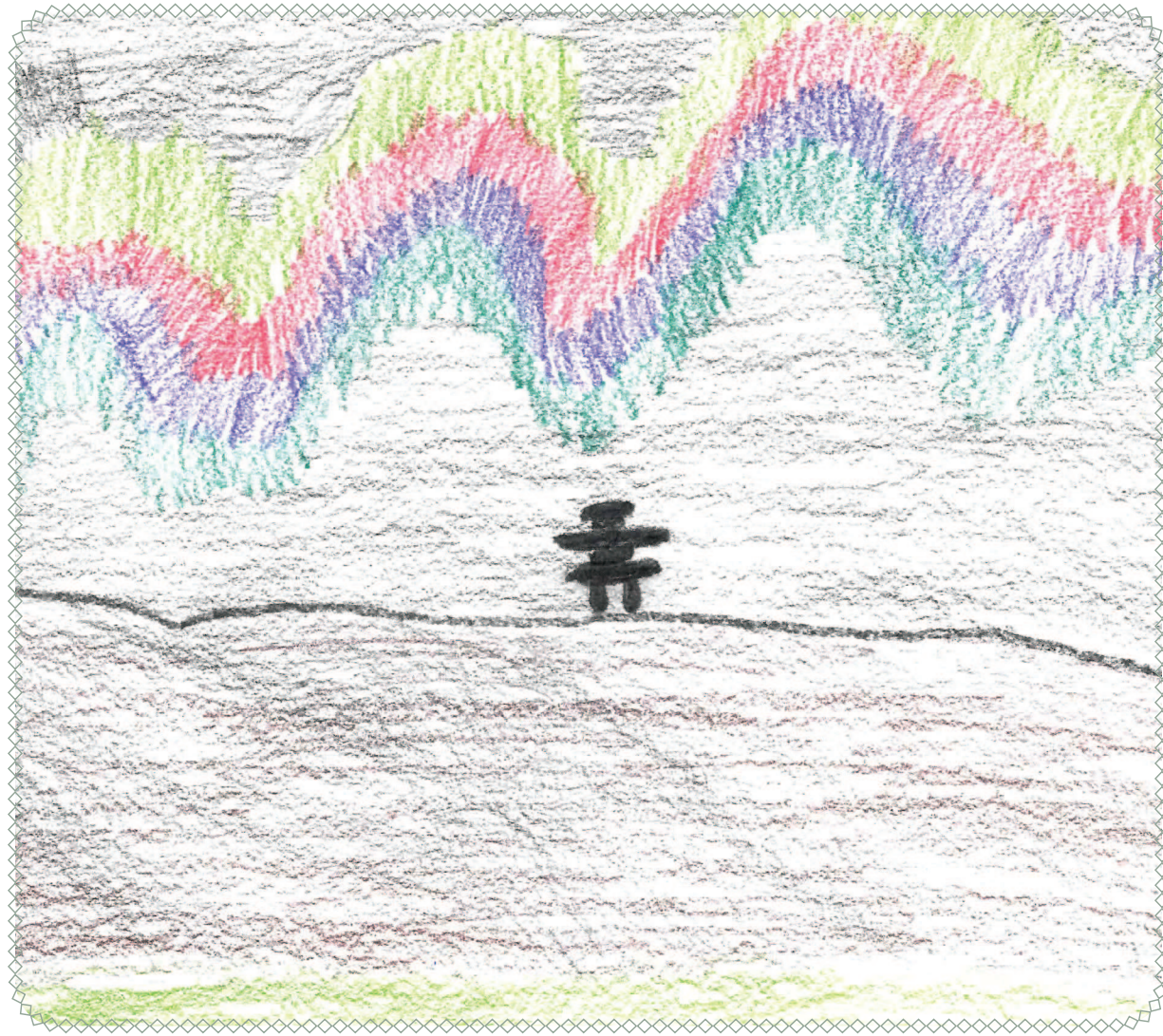
“When you have a sore throat or cold they used to heat up cranberries and make them into juice. His mother used to make him drink it while it was really hot. It was juice that was made out of berries. You pick cranberries and then make a kind of juice. You cook it with water and when it is really hot you make them drink it so you make them feel better. You have to drink it before it gets cold.”

Roy Inuktalik

“Now we don’t have very much rain. We used to have a lot of little rain. One time there is a lake there. It used to always be a lot of water but that time we did not get much rain so it dried up. This year the growth of berries it was good but the year before there was not very much growth. When there is hardly any rain it is hard to get vegetation. If we have lots of rain we get lots of growth. It is the same thing with lots of snow or less snow.”



Unknown | *Student Artwork*



Hakongak | *Student Artwork*



KINGMINIRNAT QAYURAQ

12 oz puuq kingmingnat
3/4 qallut aulaisiq juusi
2/3 qallut marlungayuq suka
1/3 qallut qakuqtaq suka

tamaita iggatiutikhat ililugit
qattannuamut igalugu
ingniqquqtuvallaanngitumik 15-20
minits-ni imaivyakhirluguluuniit.
Ayakhaqattarlugu.

Ingnirvingmit ungavarlugu
niqhiuqtaaliqtuq.

Kingmingnat qayuraq
igayauttaaqtuq qaffini ubluni
atuliqtinagu niglaqhiivingmit
pilugu uunakhirlugululuuniit
mikiyumik niqhiuqtinagu.

Aapu Kingmingnaq

QAANGANIITTUKHAQ:

1 1/2 qallutit muqpauyakhaq
3/4 niqiliakhaq (Cornmeal)
1/2 qallut suka
1 1/2 aluutinnuak publak
1/4 aluutinnuq taryuq
1/2 qallut (1 kikkariktuaq) niglaumayuq
taryuittuq pata, avguqhimayuq
kikkariktunuat
1 angiyuq mannik, ayakhatiqtuqhimayuq

ILULIKHAQ:

2 qallutik kingmingnat
2/3 qallut (qiqhuqtirlugu) marlungayuq suka
2 aluutinnuak avguattiaqhimayuq lemon amia
1 1/2 aaluutinnuak aulaisip amia
1 aluutinnuq hiurayanguqtiqhimayuq
cinnamon
Mikiyumik taryurmik
2 lbs Granny Smith aapu (hungayaaqtut),
amiiyaqhimayuk, iluliiqhimayuq, avgurlugu
kikkariktunnuatut
2 aluutiryuak lemon juusi

qaanganungaqtukhaq: atauttimut ayakharlugit niqinut pilirunmut alryaqtuqtumut muqpauyakhaq, niqiliakhaq (cornmeal), suka, publak taryurlu. avulugu pata; ayakhaqtillugit, qamiqattarlugu ikiqattarlugu pirluqhirlugu. Nuutirlugu angiyumut urviuyarmut. Mannik qangagut kuhiqtaqtilugu tamaat atipkaqtillugu.

Ilulikhaanut: uunnakhirlugu ingnirvik uvunnga 375°F. atauttimut iliurarlugit hivuliir 8-nguyut ilakhait urviuyaryuamut. Ayakhaqtillugit atauttimut iliurarlugit aapu lemon juusimut; alryaqtuqtumut ayakhaqtillugit. Nuulugu ilulikhaa aktilaqaqtumut 11x7x2- hikuliarmut pahiktiinmut (aallamulluuniit pahikhiinmut 2-quart aktilaanga).

Pirluqtirlugu qaangangut ilulikhap. Pahiqhirlugu aaput qalattirlugit aqilittirlugu, juusia purriliqqat kiniqtittuni, qaanga hiqulaaliqqat quryiqhibluni. Atauhirmi ikaarnirmi, niglaqhirlugu 15 minits-ni. Niqhiurlugu vanilla aiskuliilirlugu.

Apple Cranberry Crisp

TOPPING:

1 1/2 cups flour
 3/4 Cornmeal
 1/2 cup sugar
 1 1/2 teaspoons baking powder
 1/4 teaspoon salt
 1/2 cup (1 stick) chilled unsalted butter, cut into 1/2-inch cubes
 1 large egg, beaten to blend

FILLING:

2 cups fresh cranberries
 2/3 cup (packed) golden brown sugar
 2 teaspoons finely grated lemon peel
 1 1/2 teaspoons finely grated orange peel
 1 teaspoon ground cinnamon
 Pinch of salt
 2 pounds Granny Smith apples, peeled, cored, cut into 1-inch cubes
 2 tablespoons fresh lemon juice

For topping: Blend in a food processor flour, cornmeal, sugar, baking powder and salt. Add butter; blend, using on/off turns, until mixture resembles coarse crumbs. Transfer mixture to large bowl. Drizzle egg over and stir until ingredients are evenly moistened.

For filling: Preheat oven to 375°F. Combine first 8 ingredients in large bowl; stir to blend. Add apples and lemon juice; toss to blend. Transfer filling to 11x7x2-inch glass baking dish (or other shallow 2-quart baking dish).

Crumble topping finely over filling. Bake dessert until apples are tender, juices bubble thickly, and topping is crisp and golden, about 1 hour. Cool 15 minutes.

Serve with vanilla ice cream



CRANBERRY SAUCE

12 oz bag fresh cranberries
 3/4 cup orange juice
 2/3 cup brown sugar
 1/3 cup white sugar

Place all the ingredients in a sauce pan and cook on medium-high for 15-20 minutes or until most of the liquid has reduced. Stirring occasionally.

Remove from heat and serve.

Cranberry sauce can be made days ahead and brought to room temperature or slightly heated before serving.





KABLAT

Bearberry

Kablat (*Arctostaphylos alpina*) navuktut uyaraqarnirni Ukiuqtaqtumi napaaqtuqarniit haniani. Katimaqpiqhutik navuktut nauviit qunmukhimavyaktut. Aput mahaktiraangat mikkannuat quryiqtat nauttiat nuivaktut angmaqtiliqtinnagit uqauyait. Aupayaaqtut uqauyait qirnarikhilutigli kablat naunaiququq ukiakhaliqtuq. Uqauyait iyukkarapaktut ukiakhami nutaanik uqauyanikhutik upin'ngaami. Ilangit uqauyait iyukayuittat ataani qaliriiktiqhutik uqquuqutauvaktut ukiumi anurinit uqquumablugillu nauttiakhait upin'ngaaqqat.

Aupayaaqtut kablat (*Arctostaphylos rubra*) ahiangit aupayaaqtut iluanullu takuyuqinnaqhutik augaangamik. Uqauyait hungayaaqtut, taqagiakhutik qiblaraaqhutigli aupayaalaqipiqaqaktut ukiakhami haatutik iqingalluanngitutiglu paun'ngat uqauyaitut. Nunainarmi navuktut imaqaqarnirni kuugat

hanianni uyaraqarnirnilu.



Alpine bearberry (*Arctostaphylos alpina*) grows on rocky tundra in the Arctic and boreal forest. They grow in mats closely hugging the ground where the tips the braches slightly turn up. As the snowmelts small yellow bell-shaped flowers appear even before the leaves begin to unfold. Its scarlet leaves and plump black berries are signs for the coming winter. The leaves are deciduous meaning that they fall off the plant each fall and new leaves form the following spring. Some of the leaves stay attached to stem around the base providing a layer of insulation protecting the plant from winter winds and keeps the new flowers warm in the spring.

Red bearberry (*Arctostaphylos rubra*) fruit are red and almost translucent when

ripe. The leaves are bright green, highly textured and shiny turning fiery reddish orange in autumn and are thinner and less wrinkled than the alpine bearberry. They grow in peat-like soils near rivers and creeks and on rocky tundra.



Unknown | Student Artwork

Stages of Life



left:
Flower
Kaplakotit
Kaplaqutit

below:
Unripe
Kaplak naohimaitok
Kaplat nauhimaittuq



Julianne | Student Artwork

Turning



left:
Red
Kaplakotit
Kaplaqutit

right:
Black
Kaplagoakotit
Kaplaqyuaqutit



Ashley | Student Artwork

Inuit Qaujimajatuqangit

Lena Niptanatiak

“Uqauyait tiiliurutigiinaqtatka. Tiingirutigaangat, nunamiittuta ilaani algakhugit aputimit tiiliuriaptingni.”

Mark unalu Martha Taletok

“Nauyukhat naugaangata qupanuat manniinik pikiunaqtuq. Qiqaiyarluarvia nungutirviani Imaruqtirvia tikitkaangat. Talvani ilitturivaktugut manniktarnaqhiyuq. Uqauyait quryiqtavayat aupayaangavyaktut, augaangata manniit qupanuat nakuuhivaktut. Haqaliqitaat nirivagait taapkua nauyut kihimi hadja aallanguqtuq. Taimaittungnaiqtuq; tatqiqhiutillu. Kinguvaqtittut itqaumanimnit.”

Alice Ayalik

“Naunaiyaqpagait kblat aupayaaliriangita. Naunaiqhaivaktut Iqaluit manniliuliraangata kblaqtaliqpaktut. Augaangata Iqaluit mannitik tatakpagait. Kblat takublugit. Kuukkat hinaangit aupayaqtunik kablariakhivaktut.”

Mark unalu Martha Taletok

“Pukukpagait kblat uqauyait tiiliurutikhatik. Augaangata aputaiyaliraangat, aputairaangat pukukpagait. Nakuuqpiaqtut aqiarurliuraangat kidjakhimagaangat. Havautauyuq aqiarurliuqtunut.”

Kate Inuktalik

“Atuqpagait Attungayaq kilaaqhimayunut. Kinipkaqqaarlugu qaanganunngarlugu kilaap. Illuktunullu atuqpagaat. Atipkaqtitqaarlugu iyik qaanganunngarlugu. Kigiruiyautauyuq. Nunamit niqauyatut ittut. Immakhugu. Illuktunut atuqtitpagaat imaalu aqiarurliuryaliruvit atuqpagait tirluq aqiarurluiyariami. Kblat uqauyait mamaqtut. Sukaliqturiittuq. Niqiliqivik nungutiliraangat utuqqanguraangata pukukpagait tiiliurutikhat. Naulihaaraangata hungayaaqtillugit atuyuitait. Kihimi marlungayunnguraangita.”

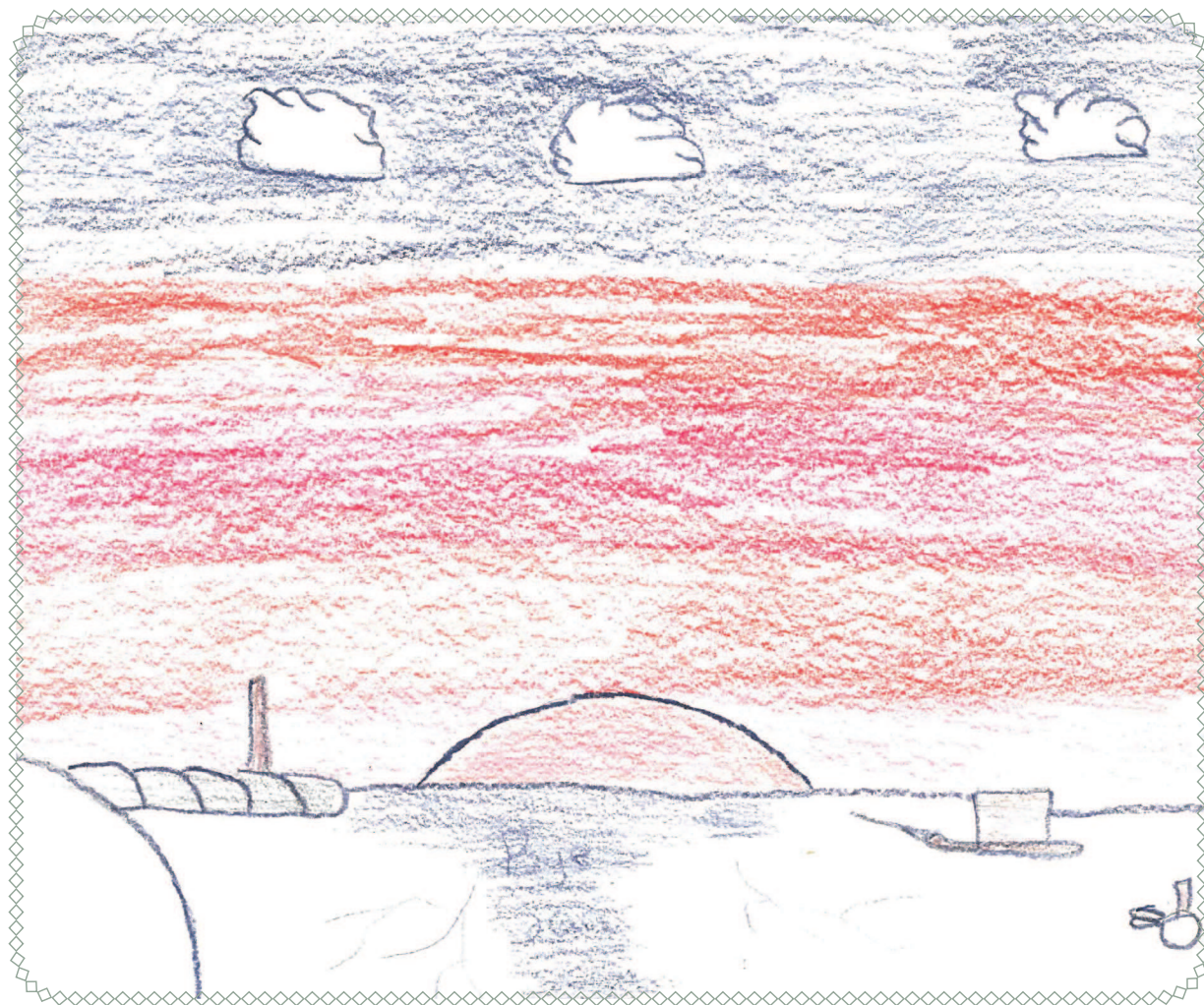


Hakonyak | Student Artwork



Andi | Student Artwork

Inuit Qaujimagatuqangit



Preston | Student Artwork

Lena Niptanatiak

“I only use bearberry leaves for tea. When they are out of tea, when they were inland sometimes they would have to dig them out of the snow to use them for tea.”

Mark and Martha Taletok

“When the plants really grow you can find where little birds have eggs. It starts probably end of May to June. That is the time we find out that the eggs are good to pick. The plants are sort of yellow and pink. When they are really ripe that is a good time for the eggs. The butterflies sometimes they eat those plants too but it is not the same anymore. It has all changed; the calendar too. It is way behind from how we remember.”

Alice Ayalik

“They check on the bearberries to see if they are red. They check out as a cue to see if the Arctic char are spawning and going up river. That is when they are spawning. They look at the bearberries. When they are really ripe the char are spawning. On the side of the river there are really a lot of red bearberries.”

Mark and Martha Taletok

“They pick up those bearberry leaves for tea. When they are really ripe after the snow is all gone. After the snow is gone they pick them up. They are really good when you have upset stomach or flue. It’s just like a medicine to cure the stomachache.”

Kate Inuktalik

“They used Attungayaq for some people who had sores. They would wet them first and then put them on. Even for snow blind they use that. They kind of wet it first and put it on their eyes. It is just like soothing medication. It is from the ground like moss. They add it with water. To soothe the snow blindness and when you have really sore stomach ache they use tirluq to soothe the stomach ache. Bearberry leaves was really tasty. You don’t have to use sugar. When they are really old at the end of August they would pick the bearberry leaves to make tea with. When they are just growing and are just green they don’t use them only when they are getting brown.”



Anagyook | Student Artwork

Aallakuttauq:

**AYURNAITTUQ VANILLA
PUDDING**

- 1/3 qallut sukamik
- 2 aluutiryuak cornstarch
- 1/4 aluutinnuaq taryuq
- 2 1/4 qallutit miluk
- 3 angiyut manniit quryiq̄ait, ahiruq̄tivyaglugit
- 3 aluutiryuat taruittumik patamik, avguarlugu
- 2 aluutiinuak vanilla extract

Kalikuq kuhiq̄tautikhaq qaangagut hitamat qallutiqaq̄taaq̄tunut urviuyarmulluun̄it kuvippiqaqtumut tutqullaglugu.

Avuurlugit suka, cornstarch, taryurlu angivallaanngitunut qattannuamut ayakhatiqturlugu. Ayakhaq̄himmaāqhugu kuvvirilugu kayumiittumik milungmik. Manniit quryiq̄ait ayakhautilugit miluglu.

Qattaq ingnirvingmut uunnakhilirlugu uunnakpallaāq̄himaittumik, ayakhaq̄attarlugu qayunnguqtirlugu purriliqhirlugu, 5-6 minits-ni. Ingnikhilugu ingnirvik haluarunmut ayakharlugu, ataa haniraiglu nipitaailuglu qattarmut, igayat qaangagut haluarunmut tuniliurtaaliqqat, 3-5 minitsmi.

Kigutigirnat Paun’ngainaq Trifle

- | | |
|---|------------------------|
| 2 qallutik miluk | 2 qallutik aqpiit |
| 1 puuq. (4 niriyaakhaat) JELL-O Vanilla Pudding | 1 qallut kigutingirnat |
| 1 (13.6 oz) puuq pound cake, avguaq̄himayuq qikkariktunnuat | 8 oz whipped cream |

kuvilugu miluk angiyumut urviuyarmut. Avulugu pudding-mik. Ayakharlugu kayumikhilutit 2 minits-mi. Nappainait cake kikariktut 3-quart niq̄hiurunmut; qaanganut ililugit nappainarnik paun’nganik. Qaangagut kuviralutit puddingmik, taimailuuffaarlutit cakemik paun’nganik puddingmiglu. Qaanga whipped cream-lirlugu. Niglaq̄hiivingmut ililugu atauhirmi ikaarnirmi nirittaalaq̄ittirlugu.

POUND CAKE

- 1/2 lb (2 tuattuungayuk) pata, mikiyumiglu
- algiq̄hiirutikhaq
- 1/2 qallut uqhurmik
- 3 qallutit suka

Alruyaqtuqtumut ayakhaunmut, pata milunguqtirlugu iggallu atauttimut. Avulugu sukamik, mikannuamik ayakhaq̄attarlugu. Avulugu manniit, atauhiillaq̄tarlugit, ayakharaalugit avugaangata. Paniupayut avukhat urviuyarmut ayakhaunmunngarlugit atauhiillaq̄tarlugit muq̄pauyarlu miluglu ayakharlugit inirutigilugu muq̄pauyaq. Vanillamik ilalugu. Kuvilugu uq̄huq̄tiq̄himayumut cake-liurunmut kaimalluriktumut qitqagut putuqaqtumut. Igalugu atauhirmik nappaaniglu ikaangnimi. Kukkillinmut uuttaakhaa uukturlugu kapurlugu qitqagut halumakpat qalattuq.

WHIPPED CREAM

- 2 aluutiryuak suka
- 1 qallut ivyuyuq whipping cream

- 5 manniit
- 3 qallutit qakutaq muq̄pauyakhaq, igatillu muq̄pauyaq̄tirutikhaa
- 1/2 aluutinnuaq taryuq
- 1/2 aluutinnuaq publak
- 1 qallut miluk

Suka ililugu urviuyarmut avulugu whipping cream. Ayakharyuarlugu qirattarnahuarlugu qunmut napaliriangat. Tutqurlugit ilakuit matutiaq̄himalugu ikaangnimi qulini. Ayakhaffaarlugu 10-15 minits-ni.

Very Berry Trifle

2 cups milk
 1 pkg. (4 serving size) JELL-O Vanilla Flavor Pudding
 1 (13.6 ounce) package pound cake, cut into
 1/2-inch cubes

2 cups cloudberry
 1 cup blueberries
 8 ounces of whipped cream

Pour milk into large bowl. Add pudding mix. Beat with wire whisk for 2 minutes or until well blended.
 Place 1/2 of the cake cubes in 3-quart serving bowl; top with 1/2 each of the fruits. Spread pudding mixture over fruit. Repeat layers of cake and fruit. Top with whipped topping.
 Refrigerate at least 1 hour or until ready to serve.
Makes 12 servings.

POUND CAKE

1/2 pound (2 sticks) butter, plus more for pan
 1/2 cup vegetable shortening
 3 cups sugar
 5 eggs

3 cups all-purpose flour, plus more for pan
 1/2 teaspoon fine salt
 1/2 teaspoon baking powder
 1 cup milk

With a mixer, cream butter and shortening together. Add sugar, a little at a time. Add eggs, 1 at a time, beating after each addition. Stir dry ingredients together in a bowl and add to mixer alternately with milk, starting with the flour and ending with the flour. Mix in vanilla. Pour into a greased and floured tube pan and bake for 1 to 1 1/2 hours, until a toothpick inserted in the center of the cake comes out clean.

WHIPPED CREAM

2 tablespoons sugar
 1 cup heavy whipping cream

Place the sugar into the mixing bowl and add the whipping cream.
 Whisk just until the cream reaches stiff peaks. Store any unused portion in an airtight container for up to 10 hours. When ready to use, re-whisk for 10 to 15 seconds.

Options:

EASY VANILLA PUDDING

1/3 cup granulated sugar
 2 tablespoons cornstarch
 1/4 teaspoon fine salt
 2 1/4 cups whole milk
 3 large egg yolks, lightly
 beaten
 3 tablespoons unsalted butter,
 cut into small pieces
 2 teaspoons vanilla extract

Place a mesh strainer over a 4-cup measuring cup or bowl with a spout and set aside.

Combine the sugar, cornstarch, and salt in a medium saucepan and whisk until incorporated. While constantly whisking, slowly drizzle in 1/4 cup of the milk until smooth. Whisk in the egg yolks and remaining milk.

Place the saucepan over medium heat and cook, whisking often, until the pudding begins to thicken and just starts to bubble, about 5 to 6 minutes. Reduce the heat to medium low and switch to a rubber spatula. Stir constantly, scraping the bottom and sides of the pan, until the pudding makes visible ribbons when drizzled over the surface, about 3 to 5 minutes.







Sarah Desrosiers

Sarah Desrosiers is a graduate student at the University of British Columbia pursuing a Masters of Science from the Department of Geography.

While completing her undergraduate degree, Sarah worked as a research assistant for the Tundra Ecology Lab where she developed a strong interest in the Arctic and northern issues. Supervised by Dr. Greg Henry, her interdisciplinary research project focuses on maintaining and enhancing a community-supported berry monitoring program in Kugluktuk, Nunavut. The project's main objective investigates ways to build capacity for youth to engage with the local environment as way for healing and wellbeing.

Currently, Sarah bases her home in Merritt, BC where she enjoys exploring the outdoors, baking goodies at Brambles Bakery and working at a local honey farm.

THANK YOU



KHS 2013 Carrer & Technology Studies Group with teacher Shamim Sharif and assistants Detrick Hala & Nimisha Bastedo



KHS 2012 Carrer & Technology Studies Group with teacher Dale Skinner and assistant Kate van Ballegooyen

